MassMutual Global Funding II

USD 21,000,000,000
GLOBAL DEBT ISSUANCE PROGRAM

*MassMutual Global Funding II is a special purpose statutory trust formed under the laws of the State of Delaware (the "**Trust**"), the sole purpose of which is to facilitate the program (the "**Program**") described in this Offering Memorandum (this "**Offering Memorandum**") for the issuance, from time to time, of discrete series of debt instruments (collectively, the "**Notes**"). The Notes will be issued by the Trust through one or more series (the Trust, with respect to each series of such Trust, a "**Series Trust**") and will be secured by one or more Funding Agreements (each, a "**Funding Agreement**") issued by Massachusetts Mutual Life Insurance Company ("**MassMutual**"), a Massachusetts corporation, with respect to such Series Trust and, in some instances, by the rights of a Series Trust in and to one or more swap transactions entered into by the Series Trust either with MassMutual acting on behalf of its general account or with MassMutual acting on behalf of a separate account (each, a "**Swap**"). The Notes issued by a Series Trust shall constitute a separate series of Notes (each, a "**Series of Notes**" or a "**Series**") issued under the Program. The Trust is the only legal entity, which may issue Notes with respect to the Program, and each Series Trust is a separate series of the Trust but is not a separate legal entity under Delaware law.*

*The Notes have not been, and will not be, registered under the United States of America Securities Act of 1933, as amended (the "**Securities Act**"), or any state or foreign securities laws and, unless so registered, may not be offered, sold, transferred or resold except pursuant to an exemption from, or in a transaction not subject to, the registration requirements of the Securities Act and applicable state or foreign securities laws. Accordingly, the Notes will be offered and sold only (a) to qualified institutional buyers (as defined in Rule 144A ("**Rule 144A**") under the Securities Act) ("**Qualified Institutional Buyers**") and (b) in offshore transactions to persons other than U.S. Persons (within the meaning of Regulation S ("**Regulation S**") under the Securities Act). See "Purchase and Transfer Restrictions."*

See "Risk Factors" beginning on page 11 for a discussion of certain factors that should be considered in evaluating an investment in the Notes.

This Offering Memorandum constitutes a base listing particulars and has been approved by the Irish Stock Exchange plc trading as Euronext Dublin ("Euronext Dublin"). Application may be made to Euronext Dublin for the Notes issued during the period of 12 months from the date of this Offering Memorandum to be admitted to the Official List (the "Official List") and trading on its Global Exchange Market (the "GEM"). Such approval relates only to the Notes (if any) of any Series that are to be admitted to trading on the GEM. The GEM is not a regulated market for the purposes of Directive 2014/65/EU (as amended, "MiFID II"). The Notes may also be offered in any member state of the European Economic Area (the "EEA"); provided, that the Notes of each Series at the time of issue will, except for the Notes issued solely outside of the EEA, be in minimum denominations of €100,000 (or equivalent in another currency at the time of issue) and integral multiples of €1,000 (or equivalent in another currency at the time of issue) in excess thereof.

*The specific terms of any Series of Notes offered will be set forth in the Pricing Supplement for such Series (the relevant "**Pricing Supplement**"). The Pricing Supplement should be read in conjunction with this Offering Memorandum and to the extent that the terms of any Pricing Supplement are inconsistent with the terms of this Offering Memorandum, the terms set forth in the Pricing Supplement shall govern. The Notes of a particular Series will be issued by a particular Series Trust and will not be the obligations of any other Series Trust.*

The Notes are not insurance contracts, insurance policies or funding agreements and do not represent an interest in any such policy or contract. Further, the Notes are not obligations of MassMutual or of an affiliate of MassMutual or any other insurance company. The Notes will not benefit from any insurance guaranty association coverage or any similar protection.

This Offering Memorandum is not a Base Prospectus for purposes of Article 5.4 of Directive 2003/71/EC, as amended or superseded.

Arranger for the Program
MORGAN STANLEY

U.S. Dealers	*European Dealers*
MORGAN STANLEY	*MORGAN STANLEY*
BARCLAYS	*BARCLAYS*
BOFA MERRILL LYNCH	*BOFA MERRILL LYNCH*
CITIGROUP	*CITIGROUP*
CREDIT SUISSE	*CREDIT SUISSE*
DEUTSCHE BANK SECURITIES	*DEUTSCHE BANK*
GOLDMAN SACHS & CO. LLC	*GOLDMAN SACHS INTERNATIONAL*
HSBC	*HSBC*
J.P. MORGAN	*J.P. MORGAN*
JEFFERIES	*JEFFERIES INTERNATIONAL LIMITED*
MIZUHO SECURITIES	*MIZUHO SECURITIES*
NATWEST MARKETS	
RAMIREZ & CO., INC.	*NATWEST MARKETS*
SMBC NIKKO	
THE WILLIAMS CAPITAL GROUP, L.P.	
UBS INVESTMENT BANK	*UBS INVESTMENT BANK*
US BANCORP	
WELLS FARGO SECURITIES	*WELLS FARGO SECURITIES*

Offering Memorandum dated June 11, 2019

*Notes offered and sold in the United States of America (“**U.S.**”) in reliance on Rule 144A (“**Rule 144A Notes**”) will only be issued in registered form (“**Registered Notes**”). Notes offered and sold outside the U.S. in reliance on Regulation S (“**Regulation S Notes**”) will only be issued as Registered Notes. Subject to the provisions of the relevant Pricing Supplement, each Series of (i) Registered Notes offered and sold to Qualified Institutional Buyers in the U.S. in reliance on Rule 144A will be initially represented by one or more permanent global Registered Notes (each, a “**Permanent Global Registered Note**” and, in respect of such Rule 144A Notes, each, a “**Rule 144A Global Note**”) registered in the name of the 144A Nominee (as defined herein) as nominee of, and deposited with the Custodian (as defined herein), as custodian for, The Depository Trust Company (“**DTC**”) and (ii) Registered Notes offered and sold outside of the U.S. in reliance on Regulation S initially will be represented by a temporary global Registered Note (“**Regulation S Temporary Global Registered Note**”) registered in the name of the Regulation S Nominee (as defined herein) as nominee of, and deposited with the Common Depositary (as determined at the time of issuance), as common depositary for, Euroclear Bank S.A./N.V. (“**Euroclear**”) and/or Clearstream Banking S. A. (“**Clearstream**”). Subject to certain restrictions, (i) an interest in a Rule 144A Global Note may be exchanged for Registered Notes in definitive form (“**Definitive Registered Notes**”) and (ii) an interest in a Regulation S Temporary Global Registered Note may be exchanged for an interest in a Permanent Global Registered Note (“**Regulation S Permanent Global Registered Note**”) or Definitive Registered Note. **Prospective investors should rely only on the information contained in this “Offering Memorandum.”*** **No Initial Purchaser, agent, dealer, salesman or other person has been authorized to give any information or to make any representations other than those contained in this Offering Memorandum and any Pricing Supplement to this Offering Memorandum and if given or made such other information or representations must not be relied upon as having been authorized by the Series Trust, the Trust, any Initial Purchaser or MassMutual. This Offering Memorandum and any Pricing Supplement to this Offering Memorandum do not constitute an offer to sell, or a solicitation of an offer to buy, any of the securities offered hereby by anyone in any jurisdiction in which such offer or solicitation is not authorized or in which the person making such offer or solicitation is not qualified to do so, or to any person to whom it is unlawful to make such offer or solicitation. Neither the delivery of this Offering Memorandum or any Pricing Supplement to this Offering Memorandum at any time, nor any sale made in connection with this Offering Memorandum or any Pricing Supplement to this Offering Memorandum, shall, under any circumstances, create an implication that there has been no change in the affairs of the Series Trust, the Trust or MassMutual since the date of this Offering Memorandum or any Pricing Supplement to this Offering Memorandum, as the case may be, or that the information contained in this Offering Memorandum or any Pricing Supplement to this Offering Memorandum, as the case may be, is correct as of any time subsequent to the date of this Offering Memorandum or any Pricing Supplement to this Offering Memorandum, as the case may be, as the results of operations, financial condition and business prospects of the Series Trust, the Trust or MassMutual may have changed since subsequent to the date of this Offering Memorandum or any Pricing Supplement to this Offering Memorandum, as the case may be.**

FOR INDIANA RESIDENTS ONLY

The Indiana Insurance Department has stated that Indiana domestic insurers should contact the Indiana Insurance Department before purchasing the Notes.

FOR NORTH CAROLINA RESIDENTS ONLY

The Notes have not been approved or disapproved by the Commissioner of Insurance for the State of North Carolina, nor has the Commissioner of Insurance ruled upon the accuracy or adequacy of this Offering Memorandum. The investor in North Carolina understands that neither the Trust nor any Series Trust is licensed in North Carolina pursuant to Chapter 58 of the North Carolina General Statutes, nor could the Trust or any Series Trust meet the basic admission requirements imposed by such chapter at the present time.

FOR ARKANSAS RESIDENTS ONLY

The Notes may not be purchased by, offered, resold, pledged or otherwise transferred to an insurer domiciled in the State of Arkansas, a health maintenance organization, farmers' mutual aid association or other Arkansas domestic company regulated by the Arkansas Insurance Department.

FOR UNITED KINGDOM INVESTORS ONLY

In the United Kingdom, this Offering Memorandum is only being distributed to, and is only directed at, persons who (1) have professional experience in matters relating to investments and fall within Article 19(5) of the Financial Services and Markets Act 2000 (Financial Promotion) Order 2005 (the "Order"), (2) are persons falling within Article 49(2)(a) to (d) ("high net worth companies, unincorporated associations etc.") of the Order or (3) are any other persons to whom it may otherwise lawfully be made under the Order (each such person being referred to as a "Relevant Person"). Any investment or investment activity to which this Offering Memorandum relates is available only to Relevant Persons and will be engaged in only with Relevant Persons. This Offering Memorandum must not be acted or relied on by persons who are not Relevant Persons.

FOR EUROPEAN ECONOMIC AREA RESIDENTS ONLY

Neither this Offering Memorandum nor any related Pricing Supplement is a prospectus for the purposes of the European Union's Directive 2003/71/EC (as amended or superseded), as implemented in the Member States of the EEA.

Prohibition of sales to EEA retail investors – The Notes are not intended to be offered, sold or otherwise made available to and should not be offered, sold or otherwise made available to any retail investor in the EEA. For these purposes, a retail investor means a person who is one (or more) of: (i) a retail client as defined in point (11) of Article 4(1) of MiFID II; or (ii) a customer within the meaning of Directive (EU) 2016/97, as amended or superseded (the "**Insurance Distribution Directive**"), where that customer would not qualify as a professional client as defined in point (10) of Article 4(1) of MiFID II. Consequently no key information document required by Regulation (EU) No 1286/2014, as amended (the "**PRIIPs Regulation**") for offering or selling the Notes or otherwise making them available to retail investors in the EEA has been prepared and therefore offering or selling the Notes or otherwise making them available to any retail investor in the EEA may be unlawful under the PRIIPs Regulation.

MIFID II product governance / target market – The Pricing Supplement in respect of any Notes may include a legend entitled "MiFID II Product Governance" which will outline the target market assessment in respect of the Notes and which channels for distribution of the Notes are appropriate. Any person subsequently offering, selling or recommending the Notes (a "**Distributor**") should take into consideration the target market assessment; however, a Distributor subject to MiFID II is responsible for undertaking its own target market assessment in respect of the Notes (by either adopting or refining the target market assessment) and determining appropriate distribution channels. A determination will be made in relation to each issue about whether, for the purpose of the MiFID product governance rules under EU Delegated Directive 2017/593 (as amended, the "**MiFID Product Governance Rules**"), any Initial Purchaser subscribing for any Notes is a "manufacturer" in respect of such Notes, but otherwise neither the Arranger nor the Initial Purchasers nor any of their respective affiliates will be a manufacturer for the purpose of the MiFID Product Governance Rules.

Benchmarks Regulation -- Interest and/or other amounts payable under the Notes may be calculated by reference to certain reference rates. Any such reference rate may constitute a benchmark for the purposes of Regulation (EU) 2016/1011 (the "**Benchmarks Regulation**"). If any such reference rate does constitute such a benchmark, the relevant Pricing Supplement will indicate whether or not the benchmark is provided by an administrator included in the register of administrators and benchmarks established and maintained by the European Securities and Markets Authority ("**ESMA**") pursuant to Article 36 (Register of administrators and benchmarks) of the Benchmarks Regulation. Transitional provisions in the Benchmarks Regulation may have the result that the administrator of a particular benchmark is not required to appear in the register of administrators and benchmarks at the date of the relevant Pricing Supplement. The registration status of any administrator under the Benchmarks Regulation is a matter of public record and, save where required by applicable law, the Trust does not intend to update the relevant Pricing Supplement to reflect any change in the registration status of the administrator.

FOR SINGAPORE RESIDENTS ONLY

The Notes may not be offered or sold, or be made the subject of an invitation for subscription or purchase, whether directly or indirectly, to persons in Singapore other than (i) to an institutional investor under Section 274 of the Securities and Futures Act, Chapter 289 of Singapore (as amended or modified from time to time, the "**SFA**"), (ii) to a relevant person, or any person pursuant to Section 275(1A), and in accordance with the conditions, specified in Section 275 of the SFA or (iii) otherwise pursuant to, and in accordance with the conditions of, any other applicable provisions of the SFA. Where the notes are subscribed or purchased under Section 275 of the SFA by a relevant person which is: (a) a corporation (which is not an accredited investor) the sole business of which is to hold investments and the entire share capital of which is owned by one or more individuals, each of whom is an accredited investor; or (b) a trust (where the trustee is not an accredited investor) whose sole purpose is to hold investments and each beneficiary is an accredited investor, shares, debentures and units of shares and debentures of that corporation or the beneficiaries' rights and interest in that trust shall not be transferable for 6 months after that corporation or that trust has acquired the notes under Section 275 except:

(i) to an institutional investor under Section 274 of the SFA or to a relevant person, or any person pursuant to Section 275(1A), and in accordance with the conditions, specified in Section 275 of the SFA;

(ii) where no consideration is given for the transfer; or

(iii) by operation of law.

Solely for the purposes of its obligations pursuant to Sections 309B(1)(a) and 309B(1)(c) of the SFA, the Trust has determined, and hereby notifies all relevant persons (as defined in Section 309A of the SFA) that all Notes to be issued under the Program are "prescribed capital markets products" (as defined in the Securities and Futures (Capital Markets Products) Regulations 2018) and Excluded Investment Products (as defined in MAS Notice SFA 04-N12: Notice on the Sale of Investment Products and MAS Notice FAA-N16: Notice on Recommendations on Investment Products).

FOR HONG KONG RESIDENTS ONLY

This Offering Memorandum has not been reviewed or approved by the Securities and Futures Commission or the Companies Registry of Hong Kong and, accordingly, the Notes may not be offered or sold by means of any document other than (a) in circumstances which do not constitute an offer to the public within the meaning of the Companies Ordinance (Cap.32, Laws of Hong Kong) or the Securities and Futures Ordinance (Cap. 571), (b) in other circumstances which do not result in the document being a "prospectus" within the meaning of the Companies Ordinance (Cap.32, Laws of Hong Kong) or (c) to "professional investors" within the meaning of the Securities and Futures Ordinance (Cap.571, Laws of Hong Kong) and any rules made thereunder.

No advertisement, invitation or document relating to the Notes may be issued or may be in the possession of any person for the purpose of issue (in each case whether in Hong Kong or elsewhere), which is directed at, or the contents of which are likely to be accessed or read by, the public in Hong Kong (except if permitted to do so under the laws of Hong Kong) other than with respect to Notes which are or are intended to be disposed of only to persons outside Hong Kong or only to "professional investors" within the meaning of the Securities and Futures Ordinance (Cap. 571, Laws of Hong Kong) and any rules made thereunder.

THE TRUST IS A DELAWARE SPECIAL PURPOSE STATUTORY TRUST, WHICH ISSUES NOTES THROUGH SERIES TRUSTS. THE TRUST IS AN INDEPENDENT LEGAL ENTITY SEPARATE, APART FROM MASSMUTUAL FORMED FOR THE SPECIAL PURPOSE OF ISSUING SERIES OF NOTES, AND IS NOT AFFILIATED WITH MASSMUTUAL. THE TRUST NEITHER IS NOR WILL BE, IN WHOLE OR IN PART, "CONTROLLED BY" OR OTHERWISE "AFFILIATED" WITH (AS SUCH TERMS ARE DEFINED IN CHAPTER 175 SECTION 206 OF THE MASSACHUSETTS GENERAL LAWS ANNOTATED) MASSMUTUAL. HOLDERS OF THE NOTES CAN LOOK ONLY TO THE ASSETS OF THE APPLICABLE SERIES TRUST FOR PAYMENT UNDER THE NOTES. HOLDERS OF THE NOTES WILL HAVE NO DIRECT RIGHT OF ACTION AGAINST MASSMUTUAL FOR PAYMENT UNDER THE NOTES.

BECAUSE EACH SERIES OF NOTES WILL BE SECURED BY ONE OR MORE FUNDING AGREEMENTS ISSUED BY A LIFE INSURANCE COMPANY AND, IN CERTAIN CASES, BY THE RIGHTS OF THE SERIES TRUST IN AND TO ONE OR MORE SWAPS ENTERED INTO WITH A LIFE INSURANCE COMPANY, THERE IS A RISK THAT IF THE NOTES WERE DEEMED TO BE CONTRACTS OF INSURANCE, THE TRANSFER OF THE NOTES COULD SUBJECT THE PARTIES TO SUCH TRANSFER TO REGULATION UNDER THE INSURANCE LAWS OF THE JURISDICTIONS IMPLICATED BY THE TRANSFER. AMONG OTHER THINGS, IF THE NOTES WERE DEEMED TO BE CONTRACTS OF INSURANCE, THE ABILITY OF A HOLDER TO SELL THE NOTES IN SECONDARY MARKET TRANSACTIONS OR OTHERWISE COULD BE SUBSTANTIALLY IMPAIRED, AND THE PROCEEDS REALIZED FROM SUCH SALE OR TRANSFER COULD BE MATERIALLY AND ADVERSELY AFFECTED. *SEE* "RISK FACTORS."

THE NOTES HAVE NOT BEEN AND WILL NOT BE REGISTERED UNDER THE SECURITIES ACT OR ANY STATE OR FOREIGN SECURITIES LAWS AND, UNLESS SO REGISTERED, MAY NOT BE OFFERED, SOLD, TRANSFERRED OR RESOLD EXCEPT PURSUANT TO AN EXEMPTION FROM, OR IN A TRANSACTION NOT SUBJECT TO, THE REGISTRATION REQUIREMENTS OF THE SECURITIES ACT AND APPLICABLE STATE OR FOREIGN SECURITIES LAWS. ACCORDINGLY, THE NOTES WILL BE OFFERED AND SOLD ONLY (A) TO QUALIFIED INSTITUTIONAL BUYERS (AS DEFINED IN RULE 144A UNDER THE SECURITIES ACT) AND (B) IN OFFSHORE TRANSACTIONS TO PERSONS OTHER THAN U.S. PERSONS (WITHIN THE MEANING OF REGULATION S). NO REPRESENTATION CAN BE MADE AS TO THE AVAILABILITY OF THE EXEMPTION PROVIDED BY RULE 144 FOR RESALES OF THE NOTES. *SEE* "PURCHASE AND TRANSFER RESTRICTIONS." NOTES SOLD PURSUANT TO REGULATION S MAY NOT BE OFFERED OR RESOLD IN THE U.S. OR TO U.S. PERSONS (AS DEFINED IN REGULATION S) UNTIL THE RELEASE DATE (AS DEFINED HEREIN), AND THEREAFTER SUCH NOTES MAY ONLY BE RESOLD TO QUALIFIED INSTITUTIONAL BUYERS OR INSTITUTIONAL INVESTORS THAT ARE "ACCREDITED INVESTORS" WITHIN THE MEANING OF RULE 501(A) UNDER THE SECURITIES ACT, PURSUANT TO AN EXEMPTION FROM THE REGISTRATION REQUIREMENTS OF THE SECURITIES ACT. *SEE* "PLAN OF DISTRIBUTION." NEITHER THE TRUST NOR ANY SERIES TRUST WILL BE REGISTERED UNDER THE INVESTMENT COMPANY ACT OF 1940, AS AMENDED (THE "INVESTMENT COMPANY ACT").

EACH OFFERING OF THE NOTES WILL BE MADE IN RELIANCE UPON AN EXEMPTION FROM OR IN A TRANSACTION NOT SUBJECT TO, REGISTRATION UNDER THE SECURITIES ACT FOR AN OFFER AND SALE OF SECURITIES, WHICH DOES NOT INVOLVE A PUBLIC OFFERING. EACH PURCHASER OF NOTES OFFERED HEREBY (TOGETHER WITH THE RELEVANT PRICING SUPPLEMENT) IN MAKING ITS PURCHASE WILL BE DEEMED TO HAVE MADE CERTAIN ACKNOWLEDGMENTS, REPRESENTATIONS, WARRANTIES AND AGREEMENTS AS SET FORTH UNDER "PURCHASE AND TRANSFER RESTRICTIONS."

IN CONNECTION WITH THE ISSUE AND DISTRIBUTION OF ANY TRANCHE OF NOTES UNDER THE PROGRAM, THE INITIAL PURCHASER OR INITIAL PURCHASERS (IF ANY) WHO ARE SPECIFIED IN THE RELEVANT PRICING SUPPLEMENT AS THE STABILIZING MANAGER(S) (THE "STABILIZING MANAGER(S)") OR ANY PERSON ACTING ON BEHALF OF ANY STABILIZING MANAGER(S) MAY OVER-ALLOT NOTES OR EFFECT TRANSACTIONS WITH A VIEW OF

SUPPORTING THE MARKET PRICE OF THE NOTES AT A LEVEL HIGHER THAN THAT, WHICH MIGHT OTHERWISE PREVAIL. HOWEVER, STABILIZATION MAY NOT NECESSARILY OCCUR. ANY STABILIZATION ACTION MAY BEGIN ON OR AFTER THE DATE ON WHICH ADEQUATE PUBLIC DISCLOSURE OF THE TERMS OF THE OFFER OF THE RELEVANT TRANCHE OF NOTES IS MADE AND, IF BEGUN, MAY CEASE AT ANY TIME, BUT IT SHALL, IN ANY EVENT, END NO LATER THAN THE EARLIER OF 30 DAYS AFTER THE ISSUE DATE OF THE RELEVANT TRANCHE OF NOTES AND 60 DAYS AFTER THE DATE OF THE ALLOTMENT OF THE RELEVANT TRANCHE OF NOTES. ANY SUCH STABILIZATION ACTION OR OVER-ALLOTMENT SHALL BE CONDUCTED IN ACCORDANCE WITH ALL APPLICABLE LAWS, RULES AND REGULATIONS.

THE INITIAL PURCHASERS WILL NOT BE UNDER ANY OBLIGATION TO MAKE A MARKET IN THE NOTES AND, TO THE EXTENT THAT ANY SUCH MARKET MAKING IS COMMENCED, IT MAY BE DISCONTINUED AT ANY TIME. FURTHER, THE NOTES ARE SUBJECT TO SUBSTANTIAL RESTRICTIONS ON TRANSFER AS SET FORTH UNDER "PURCHASE AND TRANSFER RESTRICTIONS." GIVEN THE RESTRICTIONS ON AND RISKS RELATED TO TRANSFER, THERE IS NO ASSURANCE THAT A SECONDARY MARKET WILL DEVELOP OR, IF IT DOES DEVELOP, THAT IT WILL PROVIDE HOLDERS OF THE NOTES WITH ADEQUATE LIQUIDITY, IF ANY, OR THAT SUCH LIQUIDITY WILL BE SUSTAINED. PROSPECTIVE INVESTORS SHOULD PROCEED ON THE ASSUMPTION THAT THEY MAY HAVE TO BEAR THE ECONOMIC RISK OF AN INVESTMENT IN THE NOTES UNTIL MATURITY.

THIS OFFERING MEMORANDUM IS BEING FURNISHED SOLELY FOR THE PURPOSE OF ENABLING PROSPECTIVE INVESTORS TO CONSIDER THE PURCHASE OF THE NOTES AND THE POTENTIAL LISTING OF THE NOTES ON EURONEXT DUBLIN. ITS USE FOR ANY OTHER PURPOSE IS NOT AUTHORIZED. NO REPRESENTATION OR WARRANTY, EXPRESS OR IMPLIED, IS MADE BY MASSMUTUAL, THE TRUST, ANY SERIES TRUST, ANY TRUSTEE, OR ANY INITIAL PURCHASER, OR ANY OF THEIR RESPECTIVE AFFILIATES AS TO THE ACCURACY OR COMPLETENESS OF SUCH INFORMATION AS OF ANY DATE AFTER THE DATE OF THIS OFFERING MEMORANDUM.

NO REPRESENTATION OR WARRANTY, EXPRESS OR IMPLIED, IS MADE BY THE INITIAL PURCHASERS AS TO THE ACCURACY OR COMPLETENESS OF THE INFORMATION SET FORTH HEREIN, AND NOTHING CONTAINED IN THIS OFFERING MEMORANDUM IS, OR SHALL BE RELIED UPON AS, A PROMISE OR REPRESENTATION, WHETHER AS TO THE PAST OR THE FUTURE. THE INITIAL PURCHASERS HAVE NOT INDEPENDENTLY VERIFIED ANY OF SUCH INFORMATION AND ASSUME NO RESPONSIBILITY FOR ITS ACCURACY OR COMPLETENESS.

THE NOTES HAVE NOT BEEN RECOMMENDED OR APPROVED BY ANY FEDERAL, STATE OR FOREIGN SECURITIES COMMISSION OR SECURITIES REGULATORY AUTHORITY OR ANY INSURANCE OR OTHER REGULATORY BODY. FURTHERMORE, THE FOREGOING AUTHORITIES HAVE NOT REVIEWED THIS OFFERING MEMORANDUM OR CONFIRMED OR DETERMINED THE ADEQUACY OR ACCURACY OF THIS OFFERING MEMORANDUM. ANY REPRESENTATION TO THE CONTRARY MAY BE A CRIMINAL OFFENSE.

THE TRUST TAKES RESPONSIBILITY FOR THE INFORMATION CONTAINED IN THIS OFFERING MEMORANDUM AND CONFIRMS THAT THE INFORMATION CONTAINED IN THIS OFFERING MEMORANDUM, INCLUDING ANY SUPPLEMENT HERETO, IS, TO THE BEST OF ITS KNOWLEDGE AND BELIEF, HAVING TAKEN ALL REASONABLE CARE TO ENSURE THAT SUCH IS THE CASE, IN ACCORDANCE WITH THE FACTS AND CONTAINS NO OMISSION LIKELY TO AFFECT THE IMPORT OF SUCH INFORMATION, HAVING TAKEN ALL REASONABLE CARE TO ENSURE THAT SUCH IS THE CASE.

THE ASSETS OF EACH SERIES TRUST, INCLUDING THE UNDERLYING FUNDING AGREEMENT OR AGREEMENTS AND CORRESPONDING SWAPS, IF ANY, ARE THE SOLE SOURCE OF FUNDS FOR SATISFACTION OF PAYMENT OBLIGATIONS WITH RESPECT TO THE RELEVANT SERIES OF NOTES. EXCEPT AS OTHERWISE PROVIDED HEREIN, THE NOTES DO NOT REPRESENT AN

OBLIGATION OF, AND ARE NOT INSURED OR GUARANTEED BY, MASSMUTUAL, THE TRUST, ANY SERIES TRUST, ANY TRUSTEE, ANY INITIAL PURCHASER OR ANY OF THEIR RESPECTIVE AFFILIATES. EACH PURCHASER OF A NOTE, BY SUCH PURCHASE, SHALL BE DEEMED TO HAVE ACKNOWLEDGED THAT NEITHER MASSMUTUAL, THE TRUST, ANY SERIES TRUST, ANY TRUSTEE, ANY INITIAL PURCHASER, ANY OF THEIR RESPECTIVE AFFILIATES NOR ANY PERSON ACTING ON BEHALF OF MASSMUTUAL, THE TRUST, ANY SERIES TRUST, ANY TRUSTEE, ANY INITIAL PURCHASER OR ANY OF THEIR RESPECTIVE AFFILIATES HAS MADE ANY REPRESENTATION CONCERNING THE RELEVANT FUNDING AGREEMENT OR AGREEMENTS AND CORRESPONDING SWAPS, IF ANY, THE SERIES TRUST, THE TRUST, THE NOTES OR THE OFFER AND SALE OF THE NOTES, EXCEPT AS SET FORTH OR PROVIDED IN THIS OFFERING MEMORANDUM.

PRESENTATION OF FINANCIAL INFORMATION

The financial information contained in this Offering Memorandum is based on the audited statutory financial statements of MassMutual as of December 31, 2018 and 2017 and for the years ended December 31, 2018, 2017 and 2016 (including the notes thereto, the "**Statutory Financial Statements**"), the most recently filed statutory annual statement of MassMutual (the "**Annual Statement**") and the quarterly statutory statements of MassMutual as of and for the three months ended March 31, 2019 and 2018 (the "**Quarterly Statement**" and, together with the Statutory Financial Statements and the Annual Statement, the "**Financial Statements**").

The Financial Statements were prepared in conformity with the statutory accounting principles ("**SAP**") prescribed or permitted by the Commonwealth of Massachusetts Division of Insurance (the "**Massachusetts Division**"). SAP differs in certain respects, which in some cases may be material, from U.S. generally accepted accounting principles ("**U.S. GAAP**") and international financial reporting standards ("**IFRS**"). *See* "Financial and Accounting Matters – Summary of Principal Differences Between SAP and U.S. GAAP." *See* "Annex A – Summary of Principal Differences Between Statutory Accounting Practices and International Standards" for a summary of certain significant differences between SAP and IFRS.

ADDITIONAL INFORMATION

This Offering Memorandum and all financial information contained herein may be amended and supplemented from time to time. This Offering Memorandum should be read and construed in accordance with any amendment or supplement hereto and, in relation to any offering of the Notes, should be read and construed in accordance with each relevant Pricing Supplement.

Each of the Trust and MassMutual has undertaken that in the event of any significant new factor, material mistake or inaccuracy relating to information in this Offering Memorandum, which is capable of affecting the assessment of any Notes, the Trust will prepare or procure the preparation of an amendment or supplement to this Offering Memorandum or publish a new Offering Memorandum, as the case may be, for use in connection with any subsequent issue by the Trust of Notes.

The Trust and MassMutual will provide, without charge, to each person to whom a copy of this Offering Memorandum has been delivered, upon the written request of such person, a copy of all relevant information. Written requests for such information should be directed to the specified office of either the Principal Paying Agent or, if applicable, the Irish Paying Agent (each as defined under "Description of the Notes" below) (each, a "**Paying Agent**" and, together, the "**Paying Agents**").

DOCUMENTS AVAILABLE

With respect to any Series of Notes, for so long as any of such Notes are outstanding and as long as the Notes are listed on the Official List of Euronext Dublin and admitted to trading on the GEM, the Trust, with respect to the relevant Series Trust, will make available, free of charge, at the specified offices of the Paying Agents (including, if applicable, at the specified office of the Irish Paying Agent), copies of the following documents:

(a) the Indenture, the relevant Series Indenture, the relevant Notes, the relevant Beneficial Interest Certificate, each relevant Funding Agreement, each relevant Swap, if any, the certificate of trust of the Trust (the "**Certificate of Trust**"), the Trust Agreement and the relevant Series Trust Agreement;

(b) this Offering Memorandum and all amendments and supplements hereto;

(c) each Pricing Supplement relating to such Series of Notes;

(d) annual audited and quarterly unaudited statutory-based financial statements of MassMutual as filed with the Massachusetts Division;

(e) all financial statements of the Trust generally and with respect to the applicable Series of Notes of the Trust prepared after the date hereof, if any; and

(f) the articles of incorporation and by-laws of MassMutual.

Each Series Trust will agree to provide upon request to any holder of record of Notes issued by such Series Trust and to any prospective purchaser designated by such a holder the information, which is required to be delivered pursuant to Rule 144A(d)(4) under the Securities Act ("**Rule 144A(d)(4)")**, including as it relates to MassMutual.

Copies of such documents may also be inspected in physical format during normal business hours at the office of the Indenture Trustee located at Citibank, N.A., 388 Greenwich Street, 14th Floor, New York, New York 10013, U.S. In addition, copies of such documents will be available in physical format free of charge from the principal office of the Principal Paying Agent for Notes listed on Euronext Dublin and from the relevant Paying Agent(s) with respect to Notes not listed on any securities exchange.

This Offering Memorandum and the relevant Pricing Supplement related to the issuance of any Series of Notes listed on Euronext Dublin, as the case may be, will be published on the website of Euronext Dublin at www.ise.ie.

The information on any website mentioned in this Offering Memorandum or any website directly or indirectly linked to any website mentioned in this Offering Memorandum is not a part of, or incorporated by reference into, this Offering Memorandum, and prospective purchasers should not rely on it.

The language of this Offering Memorandum is English. Certain legislative references and technical terms have been cited in their original language in order that the correct technical meaning may be ascribed to them under applicable law.

Other than as set forth above in this section or as provided in any supplement hereto, the Trust does not intend to provide any post-issuance information in relation to any Notes or the collateral.

FORWARD-LOOKING STATEMENTS

This Offering Memorandum contains forward-looking statements. Those statements appear in a number of places, including, but not limited to, under the headings "Business of MassMutual" and "Management's Discussion and Analysis of Financial Condition and Results of Operations." Such statements include statements regarding the belief or current expectations of MassMutual concerning its future financial condition and results of operations, including its expected operating and non-operating relationships, ability to meet debt service obligations and financing plans, product sales, distribution channels, retention of business, investment yields and spreads, investment portfolio and ability to manage asset/liability cash flows. Prospective investors are cautioned that any such forward-looking statements are not guarantees of future performance and involve risks and uncertainties, and that actual results may differ materially from those in the forward-looking statements as a result of various factors. The accompanying information contained in this Offering Memorandum, including without limitation the information set forth under the heading "Risk Factors," identifies important factors that could cause such differences.

Neither the Trust nor MassMutual intends, and is under no obligation, to update any particular forward-looking statement included in this Offering Memorandum.

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GENERAL DESCRIPTION OF THE PROGRAM

The following description of the Program is qualified by the more detailed information and Financial Statements (including the notes to the Financial Statements) appearing elsewhere in this Offering Memorandum, the relevant Pricing Supplement and the other documents referred to herein and therein.

MassMutual Global Funding II

The Trust is a special purpose statutory trust formed on December 10, 2001 under Delaware law pursuant to the Trust Agreement dated as of December 10, 2001 between the Depositor (as defined herein) and the Administrative Trustee (as defined herein) and the filing of the Certificate of Trust with the Delaware Secretary of State on December 10, 2001. The exclusive purposes of the Trust are, and the Trust shall have the power and authority to:

- issue and sell the Notes;
- enter into one or more Swaps, if any;
- use the net proceeds from the sale of the Notes to acquire one or more Funding Agreements and make any necessary payments under one or more corresponding Swaps with MassMutual, if any;
- pledge, collaterally assign and grant a security interest in the relevant Pledged Estate (as defined herein) to the Indenture Trustee; and
- engage in only those other activities necessary or incidental thereto.

Each Series of Notes will be issued by the Trust through a Series Trust created for the specific purpose of (i) issuing such Series of Notes, (ii) entering into one or more Swaps, if any, (iii) using the net proceeds from the sale of such Series of Notes to acquire one or more Funding Agreements from MassMutual and make any necessary payments under one or more corresponding Swap(s) with MassMutual, if any, and (iv) engaging in activities necessary or incidental thereto. Each Series Trust is a separate series of the Trust created pursuant to a Series Trust Agreement entered into between the Depositor and the Administrative Trustee (Notes will be issued pursuant to a Series Indenture (as defined herein) only as directed and authorized by the Series Trust Agreement), pursuant to which the Trust will issue a Series of Notes through a Series Trust. In addition to issuing Notes, unless otherwise specified in the relevant Pricing Supplement, each Series Trust will also issue a $100 beneficial interest certificate (the "**Beneficial Interest Certificate**") to the Depositor. The Funding Agreement(s) and corresponding Swap(s), if any, acquired by such Series Trust and the $100 consideration received by such Series Trust on the issuance of the Beneficial Interest Certificate will be the sole assets of each Series Trust. Payments under the relevant Funding Agreement(s) and corresponding Swap(s), if any, will be the sole source of income of such Series Trust. *See* "Description of the Beneficial Interest Certificate." The structure of the Program is described in greater detail below under "The Program," "Description of the Notes" and "Description of the Indenture."

Massachusetts Mutual Life Insurance Company

MassMutual is a mutual life insurance company headquartered at 1295 State Street, Springfield, Massachusetts, 01111-0001, phone: (413) 788-8411. MassMutual was chartered in 1851 in the Commonwealth of Massachusetts, U.S. The organizational number of MassMutual is 041590850. As a mutual life insurance company, MassMutual has no shareholders. MassMutual provides, in all 50 states of the U.S., the District of Columbia and Puerto Rico, directly or through its subsidiaries, a wide range of life insurance, annuity and disability products, pension and pension-related products and services and investment products and services to individuals, corporations and other institutions. MassMutual or its subsidiaries also have operations in Asia, Europe and Australia. MassMutual's major direct and indirect subsidiaries include C.M. Life Insurance Company ("**C.M. Life**"), MML Bay State Life Insurance Company ("**MML Bay State**") and Barings LLC ("**Barings**"). On May 31, 2018, MassMutual International LLC ("**MMI**") announced the completion of the sale of an 85.1% interest in MassMutual Life Insurance Company in Japan ("**MassMutual Japan**"), with MMI retaining a 14.9% interest in MassMutual Japan subsequent to the completion of the transaction. In addition, on November 16, 2018, MMI announced the completion of the sale of MassMutual Asia Limited ("**MassMutual Asia**"). On May 24, 2019, MassMutual announced the completion of the sale of its retail asset management affiliate, OppenheimerFunds, Inc. ("**OFI**") to Invesco Ltd. ("**Invesco**"), a global asset manager. Under the terms of the sale, MassMutual and OFI employee shareholders received 81.8 million of Invesco common shares and $4.0 billion in perpetual, non-cumulative preference shares with a fixed cash dividend rate of 5.9%. See "Management's Discussion and Analysis of Financial Condition and Results of Operations — Overview" and "Management's Discussion and Analysis of Financial Condition and Results of Operations — Business of MassMutual".

The Program

Trust:	MassMutual Global Funding II
Series Trust:	The Trust, with respect to a series of the Trust specified as the Series Trust in the relevant Pricing Supplement.
Funding Agreement Provider:	MassMutual
Initial Purchasers:	Morgan Stanley & Co. LLC, Morgan Stanley & Co. International plc, Barclays Capital Inc., Barclays Bank PLC, BofA Securities, Inc., Citigroup Global Markets Inc., Citigroup Global Markets Limited, Credit Suisse Securities (USA) LLC, Credit Suisse Securities (Europe) Limited, Deutsche Bank Securities Inc., Deutsche Bank AG, London Branch, Goldman Sachs & Co. LLC, Goldman Sachs International, HSBC Securities (USA) Inc., HSBC Bank plc, J.P. Morgan Securities LLC, J.P. Morgan Securities plc, Jefferies LLC, Jefferies International Limited, Merrill Lynch International, Mizuho Securities USA LLC., Mizuho International plc., , NatWest Markets Securities Inc., NatWest Markets plc, Samuel A. Ramirez & Company, Inc., SMBC Nikko Securities America, Inc., The Williams Capital Group, L.P., UBS Securities LLC, UBS AG London Branch, U.S. Bancorp Investments, Inc., Wells Fargo Securities, LLC and Wells Fargo Securities International Limited.
Indenture Trustee:	Citibank, N.A.
Principal Paying Agent:	Citibank, N.A.
Irish Paying Agent (if applicable):	Any paying agent appointed from time to time
Registrar:	Citibank, N.A.

Administrative Trustee:	U.S. Bank Trust National Association, a national banking association with its principal place of business in the State of Delaware, will be the sole administrative trustee of the Trust and each Series Trust. The Administrative Trustee will not be obligated in any way to make payments under or in respect of the Notes. The Administrative Trustee has not participated in the preparation of this Offering Memorandum. The Administrative Trustee is not affiliated with MassMutual, the beneficial owner of the Trust or each Series Trust, or the Indenture Trustee or any of their respective affiliates.
Transfer Agent:	Citibank, N.A.
Custodian:	Citibank, N.A. London Office
Common Depository	The notes will be registered in the nominee name of a common depository.
Listing Agent:	A&L Listing Limited
Depositor:	GSS Holdings II, Inc.
Authorized Program Amount:	USD 21,000,000,000. For this purpose, any Notes denominated in another currency shall be translated into U.S. dollars at the date of the relevant terms agreement (each, a "**Terms Agreement**") using the spot rate of exchange for the purchase of such currency against payment of U.S. dollars being quoted by the relevant Paying Agent on such date or such other rate as the relevant Series Trust and the relevant Paying Agent may agree. The Authorized Program Amount may be increased from time to time, subject to compliance with the relevant provisions of the Third Amended and Restated Purchase Agreement dated May 31, 2018, as amended by the First Amendment thereto dated the date hereof, by and among the Trust, MassMutual, each relevant Series Trust and the Initial Purchasers, as may be amended or supplemented from time to time (the "**Purchase Agreement**"). As of the date of this Offering Memorandum, the Trust has issued USD 15,462,700,000 of Notes under the Program in 47 discrete Series of Notes through 47 discrete Series Trusts. As of the date of this Offering Memorandum, the Trust has USD 6,197,165,171 of Notes outstanding under the Program in 13 discrete Series of Notes through 13 separate Series Trusts (*See* "Capitalization of the Trust").
Ratings:	It is anticipated that S&P Global Ratings, a Standard & Poor's Financial Services LLC business ("**S&P Global Ratings**"), Moody's Investors Service, Inc. ("**Moody's**") and Fitch Ratings, Inc. ("**Fitch**") will review each Series of Notes to determine a rating of the relevant Series of Notes. The rating of the Notes should be evaluated independently from similar ratings of other types of securities. A security rating is not a recommendation to buy, sell or hold securities and may be subject to review, revision, suspension or withdrawal by the assigning rating agency. None of S&P Global Ratings, Moody's, or Fitch has been involved in the preparation of this Offering Memorandum or any Pricing Supplement. A Series of Notes issued under the Program may, at the option of the relevant Series Trust, not be rated by any or all of S&P Global Ratings, Moody's, or Fitch if it is expressly specified in the relevant Pricing Supplement for such Series

that such Series is not rated by any or all of S&P Global Ratings, Moody's or Fitch.

Fitch is not established in the European Union (the "**EU**") and has not applied for registration under Regulation (EC) No. 1060/2009 (as amended, the "**CRA Regulatio**n"). However, the ratings assigned by Fitch are endorsed in the EU by Fitch Ratings Ltd., which is registered under the CRA Regulation (and, as such, is included in the list of credit rating agencies ("**CRAs**") published by ESMA on its website in accordance with the CRA Regulation).

Moody's is not established in the EU and has not applied for registration under the CRA Regulation. However, in the application for registration by Moody's for the registration of its EU-based entities under the CRA Regulation, it sought authorization to endorse the credit ratings of its non-EU entities through Moody's or Moody's Deutschland GmbH, which are established in the EU and are registered under the CRA Regulation (and, as such, are included in the list of CRAs published by ESMA on its website in accordance with the CRA Regulation).

S&P Global Ratings operates as a group of CRAs in the EU as defined by Article 3(m) of the EU CRA Regulation. S&P Global Ratings therefore has affiliated companies performing credit rating activities that are included in the list of CRAs published by the ESMA on its website in accordance with the CRA Regulation. However, the rating referred to within this Offering Memorandum is provided by the parent company S&P Global Ratings and not one of those affiliated entities operating in the EU. Any ratings issued by S&P Global Ratings, which are endorsed in the EU will be clearly identified as such.

The Notes: .... Principal and interest payments, if any, on any Series of Notes will be made solely from the proceeds of one or more Funding Agreements and corresponding Swaps, if any, purchased with respect to that Series of Notes.

Notes may be interest bearing or non-interest bearing. Notes may bear interest at either a fixed rate or a floating rate, as specified in the relevant Pricing Supplement for that Series of Notes. Interest on any Notes, if any, will be payable on the dates specified in the relevant Pricing Supplement for that Series of Notes.

Notes may be callable by the Series Trust, unless otherwise specified in the relevant Pricing Supplement for that Series of Notes.

A Series Trust may issue amortizing Notes that pay a level amount in respect of both interest and principal amortized over the life of the Note, if specified in the relevant Pricing Supplement for that Series of Notes.

Notes initially will be held in global form by the Custodian or the Common Depositary for DTC, Euroclear, or Clearstream, respectively.

Notes are not and will not be insurance contracts, insurance policies or funding agreements.

Notes are not and will not be obligations of or guaranteed by MassMutual, any affiliate of MassMutual or any other insurance company.

Notes will not benefit from any insurance guaranty fund coverage or any similar protection.

Notes of a particular Series will be issued by the Trust through a particular Series Trust and such Notes will not be the obligation of any other Series Trust. (*See* "Description of the Notes.")

Notes will be direct, unsubordinated obligations of the relevant Series Trust, secured by the applicable Funding Agreement(s) and the rights of a Series Trust in and to the corresponding Swap(s), if any, and all other property comprising the Pledged Estate (*See* "Description of the Indenture – Pledged Estate") and rank pari passu among themselves and with all other secured and unsubordinated obligations of such relevant Series Trust (other than any obligations preferred by statute or by operation of law).

Forms of Notes:.. Each Series of Notes will be issued in fully registered form. Each Series of Notes offered and sold in the U.S. in reliance on Rule 144A will be offered only as Registered Notes and will be initially represented by one or more permanent global Registered Notes registered in the name of the Rule 144A Nominee (as defined herein) as nominee of, and deposited with the Custodian (and defined herein) as custodian for, DTC. Each Series of Regulation S Notes will initially be represented by a Regulation S Temporary Global Registered Note registered in the name of the Regulation S Nominee (as defined herein) as nominee of, and deposited with the Common Depositary, as common depositary for, Euroclear and/or Clearstream. Each Regulation S Temporary Global Registered Note will be exchangeable for a Regulation S Permanent Global Registered Note beginning after the later of (i) the Release Date and (ii) the first date on which requisite certifications as to non-U.S. beneficial ownership of the relevant Notes are provided to the relevant Paying Agents. The Release Date is the date forty days after the later of (i) the date the relevant Notes were first offered to persons other than Initial Purchasers and (ii) the relevant closing date for that Series of Notes. Subject to certain restrictions, (i) an interest in a Rule 144A Global Note may be exchanged for Definitive Registered Notes and (ii) an interest in a Regulation S Temporary Global Registered Note may be exchanged for an interest in a Regulation S Permanent Global Registered Note or Definitive Registered Notes.

Currencies and Denominations:................. Notes may be denominated in any currency or currencies, subject to compliance with all applicable legal and/or regulatory and/or central bank requirements. Payments in respect of Notes may be made in and/or linked to any currency or currencies other than the currency in which such Notes are denominated, subject to compliance as aforesaid.

Notes will be issued in the denominations specified in the relevant Pricing Supplement, subject to compliance with all applicable legal, regulatory and/or central bank requirements.

Except for Non-EU Notes (as defined below), no Notes may be issued under the Program that have a minimum denomination of less than €100,000 (or the equivalent in another currency at the time of the issue) with multiple increments of €1,000 (or the equivalent in another currency at the time of the issue) thereafter.

Notes that are denominated in Swiss francs (or in the currency for the time being of any other country, which is not at the time of issuance a member state of the EEA) and are listed on the SWX Swiss Exchange (or are admitted to listing, trading and/or quotation on any other stock exchange, listing authority and/or quotation system in Switzerland or in any other country, which is not a member state of the EEA), or are offered by private placement into Switzerland (or into any country, which is not a member state of the EEA) (together, "**Non-EU Notes**"), may, subject to applicable law and regulation, be issued in any denomination, including in denominations of less than €100,000. Notes that have a maturity of less than one year from their date of issue and in respect of which the issue proceeds are to be received by the Trust in the United Kingdom will have a minimum denomination of £100,000 (or its equivalent in other currencies).

Interest: .... Interest bearing Notes may bear interest at a fixed rate ("**Fixed Rate Notes**") or a floating rate ("**Floating Rate Notes**").

Each Fixed Rate Note will bear interest from the date of issuance at the annual rate stated on the face thereof until the principal thereof is paid or made available for payment. Such interest will be computed on the basis of a 360-day year of 12 30-day months.

Each Floating Rate Note will bear interest from the date of issuance until the principal thereof is paid or made available for payment at a rate determined by reference to an interest rate or interest rate formula (the "**Base Rate**"), which may be adjusted by a Spread and/or Spread Multiplier (each as defined under "Description of the Notes"). The relevant Pricing Supplement will designate one or more of the following Base Rates, along with the Index Maturity (as defined below) of such Base Rate, as applicable to each Floating Rate Note:

- the Constant-Maturity Treasury Rate (a "**CMT Rate Note**"),
- the commercial paper rate (a "**Commercial Paper Rate Note**"),
- Euro Interbank Offered Rate ("**EURIBOR**") (a "**EURIBOR Note**"),
- the federal funds rate (a "**Federal Funds Rate Note**"),
- London Interbank Offered Rate ("**LIBOR**") (a "**LIBOR Note**"),
- the prime rate (a "**Prime Rate Note**"), or

- the Treasury rate (a "**Treasury Rate Note**").

The "**Index Maturity**" is the period of maturity of the instrument or obligation from which the Base Rate is calculated.

Clearing Systems: .... DTC, Euroclear and/or Clearstream.

Indenture: .... Each Series of Notes will be issued under, subject to and entitled to the benefits of a separate Series Indenture (as amended, modified or supplemented from time to time, the "**Series Indenture**") by and between the relevant Series Trust and the Indenture Trustee (in such capacity, together with any successors, the "**Indenture Trustee**"). Each Series Indenture will incorporate the Second Amended and Restated Indenture, dated as of June 13, 2007 (as amended, modified or supplemented from time to time, the "**Indenture**"), by and between the Trust and the Indenture Trustee, which shall provide the terms that govern each Series Indenture thereunder, unless any such Series Indenture specifies otherwise. Notes issued under a Series Indenture will constitute a single Series, together with any Notes issued in the future under such Series Indenture that are designated by the Series Trust as being part of such Series. *See* "Description of the Indenture."

Pledged Estate: .... Notes issued under each Series Indenture will be secured by a "**Pledged Estate**" which will consist of the relevant Funding Agreement(s) owned by the Series Trust and the rights of a Series Trust in and to the corresponding Swaps, if any, entered into by such Series Trust and all proceeds thereof and all rights related thereto.

Funding Agreements: .... Funding agreements are unsecured obligations of insurance companies. The Funding Agreements (each, a "**Funding Agreement**") issued in connection with a Series of Notes will be either general account funding agreements (each, a "**General Account Funding Agreement**") that are supported solely by the general account of MassMutual or guaranteed separate account funding agreements (each, a "**Guaranteed Separate Account Funding Agreement**") that are supported by assets held in a separate account of MassMutual, and under which payment obligations will be irrevocably and unconditionally guaranteed by MassMutual's general account, as specified in the relevant Pricing Supplement. *See* "Description of Certain Terms and Conditions of the Funding Agreements."

Each Series of Notes will be secured by all of the Funding Agreements issued by MassMutual in respect of the tranches of Notes comprising such Series of Notes and the rights of a Series Trust in and to the corresponding Swaps, if any.

Swaps: .... Concurrently with the issuance by MassMutual to a Series Trust of one or more Funding Agreements, such Series Trust may enter into one or more swap transactions (each, a "**Swap**") either with MassMutual acting on behalf of its general account or with MassMutual acting on behalf of a related separate account (each, a "**Swap Counterparty**"). Any such Swap may be an interest rate and/or currency Swap. In the event the Swap Counterparty is

MassMutual on behalf of a separate account, the obligations of such separate account under the related Swap shall be irrevocably and unconditionally guaranteed by the general account of MassMutual. *See* "Description of Certain Terms and Conditions of the Swaps."

No Guarantee:.. Neither the Trust nor any Series Trust is an affiliate or subsidiary of MassMutual. The obligations of each Series Trust evidenced by the Notes issued by that Series Trust will not be guaranteed by any person, including, but not limited to, MassMutual or any of its subsidiaries or affiliates. The obligations of MassMutual under any Funding Agreement and any Swap will not be guaranteed by any person, including, but not limited to, any of MassMutual's subsidiaries or affiliates.

Transfer Restrictions: .... The Notes have not been and will not be registered under the Securities Act and may not be offered, sold, pledged or otherwise transferred except as described under "Purchase and Transfer Restrictions." In addition, because the primary asset of each Series Trust will be one or more Funding Agreements issued by a life insurance company and corresponding Swaps, if any, entered into by a life insurance company, there is a risk that a state insurance regulatory authority could take the position that the transfer of Notes subjects the parties to regulation under the insurance laws of such jurisdictions. Any such determination could affect the transferability of, and market for, the Notes. *See* "Risk Factors."

Employee Benefit Plan Considerations:.. Prospective purchasers of Notes must carefully consider the restrictions on purchase set forth under "Purchase and Transfer Restrictions" and "Employee Benefit Plan Considerations."

U.S. Federal Income Taxation: .... Upon the issuance of each Series of Notes, Sidley Austin LLP ("**Sidley**"), special U.S. federal income tax counsel to the Trust, will render its opinion that, under current law and assuming full compliance with the terms of the Trust Agreement for the Trust, each Series Trust Agreement, the Indenture and each Series Indenture (and certain other documents), and based on certain facts and assumptions contained in such opinion, neither the Trust nor any Series Trust will be classified as an association (or publicly traded partnership) taxable as a corporation for U.S. federal income tax purposes.

In the event that a Series Trust enters into a Funding Agreement but does not enter into any Swaps in connection with the issuance of the related Series of Notes, MassMutual and the Trustee intend to take the position, for U.S. federal income tax purposes, that such Series Trust will be ignored and that the Notes will be treated as representing indebtedness of MassMutual.

In the event that a Series Trust simultaneously enters into a Funding Agreement and one or more Swaps in connection with the issuance of the related Series of Notes, (i) MassMutual and the Trustee intend to take the position, for U.S. federal income tax purposes, that such Series Trust will be treated as a grantor trust, in which case, each Holder of a Note (or any beneficial interest therein) will be treated as having purchased an undivided interest in the assets of the Series Trust and as having entered into any Swaps entered into by the Trust, in all cases, to the extent of the Holder's proportionate interest in the relevant Series Trust, and (ii) the Trustee (on behalf of any such Series Trust and each Holder of a Note (or any beneficial interest therein) issued by such Series Trust) will elect to treat the Funding Agreement and the Swaps as a "synthetic debt instrument" or an "integrated economic transaction."

For a more complete discussion of the U.S. federal income tax consequences of the acquisition, ownership and disposition of the Notes, *see* "Taxation."

Listing:... This document has been approved by Euronext Dublin as a base listing particulars. Application has been made to Euronext Dublin for the Notes issued during the period of 12 months from the date of this Offering Memorandum to be admitted to the Official List and trading on the GEM. Notes may be (i) listed on a securities exchange that is not a regulated market or (ii) not listed on any regulated market or any other securities exchange. However, neither MassMutual nor any Trust is under any obligation to maintain the listing of any Notes that are listed.

This Offering Memorandum constitutes a base "listing particulars" for purposes of listing on the Official List and trading on the GEM. If European or national legislation is adopted and is implemented or takes effect in Ireland in a manner that would require the Trust and/or MassMutual to publish or produce its financial statements according to accounting principles or standards that are different from, in the case of the Trust, U.S. GAAP or, in the case of MassMutual, SAP, or that would otherwise impose requirements on the Trust that the Trust in good faith determines are not reasonable, the Trust may de-list any Notes admitted to trading on Euronext Dublin. The Trust will use its reasonable best efforts to obtain an alternative admission to listing, trading and/or quotation for the Notes by another listing authority, exchange and/or system, within or outside the EU, as it may decide. If such an alternative admission is not available to the Trust or in the opinion of the Trust cannot reasonably be effected or maintained, an alternative admission may not be obtained. Notice of any de-listing and/or alternative admission will be given as described in the "Description of the Notes."

Governing Law:.. The Swaps, if any, the Notes, the Indenture and the relevant Series Indentures will be governed by, and construed in accordance with, the laws of the State of New York, except to the extent that the validity or perfection of a Series Trust's ownership of and security interest in the relevant Funding Agreement(s) and right in and to corresponding Swap(s), if any, or remedies under the Indenture and relevant Series Indenture in respect thereof may be governed by the laws of a jurisdiction other than the State of New York. The Trust Agreement and each Series Trust Agreement will be governed by, and construed in accordance with, the laws of the State of Delaware. The Funding Agreement(s) will be governed by the laws of the State of Delaware.

RISK FACTORS

Prospective purchasers of Notes should carefully review the information contained elsewhere in this Offering Memorandum and any Pricing Supplement and should particularly consider the following matters in evaluating an investment in the Notes.

RISK FACTORS RELATED TO THE NOTES AND THE SERIES TRUSTS

Notes are non-recourse Obligations of the Relevant Series Trust; Absence of Operating History of the Series Trusts

The obligations of the relevant Series Trust under the Notes, the Indenture and the relevant Series Indenture are payable only from the related Pledged Estate of that Series Trust. The Trust's primary business purpose is to issue the Notes, to purchase the related Funding Agreements and corresponding Swaps, if any, and to engage in activities incidental thereto, in each case through Series Trusts. Each Series Trust will be newly formed and will have no operating history at the time the Notes of such Series are issued. If any Event of Default shall occur under any Series of Notes, the right of the holders of the Notes (each, a "**Noteholder**" or "**Holder**") of such Series and the Indenture Trustee on behalf of such Holders will be limited to a proceeding against the Pledged Estate of the relevant Series Trust for such Series of Notes. Noteholders will have no direct right of action against MassMutual for payment under the Notes. Neither the Noteholders nor the Indenture Trustee on behalf of such Noteholders will have the right to proceed against the Pledged Estate of any other Series of Notes in the case of any deficiency judgment remaining after foreclosure of any property included in the Pledged Estate. All claims of the Noteholders of a Series of Notes in excess of amounts received by the relevant Series Trust under the related Funding Agreements and corresponding Swaps, if any, and related Pledged Estate will be extinguished.

Limited Resources of Each Series Trust; Issuance of Notes in Series

The net worth of each Series Trust upon the issuance of a Series of Notes by such Series Trust will be approximately USD 100. The net worth of such Series Trust is not expected to increase materially. The ability of the relevant Series Trust to make timely payments on the Notes is entirely dependent upon MassMutual making the related payments under the relevant Funding Agreements and, in some instances, the corresponding Swaps when due. The Trust is a special purpose statutory trust and is authorized to issue Notes in Series through separate Series Trusts. Payment obligations on each Series of Notes will be secured by one or more separate Funding Agreements and the Series Trust's rights in and to corresponding Swaps, if any. No Series of Notes will have any right to receive payments under a Funding Agreement and the corresponding Swap, if any, related to any other Series of Notes.

The Notes are not obligations of, and are not guaranteed by MassMutual, or any of its respective subsidiaries or affiliates. None of these entities nor any agent, trustee or beneficial owner of the Trust or the Series Trust is under any obligation to provide funds or capital to the Trust or any Series Trust.

Insurance Regulatory Risks

The laws and regulations of the 50 states of the U.S., the District of Columbia and Puerto Rico (the "**Covered Jurisdictions**") contain broad definitions of the activities that may constitute the business of insurance or the distribution of insurance products. Because the primary asset of the relevant Series Trust will be one or more funding agreements issued by MassMutual, it is possible that insurance regulators in one or more jurisdictions could take the position that (a) the issuance of the Notes by the relevant Series Trust constitutes the indirect issuance of a funding agreement or other insurance product and (b) the distribution, transfer, sale, resale or assignment of the Notes constitutes the production or sale of a funding agreement or other insurance product. If such a position were to be taken in any Covered Jurisdiction, the underlying activity and the person conducting such activity (including the relevant Series Trust, MassMutual, an Initial Purchaser, an investor or such other person) could become subject to regulation under the insurance laws of one or more of the Covered Jurisdictions, which could, among other effects, require such persons to be subject to regulatory licensure or other qualifications and levels of compliance that cannot practically be achieved. Failure to comply with such requirements could subject such persons to regulatory penalties. In addition, any such failure to comply or the threat of any such regulation could reduce liquidity with respect to the

Notes, prevent an investor from transferring Notes and reduce the marketability and market value of the Notes. Therefore, any such regulation or threat of such regulation by any one or more Covered Jurisdictions could result in an investor either being unable to liquidate its investment in the Notes or, upon any such liquidation, receiving a value significantly less than the initial investment in the Notes.

MassMutual currently believes that (1) the Notes and/or the Noteholders should not be subject to regulations as participants in the funding agreements themselves or otherwise constitute insurance contracts under the insurance laws of the Covered Jurisdictions and (2) the Notes should not subject the Series Trust, any investor or any person who acquires the Notes directly or indirectly from such investor and/or persons engaged in the sale, solicitation or negotiation or purchasing of the Notes in the Covered Jurisdictions to regulations as doing an insurance business or engaging in the sale, solicitation or negotiation of insurance, as contemplated by the insurance laws of the Covered Jurisdictions by virtue of their activities in connection with the purchase resale and/or assignment of the Notes. There are however, wide variations in the insurance laws of the Covered Jurisdictions, subtle nuances in their application, and a general absence of any consistent pattern of interpretation or enforcement. Insurance regulatory authorities have broad discretionary powers in administering the insurance laws of their respective jurisdictions, including the authority to modify or withdraw a regulatory interpretation, impose new rules, and take a position contrary to MassMutual's. In addition, insurance laws of states are known to change from time to time, which could result in a change in MassMutual's current opinion of the treatment of the Notes in a particular Covered Jurisdiction. Likewise, state courts are not bound by any regulatory interpretations and could take a position contrary to MassMutual's. Consequently, there can be no assurance that the purchase, resale, transfer or assignment of the Notes will not subject the parties to such transaction to regulation or enforcement proceedings under the insurance laws of one or more Covered Jurisdictions.

No Previous Market for the Notes; Limited Liquidity of the Notes

No previous market exists for the Notes, and no assurances can be given that any market will develop with respect to the Notes. The Initial Purchasers are under no obligation to make a market in the Notes and, to the extent that such market making is commenced, it may be discontinued at any time. There is no assurance that a secondary market will develop or, if it does develop, that it will provide Holders of the Notes with adequate liquidity or that such liquidity, if any, will be sustained. The Notes have not been and will not be registered under the Securities Act or any state or foreign securities law, and transfers of Notes are subject to substantial transfer restrictions. A Holder of Notes may not be able to liquidate its investment readily, and the Notes may not be readily accepted as collateral for loans. It is likely that if the Notes were to be deemed to be contracts of insurance, the ability of a Holder to offer, sell or transfer the Notes in a secondary market transaction or otherwise would be substantially impaired and, to the extent any such sale or transfer could be effected, the proceeds realized from such sale or transfer could be materially and adversely affected. Investors should proceed on the assumption that they may have to hold the Notes until the end of their scheduled term. In addition, liquidity may be limited if the Trust makes large allocations to a limited number of investors. *See* "Purchase and Transfer Restrictions."

Integral Multiples of Less than €100,000

Although the Notes, which are offered to the public in a member state of the EEA, are required to have a minimum denomination of €100,000 (or, where the specified currency is not euro, its equivalent in the specified currency) (the "**Minimum Specified Denomination**"), it is possible that the Notes may be traded in the clearing systems in amounts in excess of €100,000 (or its equivalent in alternate currencies) that are not integral multiples of €100,000 (or its equivalent in alternate currencies). In relation to any issue of Notes that have a denomination consisting of the Minimum Specified Denomination plus a higher integral multiple of another smaller amount, it is possible that the Notes may be traded in amounts in excess of €100,000 (or its equivalent in alternate currencies) that are not integral multiples of €100,000 (or its equivalent in alternate currencies). In such a case a Noteholder, who, as a result of trading such amounts, holds a principal amount of less than the Minimum Specified Denomination may not receive a definitive Note in respect of such holding (should definitive Notes be printed) and may need to purchase a principal amount of Notes such that its holding is at least in the Minimum Specified Denomination.

If definitive Notes are issued, Noteholders should be aware that definitive Notes that have a denomination that is not an integral multiple of the Minimum Specified Denomination may be illiquid and difficult to trade.

Financial Strength of MassMutual

The ability of each Series Trust to make timely payments under the Notes of a Series will depend entirely on its receipt of corresponding payments from MassMutual under the relevant Funding Agreements and corresponding Swaps, if any. Furthermore, the marketability, liquidity and value of the Notes may be substantially impaired to the extent MassMutual may not be able to meet, or is perceived as being less able to meet, as Provider of the Funding Agreements, its obligations under the Funding Agreements and corresponding Swaps, if any. *See* "Risk Factors Related to MassMutual."

Ratings on the Notes

The ratings of the Notes will primarily reflect the financial strength and claims paying ability of MassMutual and will change in accordance with the rating of MassMutual's financial strength and claims paying ability and with any change in the priority status under Massachusetts law of funding agreements and, if the relevant Series Trust enters into any Swaps, any change in MassMutual's counterparty ratings. The ratings address the likelihood the Holders of the Notes will receive the timely payment of any applicable interest and the ultimate payment of principal on the maturity of the Notes. Any rating is not a recommendation to purchase, sell or hold any particular security, including the Notes. Such ratings do not comment as to market price or suitability for a particular investor. In addition, there can be no assurance that a rating will be maintained for any given period of time or that a rating will not be lowered or withdrawn in its entirety.

In general, European regulated investors are restricted under the CRA Regulation from using credit ratings for regulatory purposes, unless such ratings are issued by a CRA established in the EU and registered under the CRA Regulation (and such registration has not been withdrawn or suspended), subject to transitional provisions that apply in certain circumstances while the registration application is pending. Such general restriction will also apply in the case of credit ratings issued by a non-EU CRA, unless the relevant credit ratings are endorsed by an EU-registered CRA or the relevant non-EU CRA is certified in accordance with the CRA Regulation (and such endorsement action or certification, as the case may be, has not been withdrawn or suspended). Certain information with respect to the CRA and ratings of the Notes will be set out in the relevant Pricing Supplement.

Foreign Currency Risks

The information set forth below is directed to prospective purchasers who are U.S. residents. The Series Trust for each Series of Notes disclaims any responsibility to advise prospective purchasers who are residents of countries other than the U.S. of any matters arising under foreign law that may affect the purchase of, or holding of, or receipt of payments on, the Notes. Such persons should consult their own legal and financial advisors concerning these matters.

An investment in a Note that is denominated or payable in, or the payment of which is linked to the value of, currencies other than U.S. dollars entails significant risks. These risks include the possibility of significant changes in rates of exchange between the U.S. dollar and the relevant foreign currencies and the possibility of the imposition or modification of exchange controls by either the U.S. or foreign governments. These risks generally depend on economic and political events over which the Series Trust and MassMutual have no control.

In recent years, rates of exchange between U.S. dollars and some foreign currencies have been highly volatile. This volatility may continue in the future. Fluctuations in any particular exchange rate that have occurred in the past are not necessarily indicative of fluctuations that may occur during the term of any Note. Assuming a U.S. dollar basis, depreciation against the U.S. dollar of the currency in which a Note is payable would result in a decrease in the effective yield of the Note below its stated coupon rate and could result in an overall loss on a U.S. dollar basis. In addition, depending on the specific terms of a currency-linked Note, changes in exchange rates relating to any of the relevant currencies could result in a decrease in its effective yield and in a loss of all or a substantial portion of the value of such Note.

Exchange rates either can float or be fixed by sovereign governments. Exchange rates of most economically developed nations are permitted to fluctuate in value relative to the U.S. dollar and to each other. However, from time to time governments may use a variety of techniques, such as intervention by a country's central bank or the imposition of regulatory controls or taxes, to influence the exchange rates of their currencies. Governments may also issue a new currency to replace an existing currency or alter the exchange rate or relative exchange characteristics by a devaluation or revaluation of a currency. These governmental actions could change or interfere with currency valuations and currency fluctuations that would otherwise occur in response to economic forces, as well as in response to the movement of currencies across borders.

As a consequence, these governmental actions could adversely affect the U.S. dollar-equivalent yields or payouts for (a) Notes denominated or payable in currencies other than U.S. dollars and (b) currency-linked Notes.

With respect to any Series of Notes, the relevant Series Trust will not make any adjustment or change in the terms of the Notes in the event that exchange rates should become fixed, or in the event of any devaluation or revaluation or imposition of exchange or other regulatory controls or taxes, or in the event of other developments affecting the U.S. dollar or any applicable foreign currency.

In addition, governments have imposed from time to time, and may in the future impose, exchange controls that could also affect the availability of a specified foreign currency. Even if there are no actual exchange controls, it is possible that the applicable currency for any Note not denominated in U.S. dollars would not be available when payments on that Note are due.

With respect to any Series of Notes, if a payment currency is unavailable, the relevant Series Trust would make required payments in U.S. dollars on the basis of the market exchange rate. However, if the applicable currency for any Note is not available because the euro has been substituted for that currency, the relevant Series Trust would make the payments in euros. The mechanisms for making payments in these alternative currencies are explained in "Description of the Notes – Payments" below.

The relevant Pricing Supplement may provide for (a) payments on a Non-U.S. dollar denominated Note to be made in U.S. dollars, or (b) payments on a U.S. dollar denominated Note to be made in a currency other than U.S. dollars. In these cases, the exchange rate agent identified in the relevant Pricing Supplement (the "**Exchange Rate Agent**"), will convert the currencies. The purchaser of any such Note will bear the costs of conversion through deductions from payments on those Notes.

The Notes will be governed by and construed in accordance with the laws of the State of New York. Unlike many courts in the U.S. outside the State of New York, the courts in the State of New York customarily enter judgments or decrees for money damages in the foreign currency in which Notes are denominated. These amounts would then be converted into U.S. dollars at the rate of exchange in effect on the date the judgment or decree is entered. The purchaser of such Notes would bear the foreign currency exchange risk during any such litigation.

EACH PROSPECTIVE PURCHASER OF THE NOTES SHOULD CONSULT ITS OWN FINANCIAL, LEGAL AND TAX ADVISORS AS TO ANY SPECIFIC RISKS ENTAILED BY AN INVESTMENT BY SUCH PURCHASER IN NOTES THAT ARE DENOMINATED IN, OR THE PAYMENT OF WHICH IS RELATED TO THE VALUE OF, FOREIGN CURRENCY. SUCH NOTES ARE NOT AN APPROPRIATE INVESTMENT FOR PURCHASERS WHO ARE UNSOPHISTICATED WITH RESPECT TO FOREIGN CURRENCY TRANSACTIONS.

Risks Related to Discontinued or Reformed Base Rate "Benchmarks"

Certain base rates, including LIBOR, EURIBOR and other rates or indices described herein, are deemed to be "benchmarks" and are the subject of ongoing national and international regulatory scrutiny, guidance and proposals for reform.

Some of these reforms are already effective, while others are still to be implemented or formulated. For example, on July 27, 2017, the Financial Conduct Authority (the "**FCA**") announced that it intends to stop persuading or compelling banks to submit LIBOR rates after 2021. In addition, separate workstreams are underway in Europe to reform EURIBOR using a hybrid methodology and to provide a fallback by reference to a euro risk-free rate (based on a euro overnight risk-free rate as adjusted by a methodology to create a term rate). On September 13, 2018, the working group on euro risk-free rates recommended Euro Short-term Rate ("**ESTER**") as the new risk free rate. ESTER is expected to be published by the European Central Bank by October 2019. On January 21, 2019, the euro risk-free rate working group published a set of guiding principles for fallback provisions in new euro denominated cash products, which indicate, among other things, that continuing reference to EURIBOR in relevant contracts may increase the risk to the euro area financial system.

Furthermore, in the U.S., efforts to identify a set of alternative U.S. dollar reference interest rates include proposals by the Alternative Reference Rates Committee of the Federal Reserve Board and the Federal Reserve Bank of New York that includes major market participants. In April 2019, the Alternative Reference Rate Committee proposed an alternative rate to replace U.S. Dollar LIBOR: the Secured Overnight Financing Rate. These reforms may cause such benchmarks to perform differently than they performed in the past or to be discontinued entirely and may have other consequences that cannot be predicted. Any such consequences could adversely affect the value of and return on certain Series of Floating Rate Notes that refer, or are linked, to a "benchmark" to calculate interest or other payments due on such Series of Floating Rate Notes.

Any of the international, national or other proposals for reform or the general increased regulatory scrutiny of "benchmarks" could increase the costs and risks of administering or otherwise participating in the setting of a "benchmark" and complying with any such regulations or requirements. Such factors may have the effect of discouraging market participants from continuing to administer or contribute to certain "benchmarks," trigger changes in the rules or methodologies used in certain "benchmarks" or lead to the discontinuance or unavailability of quotes of certain "benchmarks."

To the extent interest payments on a Series of Floating Rate Notes are linked to a specific "benchmark" that is discontinued or is no longer quoted, the applicable base rate will be determined using the alternative methods described in "Description of the Notes—Base Rates." Any of these alternative methods may result in interest payments that are lower than or that do not otherwise correlate over time with the payments that would have been made on such Series of Floating Rate Notes if the relevant "benchmark" was available in its current form or could result in such Series of Floating Rate Notes converting to a fixed rate. Further, the same costs and risks that may lead to the discontinuation or unavailability of a "benchmark" may make one or more of the alternative methods impossible or impracticable to determine at the relevant time. Last, in certain circumstances, including where LIBOR is the base rate for a Series of Floating Rate Notes, the Trust could have the ability in its sole discretion to replace the Calculation Agent (including with one of MassMutual's affiliates), which replacement Calculation Agent would determine the alternative rate and any adjustments for such Series of Floating Rate Notes. Any of the above changes or any other consequential changes to LIBOR, EURIBOR or any other "benchmark" as a result of international, national or other proposals for reform or other initiatives or investigations may have an adverse effect on the value of and return on such Series of Floating Rate Notes.

Notes Secured by the Rights of a Series Trust under a Swap

A Series Trust may enter into a Swap with a Swap Counterparty, which provides for the Series Trust to pay to the Swap Counterparty some or all of the payments it receives under the Funding Agreement in exchange for the payments the Series Trust is scheduled to make under the related Series of Notes. To the extent the Series Trust does not receive all amounts due to it under the Swap, the Series Trust's primary source of payments on the related Series of Notes will be the amounts payable under the relevant Funding Agreement. There can be no assurances that in such event any amounts paid to the Series Trust under such Funding Agreement would be sufficient to pay in full any amounts that are due and unpaid under the relevant Series of Notes. In addition, if MassMutual were to become insolvent, the claims of the Series Trust under the Swap against the general account of MassMutual would be accorded class 7 priority and rank *pari passu* with the claims of MassMutual's general unsecured creditors under Chapter 175, Section 180F of the Massachusetts General Laws Annotated. *See* "Description of Certain Terms and Conditions of the Swaps - Treatment of Swaps in Insolvency."

RISK FACTORS RELATED TO MASSMUTUAL, AS PROVIDER OF THE FUNDING AGREEMENTS

Changes in tax laws or interpretations of such laws, and the regulatory consequences of such changes, could adversely affect risk-based capital requirements, MassMutual's financial strength ratings or other aspects of MassMutual's business.

The National Association of Insurance Commissioners (the "**NAIC**") has recently adopted several changes to the formula used to calculate risk-based capital ("**RBC**") for life insurance companies to account for the effects of H.R. 1/Public Law 115-97, commonly known as the Tax Cuts and Jobs Act (the "**Tax Act**"), specifically focusing on changes to the RBC ratio denominator in order to reflect the corporate tax rate decrease from 35% to 21%. These changes, which became effective for life insurance company RBC calculations as of December 31, 2018, will likely increase required capital upon becoming effective, which in turn will likely decrease the statutory RBC ratios of U.S. life insurance companies. The NAIC has also prepared a guidance document for state regulators to use in evaluating companies' year-end 2018 RBC ratios in light of tax reform and these recently adopted changes to the RBC factors and instructions and to assist state regulators in interpreting the results of year-end 2018 life RBC calculations in light of tax reform. If this results in a reduction in MassMutual's combined RBC ratio, MassMutual's insurance subsidiaries may be required to hold additional capital. Although MassMutual does not expect that these changes will affect its subsidiaries' current dividend or capital plans, any increase in the amount of capital MassMutual's insurance subsidiaries are required to hold could reduce the amount of dividends such subsidiaries are able to distribute to MassMutual. Any reduction in the RBC ratios of MassMutual's insurance subsidiaries could adversely affect their financial strength ratings.

The Tax Act is unclear in certain respects and will require interpretations and implementing regulations by the U.S. Department of the Treasury (the "Treasury Department") and the Internal Revenue Service, as well as state tax authorities, and the legislation could be subject to potential amendments and technical corrections, any of which could lessen or increase certain adverse impacts of the legislation. Due to the complexity of the changes of the Tax Act, some of which may be beneficial and others of which may be detrimental to MassMutual's overall tax position, and the recent enactment of the law, it is not possible to predict with certainty whether the Tax Act will result in an overall benefit or detriment to MassMutual.

Additionally, global budget deficits make it likely that governments' need for additional revenue will result in future tax proposals that will increase MassMutual's effective tax rate. However, it remains difficult to predict the timing and effect that future tax law changes could have on MassMutual's earnings both in the U.S. and in foreign jurisdictions. Such changes could not only directly impact MassMutual's corporate taxes but also could adversely impact MassMutual's products (both life insurance and retirement plans) by making some of MassMutual's products less attractive to consumers. A shift away from life insurance and annuity contracts and other tax-deferred products by MassMutual's customers would reduce MassMutual's income from sales of these products, as well as the asset base upon which MassMutual earns investment income and fees, thereby reducing MassMutual's earnings and potentially affecting the value of MassMutual's DTA.

Adverse macro-economic conditions may impede MassMutual's ability to make any scheduled payments under the Notes

MassMutual's investment portfolio consists primarily of investment grade bonds and mortgage loans. The portfolio also contains common stock, real estate, derivatives, non-investment grade bonds, and partnerships and limited liability companies ("**LLCs**"). MassMutual's investment portfolio is subject to certain risks related to macro-economic conditions, including risks related to equity market exposure, interest rate uncertainty, credit risk and counterparty risk, as further described below:

- *Equity Market Exposure:* Weak equity market performance may adversely affect the sale of variable annuities or asset management products, cause potential purchasers of MassMutual's products to refrain from new or additional investments and cause current investors to withdraw from the market or reduce their rates of ongoing investment. Because the revenue of MassMutual's variable products and asset management businesses are, to a large extent, based on fees related to the value of assets under management, poor equity market performance may result in a reduction in fee revenues. Weak equity market performance may cause MassMutual to record additional reserves to meet product guarantees within certain variable products. *See* "Management's Discussion and Analysis of Financial Condition and Results of Operations—Quantitative and Qualitative Information about Market Risk."

- *Interest Rate Uncertainty:* In December 2015, noting the improving economic outlook in the U.S., the Board of Governors of the U.S. Federal Reserve Board (the "**Federal Reserve Board**") raised the target range for the benchmark federal funds rate for the first time since 2008. Since that time, the Federal Reserve Board has raised the benchmark federal funds rate on several occasions, including four raises of 25 basis points each during 2018, and may take further actions to influence interest rates in the future. Such action may have an impact on the pricing levels of risk-bearing investments, and may impact the level of product sales.

  However, U.S. long-term interest rates remain at relatively low levels by historical standards. During periods of low or declining interest rates, the yields on new investments purchased may be lower than the yield on existing investments, thus lowering the average yield earned on MassMutual's investment portfolio. Periods of low or declining interest rates have the potential to negatively affect MassMutual's profitability. MassMutual, like other life insurance companies, is contractually required to credit a fixed minimum rate of interest on many of its life insurance and annuity policies. If yields on new investments decline to levels below these guaranteed minimum rates and remain at those levels for a period of time, the required credited interest rate may be higher than the rate of return MassMutual earns on the investment portfolio.

  Periods of high or increasing interest rates have the potential to affect MassMutual's profitability negatively in the following ways:

  - In periods of increasing interest rates, life insurance policy loans, surrenders and withdrawals may increase as policyholders seek investments with higher perceived returns. This could result in cash outflows requiring MassMutual to sell invested assets at a time when the prices of those assets are adversely affected by the increase in market interest rates, which could cause MassMutual to realize investment losses.

  - The income for certain of MassMutual's insurance and annuity products is based on the spread between net earnings rates and the corresponding crediting rates. When interest rates rise, crediting rates may need to be adjusted upwards by more than what is supportable by the net earnings rates, reducing the spread earned by the applicable products.

  MassMutual manages interest rate risk with an asset/liability management program that includes the use of derivatives. This program is designed to manage changes in economic surplus resulting from changes in interest rates, particularly in situations when liability options or options embedded in portfolio assets can be exercised and negatively impact MassMutual's profitability. See "Management's Discussion and Analysis of Financial Condition and Results of Operations – Liquidity and Capital Resources."

  The derivatives that MassMutual purchases as part of its asset/liability management program pose an additional risk. New business is typically priced with an investment component based on current or expected market yields. Occasionally, there is an insufficient supply of appropriate fixed income investments, such as bonds, and the offerings of public bond markets become less attractive as bonds with lower credit risk are priced at very tight spreads over comparable Treasury rates. Rather than increase its credit risk**,** MassMutual may use a combination of derivatives and short-term investments to create temporary investment positions that are highly liquid and of high quality. These investments are created opportunistically when they are economically more attractive than other investments and are held to improve the quality and performance of the general account until other suitable investments become available. Although derivatives lock in the general level of interest rates at the time of the transaction, MassMutual is exposed to the risk that the spread between the yield on permanent assets and the yield on the derivatives will compress during the period the positions are held. If this occurs, MassMutual's profitability will be reduced. *See* "Management's Discussion and Analysis of Financial Condition and Results of Operations – Investments" and "Management's Discussion and Analysis of

Financial Condition and Results of Operations – Quantitative and Qualitative Information about Market Risk."

- *Credit risk* is the risk that issuers of investments owned by MassMutual may default or that other parties may not be able to pay amounts due to MassMutual. MassMutual manages its investments to limit credit risk by diversifying its portfolio among various security types and industry sectors as well as purchasing credit default swaps to transfer some of the risk. Although MassMutual believes that it carefully manages these risks, there can be no guarantee that credit risk will be managed successfully in all situations.

  - *Risk of changing credit spreads:* MassMutual's exposure to credit spreads primarily relates to market price variability and reinvestment risk associated with changes in credit spreads. A widening of credit spreads will decrease the fair value of the investment portfolio, and, if issuer credit spreads widen as a result of fundamental credit deterioration, this would likely result in higher other-than-temporary impairments ("**OTTI**") for certain types of investments. Credit spread tightening will reduce net investment income associated with new purchases of fixed maturities and may also cause an increase in the fair value of certain liabilities that are valued using a discount rate that reflects MassMutual's own credit spread. In addition, credit spread tightening may also cause an increase in the fair value of certain assets.

  - *Exposure to mortgage-backed securities ("**MBS**")*: The residential mortgage-backed securities ("**RMBS**") market continues to experience uncertainty and may experience declines in the future due to prevailing market conditions. In addition, other types of MBS, including commercial mortgage-backed securities ("**CMBS**"), may deteriorate due to prevailing market conditions, and such deterioration could cause declines in those parts of MassMutual's investment portfolio. The extent and duration of any future market or sector decline are unknown, as is the potential impact of such a decline on MassMutual's investment portfolio. In addition to CMBS, MassMutual's MBS investment portfolio consists of (i) pass-through securities, which are pools of mortgage loans collateralized by single-family residences and primarily issued by government-sponsored entities ("**GSEs**"), like Government National Mortgage Association, Federal National Mortgage Association, Federal Home Loan Mortgage Corporation and (ii) structured pass-through securities, such as collateralized mortgage obligations ("**CMOs**"), that may have specific prepayment and maturity profiles, are primarily AAA-rated and also guaranteed by the GSEs. In the past, the U.S. Congress has proposed changes to the treatment of GSEs, and other CMOs that may have specific prepayment and maturity profiles and are investment-grade in accordance with the NAIC standards but do not have GSE guarantees. To the extent that any such change results in the loss of GSE credit guarantees, this could have a material adverse effect on the value of agency guaranteed MBS.

- *Counterparty risk* is the risk that counterparties may not be able to make required payments. MassMutual has exposure to many different industries and counterparties, and routinely executes transactions with counterparties in the financial services industry, including brokers and dealers, commercial banks, investment banks, hedge funds and other institutions. Many of these transactions, including derivative transactions, expose MassMutual to credit risk in the event of default of a counterparty. In addition, with respect to secured transactions, the credit risk may be exacerbated when the collateral held by MassMutual cannot be liquidated at prices sufficient to recover the full amount of the exposure. MassMutual also has exposure to counterparties in the form of unsecured debt instruments, derivative transactions, reinsurance, and equity investments. While MassMutual maintains a diverse portfolio, there can be no assurance that any such losses or impairments to the carrying value of these assets would not materially and adversely affect the business and results of operations of MassMutual.

From time to time, MassMutual may engage in transactions to hedge some of MassMutual's enterprise exposures. The primary goal of these hedges is to limit MassMutual policyholders' exposure to a decline in MassMutual's financial results. In some instances, these transactions may be counter to the investment goals of some of MassMutual's customers or the customers of its affiliates.

Stressed conditions, volatility and disruptions in global capital markets or in particular markets or financial asset classes can have an adverse effect on MassMutual, in part because MassMutual has a large investment portfolio and assets supporting MassMutual's insurance liabilities are sensitive to changing market factors. Global market factors, including interest rates, credit spreads, equity prices, real estate markets, foreign currency exchange rates, consumer spending, business investment, government spending, the volatility and strength of the capital markets, deflation and inflation, all affect the business and economic environment and, ultimately, the profitability of MassMutual's business. Disruptions in one market or asset class can also spread to other markets or asset classes. Upheavals in the financial markets can also affect MassMutual's business through their effects on general levels of economic activity, employment and customer behavior. At times, throughout the past few years, volatile conditions have characterized financial markets, and not all global financial markets are functioning normally. Significant market volatility, and government actions taken in response, may exacerbate some of the risks MassMutual faces.

In addition, concerns over access to capital markets and the solvency of certain EU member states, their banking systems and financial institutions that have significant direct or indirect exposure to debt issued by these countries or their banking systems, have created market volatility which may continue to affect the performance of various asset classes in the near term, and perhaps longer, until there is an ultimate resolution of the sovereign debt related concerns. As a result of these concerns, several EU states have experienced credit ratings downgrades or credit ratings outlook changes. It is possible that such ratings activity and any future downgrades, as well as continued concerns about U.S. fiscal and monetary policy and the trajectory of the national debt of the U.S., could have severe repercussions to the U.S. and global credit and financial markets, further exacerbate concerns over sovereign debt of other countries and could disrupt economic activity in the U.S. and elsewhere.

Periods of protracted market illiquidity could negatively impact MassMutual's financial condition

Liquidity risk is the risk that policyholder demands for withdrawals are greater than the amount of available cash and assets that can readily be converted into cash. Although certain types of investments such as Treasury bonds and short-term investments can usually be converted to cash easily, investments which are not publicly traded, such as commercial mortgage loans and direct or indirect equity investments in real estate, cannot be readily liquidated while other investments may be liquidated with higher than usual transaction costs or at prices that are less than MassMutual otherwise would have been able to realize in some market environments. Liquidity risk is managed by holding assets with sufficient liquidity to pay policyholder withdrawals under normal circumstances as well as under stress scenarios.

An additional risk is related to adequate liquidity to provide for obligations that will or may become due in the short-term. As of December 31, 2018, MassMutual had $1.5 billion of commitments related to funding agreements that are set to mature in 2019. Additionally, MassMutual has capital commitments to some entities in which it invests, such as partnerships. Under the terms of such commitments, MassMutual may be required to fund such commitments upon request. The majority of these commitments have funding periods that extend between one and five years. As of December 31, 2018, MassMutual had total commitments pursuant to such investments of $8.7 billion.

MassMutual has limited access to capital and such access depends on a variety of factors, some of which are beyond MassMutual's control

MassMutual is a mutual life insurance company with no capital stock and no shareholders. Consequently, it is unable to access directly the public equity markets as a means to raise capital. In recent years, the securities and credit markets have experienced extreme volatility and disruption. As a result of these conditions, access to capital and credit markets and to other forms of liquidity and financing for many companies has been significantly impaired. While MassMutual does not access the equity market and does not routinely rely on debt financing for capital, in the event MassMutual needs access to additional capital to pay its operating expenses, make payments on its indebtedness, pay policyholders under insurance or investment products, pay capital expenditures, fund acquisitions or enhance its capital position, there is no assurance that it will be able to obtain such financing on favorable terms or at all. MassMutual's access to additional financing, and the terms of any such financing, will depend on a variety of factors such as the general economic environment and market conditions, the general availability of credit and the overall availability of credit to MassMutual.

MassMutual does not rely on dividends from its subsidiaries to meet its operating cash flow requirements, and the availability of such dividends may be limited. For example, for C.M. Life and MML Bay State, substantially all of the statutory shareholder's equity of approximately $1.6 billion as of December 31, 2018 was subject to dividend restrictions imposed by state regulations. Historically, MassMutual has reinvested a substantial portion of its unrestricted earnings in its international insurance subsidiaries' operations. MassMutual received $250 million and $425 million of cash dividends from MassMutual Holding LLC ("**MMHLLC**") for the years ended December 31, 2018 and 2017, respectively. MassMutual records these dividends as net investment income. There is no assurance that these subsidiaries will pay dividends to MassMutual in the future.

In the event of financial or other difficulties, MassMutual may be unable to make any scheduled payments under the Notes

There can be no assurance that MassMutual will not face financial or other difficulties that may cause it to become the subject of administrative supervision, insolvency, liquidation, rehabilitation, reorganization, conservation or other similar proceedings (collectively, "**Insolvency Proceedings**") under any state laws applicable to MassMutual. Should MassMutual become the subject of Insolvency Proceedings, the Indenture Trustee, in its capacity as agent for the benefit of the Holders of any Series of Notes then outstanding, may be stayed during the pendency of such Insolvency Proceedings from collecting any payments under the relevant Funding Agreements and corresponding Swaps, if any, and from exercising any rights in the Pledged Estate that would otherwise be available to such Indenture Trustee as secured party.

In the event, with respect to a Series Trust, MassMutual has issued a Guaranteed Separate Account Funding Agreement and, in certain cases, entered into corresponding Swap(s), the assets of MassMutual, which are held in the related separate account shall be available solely to satisfy the obligations of MassMutual under the Guaranteed Separate Account Funding Agreement and the Swap(s), if any (after giving effect to any other liabilities of such separate account). However, such separate account assets may not be sufficient to satisfy MassMutual's obligations under the Guaranteed Separate Account Funding Agreement and the Swap, if any, and in such event the Indenture Trustee, in its capacity as agent for the Holders of the applicable Series of Notes, will have claim(s) against the general account of MassMutual for such deficiencies.

In the event, with respect to a Series Trust, MassMutual has issued a General Account Funding Agreement and, in certain cases, entered into a corresponding Swap, the Indenture Trustee, in its capacity as agent for the Holders of any Series of Notes, will solely have a claim against the general account of MassMutual for payments due under such General Account Funding Agreement and the Swap. Ultimately, the Indenture Trustee may not be able to recover any of these payments from the general account of MassMutual should there be insufficient assets to provide for these payments.

In addition, notwithstanding the language to the contrary contained in the relevant Swaps, if any, should MassMutual become the subject of Insolvency Proceedings, termination of such Swaps may not be authorized. If any Funding Agreements provide for payments at a different interest rate or in a different currency than the relevant Series of Notes, there can be no assurance that in such event any amounts paid under such Funding Agreements would be sufficient, when converted into such other interest rate or currency at the prevailing rate of exchange, to pay in full any amounts that are due and unpaid under the relevant Series of Notes. In addition, under certain circumstances, payments made by MassMutual to the Indenture Trustee or the relevant Series Trust may be sought to be recovered in Insolvency Proceedings as preferential payments or pursuant to other similar theories.

Massachusetts law would apply to MassMutual's Insolvency Proceedings. Investors should note, however, that the statutory liquidation priority accorded to Funding Agreements under Massachusetts law does not clearly apply to any additional amounts required to be paid (if specified in the relevant Pricing Supplement) as may be necessary in order that the net amounts receivable by a Noteholder after any withholding or deduction shall equal the respective amounts, which would have been receivable by such Noteholder in the absence of such withholding or deduction. Accordingly, claims for such payments, if any, may not rank equally with either life insurance policy and annuity claims or funding agreement claims, and may rank with MassMutual's unsecured debt obligations, which would adversely affect the ability of the Trust to recover any claims of additional amounts in respect of such Funding Agreement.

Investors should be aware that Insolvency Proceedings with respect to MassMutual could cause a significant delay in receiving payments due under the Notes and could materially and adversely affect the timing and the amounts, if any, paid under the Notes. *See* "Description of Certain Terms and Conditions of the Funding Agreements – Insolvency of MassMutual – Treatment of Guaranteed Separate Account Funding Agreements in Insolvency," "Description of Certain Terms and Conditions of the Funding Agreements – Insolvency of MassMutual – Treatment of General Account Funding Agreement in Insolvency" and "Description of Certain Terms and Conditions of the Swaps – Treatment of Swaps in Insolvency."

Additionally, investors should be aware that MassMutual has no access to separate account funds to fund general account liabilities. At December 31, 2018, $64.5 billion of MassMutual's assets were held in separate accounts that have been allocated to specific liabilities. Except for seed money held in separate accounts and supplemental accounts, separate account assets can only be used to satisfy separate account liabilities and are not available to satisfy the general obligations of MassMutual or to make payments with respect to the Notes. *See* "Financial and Accounting Matters – Separate Accounts."

This insolvency risk relating to MassMutual is influenced by a number of factors, as follows:

- *Financial Performance Different from Expected:* MassMutual's earnings significantly depend upon the extent to which actual claims experience is consistent with the assumptions used for both setting prices for products and establishing liabilities for future policy benefits and claims. MassMutual's liabilities for future claim payments are established based on actuarial estimates of future experience, such as persistency, mortality, morbidity, expenses and investment returns. To the extent that actual claims experience is less favorable than the underlying assumptions used in establishing such liabilities, MassMutual could be required to increase its liabilities. MassMutual evaluates its liabilities periodically based on accounting requirements and the assumptions used to establish the liabilities, which may change from time to time, as well as its actual experience.
- *Investment Impairments:* The valuation of securities and the determination of OTTI require management to use significant judgment and assumptions. The determination of the amount of impairments follow certain evaluation criteria that vary by investment type and are based on MassMutual's evaluation and assessment of known and inherent risks associated with the respective assets class. MassMutual's judgment regarding OTTI depends upon evolving conditions that can alter the anticipated cash flows realized by investors. Further deterioration of market conditions and related management judgments of OTTI could negatively affect MassMutual's results of operations and surplus, due to additional impairments that may need to be taken in the future. In addition, market volatility may make it difficult to value certain of MassMutual's securities if trading becomes less frequent. As such, valuations may include assumptions or estimates that may have significant period-to-period changes, which could have a material adverse effect on MassMutual's results of operations or financial condition. Historical trends may not be indicative of future impairments. *See* "Financial and Accounting Matters—Critical Accounting Policies."

MassMutual is engaged in a highly competitive business in which financial strength ratings are an important competitive factor

The life insurance industry is highly competitive. There are a large number of life insurance companies in the U.S., many of which offer insurance products similar to those marketed by MassMutual. Competitiveness in the insurance business is affected by various factors including, but not limited to, price, size and strength of distribution force, range of product lines, product quality, financial strength ratings, servicing ability and general reputation.

Adequate financial strength ratings are an important factor in the competitive position of life insurance companies. Rating agencies regularly review the financial performance and condition of insurers, including MassMutual. The rating agencies assign ratings based upon consideration of several qualitative and quantitative factors, including the rated company's operating performance and investment results, products, risk profile and capital resources. The rating agencies may also consider factors outside of the rated company's control, including changes to general economic conditions. A decline in the ratings of MassMutual, or the potential for such a decline could have an adverse effect on MassMutual's business, financial condition and operating results. In addition, a significant decline in the ratings of MassMutual, or the potential for such a significant decline, could adversely affect, among other things,

(a) its ability to sell certain of its products, (b) the return on the insurance and annuity products it issues and, ultimately, the results of its operations and (c) its ability to compete for attractive acquisition opportunities. Such ratings do not comment as to market price or suitability for a particular investor. In addition, ratings are subject to change and there can be no assurance that a rating will be maintained for any given period of time or that a rating will not be lowered or withdrawn in its entirety. Due to the ongoing uncertainty in global economic conditions, it is possible that the rating agencies may change the benchmarks they use to analyze capital, liquidity, earnings and other factors that are critical to the assignment of a particular rating. If any such changes are made, it is possible that such changes could have an adverse impact on the ratings of U.S. life insurance companies, including MassMutual.

In addition to competition from within the insurance industry for products and key talent, insurers are increasingly facing competition from non-traditional sources within the financial services industry. There can be no assurance that MassMutual will be able to compete successfully against current and future competitors or that competitive pressures faced by MassMutual will not materially and adversely affect its business, operating results and financial condition. *See* "Business of MassMutual – Domestic Operations Overview – Competitive Landscape."

MassMutual is subject to extensive regulation and actions of the U.S. Government, Federal Reserve, and other governmental and regulatory bodies that may adversely affect MassMutual

MassMutual is subject to extensive state regulatory oversight in Massachusetts, the state in which it is domiciled, and the other jurisdictions in which it does business. State insurance authorities have broad administrative powers over MassMutual with respect to all aspects of the insurance business. These regulations are intended to protect policyholders, not holders of any securities, such as the Notes. This regulatory oversight and various proposals at the federal level could in the future adversely affect MassMutual's ability to sustain adequate returns in certain lines of business. MassMutual's business also could be adversely affected by changes in state law relating to licensing, regulation of premium rates, asset and reserve valuation requirements, restrictions on dividends and distributions, limitations on investments, accounting standards and RBC requirements and, at the federal level, by laws and regulations that may affect certain aspects of the insurance and financial services industries, including proposals for financial services regulatory reform or preemptive federal regulation. A portion of MassMutual's insurance business is subject to regulation with respect to policy rates, minimum guarantees and related matters. Assessments are also levied against MassMutual as a result of participation in various types of state guaranty associations, state insurance pools for the uninsured or other arrangements. MassMutual may also be the subject of a number of ongoing financial or market conduct examinations, audits or inquiries and is subject to state regulation regarding potential acquisitions or changes of control. *See* "Business of MassMutual – Regulation."

Although MassMutual and its U.S. insurance subsidiaries' businesses are subject to regulation in each state in which they conduct business, in many instances the models on which state insurance laws and regulations are based emanate from the NAIC. State insurance regulators and the NAIC regularly re-examine existing laws and regulations applicable to insurance companies and their products. Any proposed or future legislation or NAIC initiatives, if adopted, may be more restrictive on MassMutual's ability to conduct business than current regulatory requirements or may result in higher costs or increased statutory capital and reserve requirements. Statutes, regulations and interpretations may be applied with retroactive impact, particularly in areas such as accounting and reserve requirements. Also, regulatory actions with prospective impact can potentially have a significant impact on products currently sold. The NAIC continues to work to reform state regulation in various areas, including comprehensive reforms relating to life insurance and annuity reserves.

State regulators retain the authority to license insurers in their states and an insurer may not operate in a state in which it is not licensed. MassMutual's ability to retain its insurance licenses depends on its ability to meet requirements established by the NAIC and adopted by each state, such as RBC standards, surplus requirements, minimum reinsurance levels and adequacy of its investment portfolio. Some of the factors influencing these licensing requirements, particularly factors such as changes in equity market levels, the value of certain derivative instruments that do not receive hedge accounting, the value and credit ratings of certain fixed-income and equity securities in MassMutual's investment portfolio, interest rate changes and changes to the RBC formulas and the interpretation of the NAIC's instructions with respect to RBC calculation methodologies, are out of MassMutual's control.

In addition, federal laws and regulations affect the taxation of life insurance products and insurance companies. From time to time, Congress has considered proposals that, if enacted, could have had an adverse impact on the federal income tax treatment of MassMutual or some of MassMutual's insurance products or could have imposed a greater regulatory burden on MassMutual. If such proposals were to be adopted in the future, they could increase MassMutual's tax costs, have an adverse effect on MassMutual's ability to sell such products, or result in the surrender of some existing contracts and policies. MassMutual cannot predict whether future legislation or administrative guidance will be enacted or issued or, if so, will contain provisions that would adversely alter the tax treatment of these or other products.

The 2008 financial markets crisis affecting banks and other financial institutions has resulted in numerous changes to regulation and oversight of the financial industry, the full impact of which has yet to be realized. In 2010, the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 (the "**Dodd-Frank Act**") was enacted and signed into law. The Dodd-Frank Act makes extensive changes to the laws regulating financial services firms and requires various federal agencies to adopt a broad range of new rules and regulations implementing the Dodd-Frank Act. Federal agencies have been given significant discretion in drafting the rules and regulations that will implement the Dodd-Frank Act. Implementation of the Dodd-Frank Act is continuing and the process of adopting such implementing rules and/or regulations has in some instances been delayed beyond the timeframes initially imposed by the Dodd-Frank Act. Changes in general political, economic or market conditions, including as a result of the most recent U.S. presidential and congressional elections, could affect the scope, timing and final implementation of the Dodd-Frank Act. MassMutual cannot predict if or when future legislation or administrative guidance will be enacted or issued or what impact any changing regulation may have on the operations of MassMutual.

While the Dodd-Frank Act does not directly allow for the federal regulation of the business of insurance, the Dodd-Frank Act does allow federal regulators to compel state insurance regulators to liquidate an insolvent insurer under some circumstances if state regulators have not acted within a specific period. It also establishes the Federal Insurance Office (the "**FIO**"), within the Treasury Department. While currently not having a general supervisory or regulatory authority over the business of insurance, the Director of the FIO performs various functions with respect to insurance, including serving as a non-voting member of the Financial Stability Oversight Council (the "**FSOC**") and making recommendations to the FSOC regarding non-bank financial companies to be designated as systemically important financial institutions ("**SIFI**"). The Director of the FIO has also submitted reports to Congress regarding (i) how to modernize and improve the system of insurance regulation in the U.S., (ii) the impact of Part II of the Nonadmitted and Reinsurance Reform Act of 2010 and (iii) the global reinsurance market and the regulation of reinsurance. Such reports could ultimately lead to changes in the regulation of insurers and reinsurers in the U.S.

The Dodd-Frank Act also authorizes the FIO to assist the Secretary of the Treasury Department in negotiating covered agreements. A covered agreement is an agreement between the U.S. and one or more foreign governments, authorities or regulatory entities, regarding prudential measures with respect to insurance or reinsurance. The FIO is further charged with determining, in accordance with the procedures and standards established under the Dodd-Frank Act, whether state laws are preempted by a covered agreement.

Pursuant to this authority, in September 2017, the U.S. and the European Union signed a covered agreement to address, among other things, reinsurance collateral requirements (the "**EU Covered Agreement**"). In addition, on December 11, 2018, the Treasury Department and the Office of the U.S. Trade Representative announced their intent to sign a Bilateral Agreement between the U.S. and the United Kingdom on Prudential Measures Regarding Insurance and Reinsurance in anticipation of the United Kingdom's exit from the European Union in March 2019 (the "**UK Covered Agreement**"). U.S. state regulators have 60 months, or five years from the date of the signing of the EU Covered Agreement, to adopt reinsurance reforms removing reinsurance collateral requirements for EU and UK reinsurers that meet the prescribed minimum conditions set forth in the applicable EU Covered Agreement or UK Covered Agreement or else state laws imposing such reinsurance collateral requirements may be subject to federal preemption. The NAIC is currently working to adopt amendments to the Credit for Reinsurance Model Law and Regulation to conform to the requirements of the EU Covered Agreement and UK Covered Agreement. The reinsurance collateral provisions of the EU Covered Agreement and UK Covered Agreement may increase competition, in particular with respect to pricing for reinsurance transactions, by lowering the cost at which competitors are able to provide reinsurance to U.S. insurers. MassMutual cannot predict what impact, if any, the EU Covered Agreement or UK Covered Agreement or their implementation could have on the business, results of operations and financial condition of MassMutual.

In 2011, the FSOC issued a final rule and interpretive guidance under the Dodd-Frank Act outlining the process for designating SIFIs. The final rule and guidance lay out the procedural framework the FSOC will follow and the factors it will consider in making the SIFI designation. A company designated as a SIFI would become subject to prudential regulation by the Federal Reserve Board, including, among other things, heightened capital, leverage and liquidity standards, risk management requirements, concentration limits, maintenance of resolution plans and stress tests, and potential discretionary requirements relating to contingent capital, enhanced public disclosure and short-term debt limits. On April 21, 2017, the President of the U.S. issued an executive memorandum (the "**Executive Memorandum**") to the Secretary of the Treasury Department, directing the Secretary of the Treasury Department to conduct a review of, and report to the President regarding, FSOC processes and imposing a temporary moratorium on non-emergency SIFI determinations and designations pending completion of such review and receipt of such report. The requested report, which the Treasury Department published on November 17, 2017, recommends significant changes to the FSOC processes for making SIFI determinations and designations. On March 6, 2019, the FSOC issued proposed guidance regarding the designation of nonbank financial companies as SIFIs, to move from an "entity-based" designation approach towards an "activities-based" approach. This approach would eliminate the prior quantitative thresholds for designation as a SIFI in lieu of pursuing designations only if potential risk or threat cannot be addressed through an activities-based approach through the entities primary regulator and the potential risk is one that could be addressed through such designation process. As a result, there is considerable uncertainty as to the future of federal regulation of non-bank SIFIs and, specifically, as to whether MassMutual could be designated a SIFI.

On April 6, 2016, the U.S. Department of Labor (the "**DOL**") issued an amendment to DOL regulations defining the term "fiduciary" (the "**DOL Fiduciary Rule**") that significantly expands the circumstances under which certain insurance companies may become fiduciaries of employee benefit plans and individual retirement accounts ("**IRAs**"). In addition, the DOL also issued two new prohibited transaction exemptions and amendments to several other existing exemptions which, among other things, require compliance with the new "best interest contract exemption" by a financial advisor in connection with recommending equity-indexed annuities for purchase by an IRA, if such advisor would receive a commission or other compensation as a result of such recommendation. The amendment to the definition of fiduciary and the requirements of the exemptions, if fully implemented, could fundamentally change the way insurance companies do business and could limit the types of investments that can be sold to certain plans and IRAs. The rule became applicable on June 9, 2017 with a phased implementation period ending on July 1, 2019. However, on March 15, 2018, the Fifth Circuit vacated the amendment to the DOL regulations, as well as the new prohibited transaction exemptions and the changes to existing prohibited transaction exemptions. The Fifth Circuit's opinion has not yet become effective as a result of a request by the Attorneys General of California, New York and Oregon for reconsideration of the denial of their initial request to intervene in the case and have the full court review the request. MassMutual intends to monitor any developments with respect to this matter to determine any potential impact on MassMutual's business. While the DOL has indicated that it plans to issue in September 2019 a revised final fiduciary rule package to replace the DOL Fiduciary Rule vacated by the Fifth Circuit, MassMutual cannot predict at this time the scope or substance of the new regulation that may be ultimately promulgated by the DOL or the impact such regulation may have on MassMutual's businesses and operations.

In addition to the DOL, the SEC, federal and state lawmakers and state insurance regulators continue their efforts to evaluate what is an appropriate regulatory framework around a standard of care for the sale of investment products and services. On June 5, 2019, the SEC adopted a package of proposed rules and interpretations designed to address standard of care issues and the transparency of retail investors' relationships with investment advisors and broker-dealers. On July 18, 2018, the New York State Department of Financial Services adopted a best interest standard of care regulation applicable to annuity and life transactions through issuance of the First Amendment to Insurance Regulation 187 – Suitability and Best Interests in Life Insurance and Annuity Transactions (Regulation 187).

These regulatory developments, together with disruptions relating to the status of the DOL Fiduciary Rule, have created uncertainties in the annuity marketplace. MassMutual is evaluating the scope and potential impact of these regulatory proposals on its businesses and its distribution partners. Despite these developments, MassMutual believes its diverse annuity product offerings position it to compete effectively in this evolving market environment. While MassMutual cannot yet predict what impact these developments will have on its businesses, it is closely following the ongoing review and assessment of a potential new DOL Fiduciary Rule as well as these other federal and state-level developments.

A computer system failure or security breach could disrupt MassMutual's business, damage its reputation and adversely impact its profitability

MassMutual relies on computer systems to conduct business, including customer service, marketing and sales activities, customer relationship management and producing financial statements. While MassMutual has policies, procedures, automation and backup plans designed to prevent or limit the effect of failure, its computer systems may be vulnerable to disruptions or breaches as the result of natural disasters, man-made disasters, criminal activity, pandemics, or other events beyond its control. The failure of MassMutual's computer systems for any reason could disrupt its operations, result in the loss of customer business and adversely impact its profitability.

MassMutual retains confidential information on its computer systems, including customer information and proprietary business information. Additionally, third parties provide certain key components of MassMutual's business infrastructure, on which MassMutual relies to successfully deliver MassMutual's products and services. In connection with such services, the third party service providers also may retain confidential information on its computer system. Any compromise of the security of MassMutual's or a third party service provider's computer systems that results in the disclosure of personally identifiable customer information could damage MassMutual's reputation, expose MassMutual to litigation, increase regulatory scrutiny and require it to incur significant technical, legal and other expenses. *See* "Business of MassMutual – Regulation – Privacy and Data Security Regulation."

MassMutual's employee benefit plans expose it to market risks, including that the assets in the plans are insufficient to cover projected benefit obligations.

Market risk arises within MassMutual's employee benefit plans to the extent that the obligations of the plans are not fully matched by assets with determinable cash flows. Pension and post-retirement obligations are subject to change due to fluctuations in the discount rates used to measure the liabilities as well as factors such as changes in inflation, salary increases and participants living longer. The risks are that market fluctuations could result in assets, which are insufficient over time to cover the level of projected benefit obligations. In addition, increases in inflation and members living longer could increase the pension and post-retirement obligations. MassMutual determines the level of this risk using reports prepared by independent actuaries and takes action, where appropriate, in terms of setting investment strategy and determining contribution levels. In the event that the pension and post-retirement obligations arising under MassMutual's employee benefit plans exceed the assets set aside to meet the obligations, MassMutual may be required to make additional contributions or increase its level of contributions to these plans. *See* "Statutory Financial Statements – Notes to Statutory Financial Statements, Footnote 16. Business risks, commitments and contingencies."

Litigation and regulatory inquiries or investigations may harm MassMutual's business.

Life insurance companies have historically been subject to substantial litigation resulting from claims disputes and other matters. MassMutual and its subsidiaries are, from time to time, plaintiffs or defendants in actions arising out of their insurance business and investment operations. MassMutual is, from time to time, also involved in various governmental and administrative proceedings or regulatory investigations and inquiries. Litigation, as well as governmental, administrative or regulatory proceedings, inquiries or investigations may harm MassMutual's business and financial strength and reduce its profitability. *See* "Business of MassMutual – Legal Proceedings."

USE OF PROCEEDS

The net proceeds to the relevant Series Trust from each offering of the Notes of such Series Trust will be invested by such Series Trust in the relevant Funding Agreement(s).

MASSMUTUAL GLOBAL FUNDING II

MassMutual Global Funding II is a special purpose statutory trust formed under Delaware law pursuant to the Trust Agreement and the filing of the Certificate of Trust. The Trust, formed in the United States, was created to facilitate a program for the issuance, from time to time, of discrete Series of Notes issued by particular Series Trusts and secured by Funding Agreements and the Series Trust's rights in and to corresponding Swaps, if any, entered into between MassMutual and such Series Trust. The registered office of the Trust is MassMutual Global Funding II c/o U.S. Bank Trust National Association, 300 Delaware Avenue, 9th Floor, Wilmington, Delaware 19801; its telephone number is (212) 816-5685.

The Series Trust for each Series of Notes will be a series of the Trust. The Series Trust's business and affairs will be conducted by the Administrative Trustee pursuant to the terms of a Series Trust Agreement (each, a "**Series Trust Agreement**"). Each Series Trust Agreement will incorporate the Trust Agreement. Under the relevant Series Trust Agreement, each Series Trust will be authorized and directed to issue the relevant Series of Notes and the relevant Beneficial Interest Certificate, to purchase the relevant Funding Agreement(s) and to enter into corresponding Swaps, if any. In addition, the relevant Series Trust Agreement will provide that each such Series Trust will exist for the exclusive purposes of (a) issuing and selling the Notes of the relevant Series and the relevant Beneficial Interest Certificate, (b) entering into one or more Swaps, if any, (c) using the proceeds from the sale of Notes to acquire one or more Funding Agreement(s) issued by MassMutual and make any necessary payment under one or more corresponding Swap(s), if any, (d) paying amounts due on and satisfying other obligations with respect to the relevant Series of Notes and the corresponding Swap(s), if any, (e) entering into the relevant Series Indenture and (f) engaging in only those other activities necessary or incidental to those described in (a) to (f) above. Accordingly, the relevant Funding Agreement(s) and corresponding Swap(s), if any, and the $100 consideration received upon the issuance of the Beneficial Interest Certificate will be the sole assets of each Series Trust. Payments under the Funding Agreement(s) issued to each Series Trust and under the corresponding Swap(s), if any, will be the sole source of income of such Series Trust.

In no event will the Holders of the Notes have any right to appoint, remove or replace the Administrative Trustee. The Administrative Trustee may at any time resign by giving written notice to the Depositor and the Indenture Trustee at least 90 days before the date of resignation specified in the notice. If at any time the Administrative Trustee ceases to meet the eligibility criteria set forth in the Trust Agreement and fails to resign after written request by the Depositor and the Indenture Trustee or if at any time the Administrative Trustee is legally unable to act, or has been adjudged bankrupt or insolvent, or a receiver of the Administrative Trustee or of its property is appointed, or any public officer takes charge or control of the Administrative Trustee or of its property or affairs for the purpose of rehabilitation, conservation or liquidation, then the Depositor and the Indenture Trustee may remove the Administrative Trustee. Upon resignation or removal, the Depositor shall promptly appoint a successor Administrative Trustee meeting the qualifications set forth in the Trust Agreement by written instrument delivered to each of the resigning Administrative Trustee, the successor Administrative Trustee, any remaining Administrative Trustees, the Indenture Trustee and the issuer of the Funding Agreements.

Delaware law does not require that the Trust or any Series Trust prepare financial statements. Accordingly, no financial statements have been or will be prepared with respect the Trust or any Series Trust.

CAPITALIZATION OF THE TRUST

The following table sets forth the capitalization of MassMutual Global Funding II as of the date indicated below prepared in accordance with U.S. GAAP:

	As of April 30, 2019 (unaudited)
Outstanding Debt Securities:	
Amortizing Zero Coupon Notes Due December 2031[(1)]	$ 48,039,902
Amortizing Zero Coupon Notes Due December 2032[(1)]	49,125,269
2.5% Notes Due October 2022	500,000,000
3.6% Notes Due April 2024	250,000,000
2.45% Notes Due November 2020	650,000,000
2.0% Notes Due April 2021	750,000,000
1.5% Notes Due October 2019	600,000,000
2.5% Notes Due April 2022	500,000,000
2.75% Notes Due June 2024	750,000,000
1.95% Notes Due September 2020	750,000,000
2.95% Notes Due January 2025	500,000,000
3.4% Notes Due March 2026	650,000,000
Floating Notes Due March 2021[(2)]	200,000,000
Total outstanding debt securities	6,197,165,171
Equity:	
Paid in capital	1,300
Retained earnings	–
Accumulated other comprehensive income	–
Total equity	1,300
Total capitalization	6,197,166,471

(1) Zero coupon notes are recorded at amortized value.

(2) Floating note is based on USD 3M LIBOR

FINANCIAL AND ACCOUNTING MATTERS

The historical financial information included in this Offering Memorandum has been prepared in conformity with the SAP prescribed or permitted by the Massachusetts Division.

Summary of Principal Differences Between SAP and U.S. GAAP

SAP is different in some respects from financial statements prepared in accordance with U.S. GAAP. The more significant differences between SAP and U.S. GAAP are as follows: (a) bonds are generally carried at amortized cost, whereas U.S. GAAP reports bonds at fair value for bonds available for sale and trading or at amortized cost for bonds held to maturity; (b) changes in the fair value of derivative financial instruments are recorded as changes in surplus, whereas U.S. GAAP generally reports these changes as revenue unless deemed an effective hedge; (c) interest rate and credit default swaps associated with replicated asset transactions are carried at amortized cost, whereas U.S. GAAP would carry them at fair value; (d) embedded derivatives are recorded as part of the underlying contract, whereas U.S. GAAP would identify and bifurcate certain embedded derivatives from the underlying contract or security and account for them separately at fair value; (e) income recognition on partnerships and LLCs, which are accounted for under the equity method, is limited to the amount of cash distribution, whereas U.S. GAAP is without limitation; (f) certain majority-owned subsidiaries and variable interest entities are accounted for using the equity method, whereas U.S. GAAP would consolidate these entities; (g) changes in the balances of deferred income taxes, which provide for book versus tax temporary differences, are subject to limitation and are recorded in surplus, whereas U.S. GAAP would generally include the change in deferred taxes in net income without limitation; (h) assets and liabilities associated with certain group annuity and variable universal life contracts, which do not pass-through all investment gains to contract holders, are maintained in separate accounts and are presented on a single line in the statutory financial statements, whereas U.S. GAAP reports these contracts as general investments and liabilities of MassMutual; (i) assets are reported at admitted asset value and assets designated as nonadmitted are excluded through a charge against surplus, whereas U.S. GAAP recognizes all assets, net of any valuation allowances; (j) statutory policy reserves are based upon prescribed methods, such as the Commissioners' Reserve Valuation Method ("**CRVM**"), Commissioners' Annuity Reserve Valuation Method ("**CARVM**") or net level premium method, and prescribed statutory mortality, morbidity and interest assumptions at the time of issuance, whereas U.S. GAAP policy reserves would generally be based upon the net level premium method or the estimated gross margin method with estimates at time of issuance, of future mortality, morbidity, persistency and interest; (k) liabilities for policyholder reserves, unearned premium, and unpaid claims are presented net of reinsurance ceded, whereas U.S. GAAP would present the liabilities on a direct basis and report an asset for the amounts due from reinsurers for the amounts ceded; (l) an asset valuation reserve ("**AVR**") is reported as a contingency reserve to stabilize surplus against fluctuations in the statement value of real estate, partnerships and LLCs and certain common stocks as well as credit-related changes in the value of bonds, mortgage loans and certain derivatives, whereas U.S. GAAP does not record this reserve; (m) after-tax realized capital gains (losses) that result from changes in the overall level of interest rates for all types of fixed-income investments and interest-related hedging activities are deferred into the interest maintenance reserve ("**IMR**") and amortized into revenue, whereas U.S. GAAP reports these gains and losses as revenue; (n) changes to the mortgage loan valuation allowance are recognized in net unrealized capital gains (losses), net of tax, in the Statutory Statements of Changes in Surplus, whereas U.S. GAAP reports these changes in net realized capital gains (losses); (o) the overfunded status of pension and other post-retirement plans, which is the excess of the fair value of the plan assets over the projected benefit obligation, is a nonadmitted asset for statutory accounting whereas U.S. GAAP recognizes the overfunded status as an asset; (p) surplus notes are reported in surplus, whereas U.S. GAAP would report these notes as liabilities; (q) payments received for universal and variable life insurance products, certain variable and fixed deferred annuities and group annuity contracts are reported as premium income and corresponding change in reserves, whereas U.S. GAAP would treat these payments as deposits to policyholders' account balances; (r) certain acquisition costs, such as commissions and other variable costs, directly related to successfully acquiring new business are charged to current operations as incurred, whereas U.S. GAAP would generally capitalize these expenses and amortize them based on profit emergence over the expected life of the policies or over the premium payment period; (s) Statutory Statements of Changes in Surplus includes net income, change in net unrealized capital gains (losses), change in net unrealized foreign exchange capital gains (losses), change in other net deferred income taxes, change in nonadmitted assets, change in AVR, prior period adjustments and change in minimum pension liability, whereas U.S. GAAP presents net income as retained earnings and net unrealized capital gains (losses), change in net unrealized foreign exchange capital gains (losses), change in minimum pension liability as other comprehensive income; and (t) the change in the fair value for unaffiliated common stock is recorded in surplus, whereas the change in the fair value for ownership interests in an entity not accounted for under the equity method or consolidated are recorded in revenue for U.S. GAAP.

Investment Reserves

MassMutual maintains an AVR and an IMR. The AVR is a contingency reserve to stabilize surplus against fluctuations in the statement value of common stocks, real estate investments, partnerships and LLCs as well as credit-related changes in the value of bonds, preferred stocks, mortgage loans, and certain derivatives to the extent that AVR is greater than zero for the appropriate asset category. The AVR is reported as a liability and the change in AVR, net of tax, is reported in surplus. The IMR is used to stabilize net income against fluctuations in interest rates. The IMR is included in other liabilities, or if negative, is nonadmitted.

As of December 31, 2018, the AVR totaled $3.3 billion, which represents a 3% increase from December 31, 2017. This increase was primarily due to current year net unrealized capital gains of $1.0 billion and a $119 million increase in reserve contributions, partially offset by current year net realized capital losses of $691 million and an adjustment down to the maximum allowable reserve calculated based on the statement values of $328 million.

After-tax realized capital gains and losses, which result from changes in the overall level of interest rates for all types of fixed-income investments and interest-related hedging activities are deferred into the IMR and amortized into revenue. These interest-related gains and losses are amortized into net investment income using the grouped method over the remaining life of the investment sold or, in the case of derivative financial instruments, over the remaining life of the underlying asset. Net realized after-tax capital gains of $384 million in 2018, losses of $12 million in 2017 and gains of $145 million in 2016 were deferred into the IMR. Amortization of the IMR into net investment income amounted to gains of $64 million in 2018, gains of $113 million in 2017 and $135 million in 2016.

Realized capital gains and losses net of taxes, exclude gains and losses deferred into the IMR and gains and losses of the separate accounts. Realized capital gains and losses, which are determined using the specific identification method, are recognized in net income and include OTTI.

Policyholder Dividends and Other Experience Credits

Dividends expected to be paid to policyholders in the following year are approved annually by MassMutual's Board of Directors and are recorded as an expense in the current year. The liability for policyholders' dividends includes the estimated amount of annual dividends and settlement dividends. Generally, dividends are declared and paid annually, but are not guaranteed. Settlement dividends are an additional dividend payable at termination of a policy upon maturity, death, lapse or surrender of some permanent life insurance policies.

The aggregate amount of dividends is at the discretion of the Board of Directors subject to statutory and actuarial professional guidance. The allocation of these dividends to policyholders reflects the relative contribution of each group of participating policies to surplus and considers, among other factors, investment returns, mortality and morbidity experience, expenses and taxes.

Each participating policyholder receives an equitable share of the divisible surplus that results when overall actual experience is more favorable than the experience assumed in determining the premiums and guaranteed elements of policies.

Dividends have the effect of reducing the cost of insurance to participating policyholders and should be distinguished from the dividends paid on shares of capital stock by other types of business corporations or by stock life insurance companies. Policies on which such dividends may be payable are referred to as participating policies; policies on which such dividends are not payable are referred to as nonparticipating policies. However, some participating policies are not expected to generate divisible surplus; dividends are therefore not illustrated and annual reviews are done to determine if any dividends should be paid to those policies. For nonparticipating policies, adjustments may be made to nonguaranteed premiums, policy credits and charges to reflect, for example, anticipated experience changes with respect to investment results, mortality and expenses.

For further information concerning statutory policyholder dividend requirements, *see* "Business of MassMutual – Regulation."

Liability for Policyholders' Reserves and Deposit-type Contracts

SAP prescribes methods for valuing obligations under in force policies and contracts. Those valuations are reflected in the "policyholders' reserves" and "liabilities for deposit-type contracts" lines of the financial statements. Statutes, regulations, and actuarial professional standards require MassMutual to analyze the adequacy of these reserves, under a variety of moderately adverse scenarios in the context of SAP on an annual basis.

For a discussion of policy reserves, *see* "Financial and Accounting Matters – Liability for Policyholders' Reserves and Deposit-type Contracts."

Separate Accounts

Separate accounts are segregated funds administered and invested by MassMutual, the performance of which primarily benefits the policyholders/contract holders with an interest in the separate accounts. Group and individual variable annuity, variable life and other insurance policyholders/contract holders select from among the separate accounts and sub-accounts made available by MassMutual. The separate accounts and sub-accounts are offered as investment options under certain insurance contracts or policies. The returns produced by separate account assets increase or decrease separate account reserves. Separate account assets consist principally of marketable securities reported at fair value. Except for MassMutual's seed money and supplemental accounts, as noted below, and certain guaranteed separate accounts issued in Minnesota, separate account assets can only be used to satisfy separate account liabilities and are not available to satisfy the general obligations of MassMutual. Separate account administrative and investment advisory fees are included in fees and other income.

Assets may be transferred from the general investments of MassMutual to seed the separate accounts. When assets are transferred to separate accounts, they are transferred at fair market value. Gains related to the transfer are deferred to the extent that MassMutual maintains a proportionate interest in the separate account. The deferred gain is recognized as MassMutual's ownership decreases or when the separate account sells the underlying asset during the normal course of business. Losses associated with these transfers are recognized immediately.

Separate accounts reflect two categories of risk assumption: nonguaranteed separate accounts for which the policyholder/contract holder assumes the investment risk and guaranteed separate accounts for which MassMutual contractually guarantees a minimum return, a minimum account value, or both, to the policyholder/contract holder. For certain guaranteed separate account products such as interest rate guaranteed products and indexed separate account products, reserve adequacy is performed on a contract-by-contract basis using, as applicable, prescribed interest rates, mortality rates and asset risk deductions. If the outcome from this adequacy analysis produces a deficiency relative to the current account value, a liability is recorded in policyholders' reserves or liabilities for deposit-type contracts in the Statutory Statements of Financial Position with the corresponding change in the liability recorded as change in policyholders' reserves or policyholders' benefits in the Statutory Statements of Operations.

Premium income, benefits and expenses of the separate accounts are included in the Statutory Statements of Operations with the offset recorded in the change in policyholders' reserves. Investment income, realized capital gains (losses) and unrealized capital gains (losses) on the assets of separate accounts, other than seed money, accrue to policyholders/contract holders and are not recorded in the Statutory Statements of Operations.

The above discussion describes the treatment of existing separate accounts in the most recent Statutory Financial Statements of MassMutual. For a detailed description of the treatment of guaranteed separate accounts that may be established to support the deposits of the Guaranteed Separate Account Funding Agreements that may be issued pursuant to the Program, *see* "Description of Certain Terms and Conditions of the Funding Agreements."

Critical Accounting Policies

The preparation of financial statements requires management to make estimates and assumptions that impact the reported amounts of assets and liabilities, the disclosure of assets and liabilities as of the date of the statutory financial statements and the reported amounts of revenues and expenses during the reporting periods. The most significant estimates include those used in determining the carrying values of investments including the amount of mortgage loan investment valuation reserves, OTTI, the value of the investment in MMHLLC the liabilities for policyholders' reserves, the determination of admissible DTA, the liability for taxes and the liability for litigation or other contingencies. Future events including, but not limited to, changes in the level of mortality, morbidity, interest rates, persistency, asset valuations and defaults could cause results to differ from the estimates used in the statutory financial statements. Although some variability is inherent in these estimates, management believes the amounts presented are appropriate.

For a complete discussion of accounting policies and practices, *see* "Statutory Financial Statements – Notes to Statutory Financial Statements."

Carrying Values of Investments and Derivatives. Bonds are generally valued at amortized cost using the constant yield interest method with the exception of NAIC Category 6 bonds, which are in or near default, and certain residential mortgage-backed securities ("**RMBS**") and commercial mortgage-backed securities ("**CMBS**"), which are rated by outside modelers, which are carried at the lower of amortized cost or fair value. NAIC ratings are applied to bonds and other securities. Categories 1 and 2 are considered investment grade, while Categories 3 through 6 are considered below investment grade. Bonds are recorded on a trade date basis, except for private placement bonds, which are recorded on the funding date.

The fair value of bonds is based on quoted market prices when available. If quoted market prices are not available, values provided by other third-party organizations are used. If values provided by other third-party organizations are unavailable, fair value is estimated using internal models by discounting expected future cash flows using observable current market rates applicable to yield, credit quality and maturity of the investment or using quoted market values for comparable investments. Internal inputs used in the determination of fair value include estimated prepayment speeds, default rates, discount rates and collateral values, among others. Structure characteristics and cash flow priority are also considered. Fair values resulting from internal models are those expected to be received in an orderly transaction between willing market participants.

Preferred stocks in good standing, those that are rated Categories 1 through 3 by the NAIC Securities Valuation Office ("**SVO**"), are generally valued at amortized cost. Preferred stocks not in good standing, those that are rated Categories 4 through 6 by the SVO of the NAIC, are valued at the lower of amortized cost or fair value. Fair values are based on quoted market prices, when available. If quoted market prices are not available, values provided by third-party organizations are used. If values provided by third-party organizations are unavailable, fair value is estimated using internal models. These models use inputs not directly observable or correlated with observable market data. Typical inputs integrated into MassMutual's internal discounted expected earnings models include, but are not limited to, earnings before interest, taxes, depreciation and amortization estimates. Fair values resulting from internal models are those expected to be received in an orderly transaction between willing market participants.

Common stocks of unconsolidated subsidiaries, primarily C.M. Life, MML Bay State, MMHLLC and MMI, are accounted for using the statutory equity method. MassMutual accounts for the value of MMHLLC and MMI at its underlying U.S. GAAP equity value adjusted to remove certain nonadmitted and intangible assets**.** MMHLLC'S value is also adjusted by a portion of its noncontrolling interests ("**NCI**") and appropriated retained earnings, after consideration of MMHLLC's fair value and MassMutual's capital levels. The Massachusetts Division has affirmed the statutory recognition of MassMutual's application of the NCI guidelines in MMHLLC's statutory carrying value. However, MassMutual has limited this recognition to $2,749 million as of December 31, 2018 and $2,703 million as of December 31, 2017. Operating results, less dividend distributions, for MMHLLC are reflected as net unrealized capital gains (losses) in the Statutory Statements of Changes in Surplus. Dividend distributions received from MMHLLC are recorded in net investment income and are limited to MMHLLC's U.S. GAAP retained earnings. The cost basis of common stocks – subsidiaries and affiliates is adjusted for impairments deemed to be other than temporary. MassMutual considers the following factors in the evaluation of whether a decline in value is other than temporary: (a) the financial condition and near-term prospects of the issuer; (b) MassMutual's ability and intent to retain the investment for a period sufficient to allow for a near-term recovery in value; and (c) the period and degree to which the value has been below cost. MassMutual conducts a quarterly analysis of issuers whose common or preferred stock is not-in-good standing or valued below 80% of cost. MassMutual also considers other qualitative and quantitative factors in determining the existence of OTTI including, but not limited to, unrealized loss trend analysis and significant short-term changes in value.

Unaffiliated common stocks are carried at fair value, which is based on quoted market prices when available. If quoted market prices are not available, values provided by other third-party organizations are used. If values from other third parties are unavailable, fair values are determined by management using estimates based upon internal models. MassMutual's internal models include estimates based upon comparable company analysis, review of financial statements, broker quotes and last traded price. Fair values resulting from internal models are those expected to be received in an orderly transaction between willing market participants at the financial statement date.

Mortgage loans are valued at the unpaid principal balance of the loan, net of unamortized premium and discount, valuation allowances, nonrefundable commitment fees and mortgage interest points. Interest income earned on impaired loans is accrued on the outstanding principal balance of the loan based on the loan's contractual coupon rate. Interest is not accrued for (a) impaired loans more than 60 days past due, (b) delinquent loans more than 90 days past due, or (c) loans that have interest that is not expected to be collected. MassMutual continually monitors mortgage loans where the accrual of interest has been discontinued, and will resume the accrual of interest on a mortgage loan when the facts and circumstances of the borrower and property indicate that the payments will continue to be received according to the terms of the original or modified mortgage loan agreement.

MassMutual performs internal reviews at least annually to determine if individual mortgage loans are performing or nonperforming. The fair value of performing mortgage loans are estimated by discounting expected future cash flows using current interest rates for similar loans with similar credit risk. For nonperforming loans, the fair value is the estimated collateral value of the underlying real estate. If foreclosure is probable, MassMutual will obtain an external appraisal.

Investment real estate, which MassMutual has the intent to hold for the production of income, and real estate occupied by MassMutual, is carried at depreciated cost, less encumbrances. Depreciation is calculated using the straight-line method over the estimated useful life of the real estate holding, not to exceed 40 years. Depreciation expense is included in net investment income.

Real estate held for sale is initially carried at the lower of depreciated cost or fair value less estimated selling costs and is no longer depreciated. Adjustments to carrying value, including further declines in fair value, are recorded in a valuation reserve, which is included in realized capital losses.

Fair value of real estate is generally estimated using the present value of expected future cash flows discounted at a rate commensurate with the underlying risks. MassMutual also obtains external appraisals for a rotating selection of properties annually. If an external appraisal is not obtained, an internal appraisal is performed.

Partnerships and LLCs, except for partnerships that generate and realize low income housing tax credits ("**LIHTCs**"), are accounted for using the equity method with the change in the equity value of the underlying investment recorded in surplus. Distributions received are recognized as net investment income to the extent the distribution does not exceed previously recorded accumulated undistributed earnings.

Investments in partnerships that generate LIHTCs are carried at amortized cost unless considered impaired. Under the amortized cost method, the excess of the carrying value of the investment over its estimated residual value is amortized into net investment income during the period in which tax benefits are recognized.

The equity method is suspended if the carrying value of the investment is reduced to zero due to losses from the investment. Once the equity method is suspended, losses are not recorded until the investment returns to profitability and the equity method is resumed. However, if MassMutual has guaranteed obligations of the investment or is otherwise committed to provide further financial support for the investment, losses will continue to be reported up to the amount of those guaranteed obligations or commitments.

Interest rate swaps and credit default swaps associated with replicated assets are valued at amortized cost and all other derivative types are carried at fair value, which is based primarily upon quotations obtained from counterparties and independent sources. These quotations are compared to internally derived prices and a price challenge is lodged with the counterparties and independent sources when a significant difference cannot be explained by appropriate adjustments to the internal model. When quoted market values are not reliable or available, the value is based on an internal valuation process using market observable inputs that other market participants would use. Changes in the fair value of these instruments other than interest rate swaps and credit default swaps associated with replicated assets are recorded as unrealized capital gains (losses) in surplus. Gains and losses realized on settlement, termination, closing or assignment of contracts are recorded as realized capital gains (losses). Amounts receivable and payable are accrued as net investment income.

Investment Valuation Reserves on Mortgage Loans. When based upon current available information and events, it is probable that MassMutual will be unable to collect all amounts of principal and interest due according to the contractual terms of the mortgage loan agreement, a valuation allowance is recorded on a loan-by-loan basis in net unrealized capital losses for the excess of the carrying value of the mortgage loan over the fair value of its underlying collateral. Such information or events could include property performance, capital budgets, future lease roll, a property inspection as well as payment trends. Collectability and estimated decreases in collateral values are also assessed on a loan-by-loan basis considering all events and conditions relevant to the loan. This evaluation is inherently subjective as it requires estimates that are susceptible to significant revisions as more information becomes available, as changes occur in the market or as negotiations with the borrowing entity evolve. If there is a change in the fair value of the underlying collateral or the estimated loss on the loan, the valuation allowance is adjusted accordingly. An OTTI occurs upon the realization of a credit loss, typically through foreclosure or after a decision is made to accept a discounted payoff, and is recognized in realized capital losses. The previously recorded valuation allowance is reversed from unrealized capital losses. When an OTTI is recorded, a new cost basis is established reflecting estimated value of the collateral.

Other-than-Temporary Impairments. MassMutual employs a systematic methodology to evaluate OTTI by conducting a quarterly analysis of bonds. The impairment review process provides a framework for deriving OTTI in a manner consistent with market participant assumptions. MassMutual considers the following factors, where applicable depending on the type of securities, in the evaluation of whether a decline in value is other than temporary: (a) the likelihood that MassMutual will be able to collect all amounts due according to the contractual terms of the debt security; (b) the present value of the expected future cash flows of the security; (c) the characteristics, quality and value of the underlying collateral or issuer securing the position; (d) collateral structure; (e) the length of time and extent to which the fair value has been below amortized cost; (f) the financial condition and near-term prospects of the issuer; (g) adverse conditions related to the security or industry; (h) the rating of the security; (i) MassMutual's ability and intent to hold the investment for a period of time sufficient to allow for an anticipated recovery to amortized cost; and (j) other qualitative and quantitative factors in determining the existence of OTTI including, but not limited to, unrealized loss trend analysis and significant short-term changes in value.

For corporate securities, if it is determined that a decline in the fair value of a bond is other than temporary, OTTI is recognized as a realized loss equal to the difference between the investment's amortized cost basis and, generally, its fair value at the balance sheet date. For loan-backed and structured securities, if the present value of cash flows expected to be collected is less than the amortized cost basis of the security, an OTTI is recognized as a realized loss equal to the difference between the investment's amortized cost basis and the present value of cash flows expected to be collected. The expected cash flows are discounted at the security's effective interest rate. Internal inputs used in determining the amount of the OTTI on structured securities include collateral performance, prepayment speeds, default rates, and loss severity based on borrower and loan characteristics, as well as deal structure including subordination, over-collateralization and cash flow priority. In addition, if MassMutual has the intent to sell, or the inability, or lack of intent to retain the investment for a period sufficient to recover the amortized cost basis, an OTTI is recognized as a realized loss equal to the entire difference between the investment's amortized cost basis and its fair value at the balance sheet date.

When a bond is other-than-temporarily impaired, a new cost basis is established. For loan-backed and structured securities, any difference between the new amortized cost basis and any increased present value of future cash flows expected to be collected is accreted into net investment income over the expected remaining life of the security.

The impairment review process provides a framework for deriving OTTI in a manner consistent with market participant assumptions. In these analyses, collateral type, investment structure and credit quality are critical elements in determining OTTI.

Asset-backed securities ("**ABS**") and mortgage-backed securities ("**MBS**") are evaluated for OTTI on a quarterly basis using scenarios customized by collateral type. Cash flow estimates are based on various assumptions and inputs obtained from external industry sources along with internal analysis and actual experience. Assumptions are based on the specifics of each security including collateral type, loan type, vintage and subordination level in the structure. Where applicable, assumptions include prepayment speeds, default rates and loss severity, weighted average maturity and changes in the collateral values.

MassMutual has a review process for determining if collateralized debt obligations ("**CDOs**") are at risk for OTTI. For the senior, mezzanine and junior debt tranches, cash flows are modeled using multiple scenarios based on the current ratings and values of the underlying corporate credit risks and incorporating prepayment and default assumptions that vary according to collateral attributes of each CDO. The prepayment and default assumptions are varied within each model based upon rating (base case), historical expectations (default), rating change improvement (optimistic), rating change downgrade (pessimistic) and fair value (market). The default rates produced by these multiple scenarios are assigned an expectation weight according to current market and economic conditions and fed into a final scenario. OTTI is recorded if this final scenario results in the loss of any principal or interest payments due.

For the most subordinated junior CDO tranches, the present value of the projected cash flows in the final scenario is measured using an effective yield. If the current book value of the security is greater than the present value measured using an effective yield, an OTTI is taken in an amount sufficient to produce its effective yield. Certain CDOs cannot be modeled using all of the scenarios because of limitations on the data needed for all scenarios. The cash flows for these CDOs, including foreign currency denominated CDOs, are projected using a customized scenario MassMutual believes is reasonable for the applicable collateral pool.

The cost basis of common and preferred stocks is adjusted for impairments deemed to be other than temporary. MassMutual considers the following factors in the evaluation of whether a decline in value is other than temporary: (a) the financial condition and near-term prospects of the issuer; (b) MassMutual's ability and intent to retain the investment for a period of time sufficient to allow for a near-term recovery in value; and (c) the period and degree to which the value has been below cost. MassMutual conducts a quarterly analysis of issuers whose common or preferred stock is not-in-good standing or valued below 80% of cost. MassMutual also considers other qualitative and quantitative factors in determining the existence of OTTI including, but not limited to, unrealized loss trend analysis and significant short-term changes.

For mortgage loans, an OTTI occurs upon the realization of a credit loss, typically through foreclosure or after a decision is made to accept a discounted payoff, and is recognized in realized capital losses. The previously recorded valuation allowance is reversed from unrealized capital losses. When an OTTI is recorded, a new cost basis is established reflecting management's estimate of the fair value of the collateral.

For real estate held for the production of income, depreciated cost is adjusted for impairments whenever events or changes in circumstances indicate the carrying amount of the asset may not be recoverable, with the impairment being included in realized capital losses. An impairment is recorded when the property's estimated future net operating cash flows over ten years, undiscounted and without interest charges, is less than book value.

For partnerships and LLCs, when it is probable that MassMutual will be unable to recover the outstanding carrying value of an investment based on undiscounted cash flows, or there is evidence indicating an inability of the investee to sustain earnings to justify the carrying value of the investment, OTTI is recognized in realized capital losses reflecting the excess of the carrying value over the estimated fair value of the investment. The estimated fair values of limited partnership interests are generally based on MassMutual's share of the net asset value ("**NAV**") as provided in the financial statements of the investees. In certain circumstances, management may adjust the NAV by a premium or discount when it has sufficient evidence to support applying such adjustments.

For determining impairments in partnerships that generate LIHTCs, MassMutual uses the present value of all future benefits, the majority of which are tax credits, discounted at a risk-free rate ranging from 2.5% for future benefits of two years to 2.7% for future benefits of ten or more years and compares the results to its current book value. Impairments are recognized in realized capital losses reflecting the excess of the carrying value over the estimated fair value of the investment.

Liability for Policyholders' Reserves and Deposit-type Contracts. Policyholders' reserves provide for the present value of estimated future obligations in excess of estimated future premium on policies in force.

Reserves for individual life insurance contracts are developed using accepted actuarial methods computed principally on the net level premium or CRVM bases using the American Experience or the 1941, 1958, 1980 or the 2001 Commissioners' Standard Ordinary mortality tables with assumed interest rates. Reserves for disability riders associated with life contracts are calculated using morbidity rates from the 1952 Period 2 Intercompany Disability Table, modified to reflect MassMutual's morbidity experience.

MassMutual waives deduction of deferred fractional premium at death and returns any portion of the final premium beyond the date of death. Reserves are computed using continuous functions to reflect these practices.

MassMutual charges a higher premium on certain contracts that cover substandard mortality risk. For these policies, the reserve calculations are based on a substandard mortality rate, which is a multiple of the standard mortality tables.

Certain variable universal life and universal life contracts include features such as guaranteed minimum death benefits ("**GMDBs**") or other guarantees that ensure continued death benefit coverage when the policy would otherwise lapse. The value of the guarantee is only available to the beneficiary in the form of a death benefit. The liability for variable and universal life GMDBs and other guarantees is included in policyholders' reserves and the related change in this liability is included in change in policyholders' reserves.

Reserves for individual and group payout annuities are developed using accepted actuarial methods computed principally under CARVM using applicable interest rates and mortality tables. Individual payout annuities primarily use the 1971 and 1983 Individual Annuity Mortality and Annuity 2000 tables. Group payout annuities primarily use the 1983 Group Annuity Mortality and 1994 Group Annuity Reserving tables.

Certain individual variable annuity products have a variety of additional guarantees such as GMDBs and variable annuity guaranteed living benefits ("**VAGLBs**"). The primary types of VAGLBs include guaranteed minimum accumulation benefits ("**GMABs**"), guaranteed minimum income benefits ("**GMIBs**") including GMIB Basic and GMIB Plus and guaranteed minimum withdrawal benefits ("**GMWBs**"). In general, these benefit guarantees require the contract owner or policyholder to adhere to a company-approved asset allocation strategy. The liabilities for individual variable annuity GMDBs and VAGLBs are included in policyholders' reserves and the related changes in these liabilities are included in change in policyholders' reserves.

Variable annuity GMDBs provide a death benefit in excess of the contract value if the contract value is less than the guaranteed minimum amount. Some contracts provide that guarantee upon the contract owner's death and others provide it upon the annuitant's death. This amount may be based on a return of premium (the premium paid generally adjusted for withdrawals), a roll-up (an accumulation of premium at a specified interest rate adjusted for withdrawals), a reset (the contract value on a specified anniversary date adjusted for subsequent withdrawals, which is allowed to decrease when reset) or a ratchet (the contract value on a specified anniversary date adjusted for subsequent withdrawals, which is never allowed to decrease when reset). For a variable annuity contract, a decline in the stock or bond market causing the contract value to fall below the guaranteed specified amount will increase the net amount at risk, which is the amount of the GMDBs in excess of the contract value.

GMABs provide the annuity contract holder with a guaranteed minimum contract value at the end of the product's guarantee period. If the contract value is below that guarantee at the end of the period, the contract value is increased to the guaranteed minimum account benefit value and the contract continues from that point. Options for the guarantee period are 10, 12, 20 and 26 years.

GMWBs provide the annuity contract holder with a guarantee that a minimum amount will be available for withdrawal annually for life regardless of the contract value.

GMIBs provide the annuity contract holder with a guaranteed minimum amount when the contract is annuitized. The GMIBs would be beneficial to the contract holder if the contract holder's contract value would otherwise not provide a higher annuitization value using currently offered rates at the time of annuitization. GMIBs generally anticipate payout between ages 60 and 90.

GMIB Plus replaced GMIB Basic and was issued from 2007 through 2009. GMIB Plus includes a product version, which provides a minimum floor amount that can be applied to an annuity option. The GMIB Plus value is equal to the initial purchase amount increased by a compound annual interest rate. If a contract owner takes a withdrawal, the GMIB Plus value is recalculated by making an adjustment for withdrawals. There are two types of adjustments for withdrawals: (1) Dollar for dollar adjustment – during each contract year, the GMIB Plus value will be lower for each dollar that is withdrawn up to and equal to the current contract year interest credited on the GMIB Plus value; (2) Pro-rata adjustment – during each contract year, for any amount withdrawn that exceeds the current contract year interest credited on the GMIB Plus value, the GMIB Plus value will be further reduced by a pro-rata adjustment. Such a withdrawal will negatively impact the GMIB Plus value. GMIB Plus cannot be annuitized within ten years of contract issuance as the rider can only be exercised after a ten-year waiting period has elapsed. This guarantee was only available upon contract issuance.

Reserves for individual and group fixed deferred annuities are developed using accepted actuarial methods computed principally under CARVM using applicable interest rates and mortality tables. Individual deferred annuities primarily use the 1971 and 1983 Individual Annuity Mortality and Annuity 2000 tables. Group deferred annuities primarily use the 1983 Group Annuity Mortality and 1994 Group Annuity Reserving tables.

Reserves for individual and group variable deferred annuities are developed using accepted actuarial methods computed principally under CARVM for variable annuities using applicable interest rates and mortality tables. Individual variable deferred annuities primarily use the 1994 Minimum Guaranteed Death Benefit or Annuity 2000 tables. The liability is evaluated under both a standard scenario and stochastic scenarios net of currently held applicable hedge asset cash flows. MassMutual holds the reserve liability valuation at the higher of the standard or stochastic scenario values. Based on MassMutual's currently held hedges, if market interest rates increase, the fair value of MassMutual's hedges would decrease in value and reserves would decrease. Should market interest rates decrease, the fair value of MassMutual's hedges would increase in value and reserves would increase. In addition, MassMutual elected to hold additional reserves above those indicated based on the stochastic or standard scenario in order to maintain a prudent level of reserve adequacy.

The standard scenario is a prescriptive reserve with minimal company discretion. The primary driver of the standard scenario result is the composition of the in force policies, with the key factor being the extent to which the product guarantees are "in the money." The value of the reserve guarantees under the standard scenario is driven primarily by equity markets.

For the stochastic scenarios, MassMutual uses the American Academy of Actuaries' scenarios. Prudent estimate assumptions are used for mortality, expenses and commissions, investment management fees, taxes and policyholder behavior including lapses, partial withdrawals, annuitization and additional premium. These assumptions are consistent with those used for asset adequacy testing and are based on MassMutual experience. Stochastic reserves are driven by the degree that the variable annuity benefits are "in the money" at projected interest rates and equity market levels, expenses, discount rates, net derivative values, and policyholder behavior.

Separate accounts include certain group annuity contracts used to fund retirement plans that offer a guarantee of a contract holder's principal, which can be withdrawn over a stated period of time. These contracts offer a stated rate of return backed by MassMutual. Contract payments are not contingent upon the life of the retirement plan participants.

Disability income policy reserves are generally calculated using the two-year preliminary term method and actuarially accepted morbidity tables using the 1964 Commissioners' Disability Table and the 1985 Commissioners'

Individual Disability Table A with assumed interest and mortality rates in accordance with applicable statutes and regulations.

Disabled life claim reserves are generally calculated using actuarially accepted methodologies and actuarially accepted morbidity tables using the 1964 Commissioners' Disability Table and 1985 Commissioners' Individual Disability Tables A and C with assumed interest rates in accordance with applicable statutes and regulations.

Long term care policy reserves are generally calculated using the one-year preliminary term method and actuarially accepted morbidity, mortality and lapse tables with assumed interest rates in accordance with applicable statutes and regulations.

Long term care claim reserves are generally calculated using actuarially accepted methodologies and actuarially accepted morbidity tables with assumed interest rates in accordance with applicable statutes and regulations.

Unpaid claims and claim expense reserves are related to disability and long term care claims. Unpaid disability claim liabilities are projected based on the average of the last three disability payments. Claim expense reserves are based on an analysis of the unit expenses related to the processing and examination of new and ongoing claims. Interest accrued on reserves is calculated by applying NAIC prescribed interest rates to the average reserves by year incurred.

Tabular interest, tabular reserves, reserves released, and tabular cost for all life and annuity contracts and supplementary contracts involving life contingencies are determined in accordance with NAIC Annual Statement instructions. For tabular interest, whole life and term products use a formula that applies a weighted average interest rate determined from a seriatim valuation file to the mean average reserves. Universal life, variable life, group life, annuity and supplemental contracts use a formula that applies a weighted average credited rate to the mean account value. For contracts without an account value (*e.g.*, a Single Premium Immediate Annuity), a weighted average statutory valuation rate is applied to the mean statutory reserve or accepted actuarial methods using applicable interest rates are applied.

All policyholders' reserves and accruals are presented net of reinsurance. Management believes that these liabilities and accruals present management's best estimate and will be sufficient, in conjunction with future revenues, to meet future anticipated obligations of policies and contracts in force.

Federal Income Taxes. Total federal income taxes are based upon MassMutual's best estimate of its current and DTA or liabilities. Current tax expense (benefit) is reported in the Statutory Statements of Operations as federal income tax expense (benefit) if resulting from operations and within net realized capital gains (losses) if resulting from invested asset transactions. Changes in the balances of deferred taxes, which provide for book-to-tax temporary differences, are subject to limitations and are reported within various lines within surplus. Accordingly, the reporting of book-to-tax temporary differences, such as reserves and policy acquisition costs, and of book-to-tax permanent differences, such as tax-exempt interest and tax credits, results in effective tax rates in the Statutory Statements of Operations that differ from the federal statutory tax rate.

SELECTED HISTORICAL STATUTORY FINANCIAL INFORMATION OF MASSMUTUAL

The Notes are not obligations of, and are not guaranteed by, MassMutual, or any of its subsidiaries or affiliates. In addition, the obligations under the Funding Agreements and corresponding Swaps, if any, are solely obligations of MassMutual and are not guaranteed by any of MassMutual's subsidiaries or affiliates or any other person. The selected financial information of MassMutual set forth below has been compiled on an unconsolidated basis and determined in accordance with SAP.

For a description of the accounting principles applicable to this financial information and certain differences between SAP and U.S. GAAP, *see* "Financial and Accounting Matters—Summary of Principal Differences Between SAP and U.S. GAAP."

The following statutory financial information as of December 31, 2018 and 2017 and for the years ended December 31, 2018, 2017 and 2016 has been derived from MassMutual's Statutory Financial Statements included elsewhere in this Offering Memorandum. The Statutory Financial Statements for 2018, 2017 and 2016 have been audited by KPMG LLP, independent auditors.

This information should be read in conjunction with, and is qualified in its entirety by, "Management's Discussion and Analysis of Financial Condition and Results of Operations" and the Statutory Financial Statements and other information included elsewhere in this Offering Memorandum. The results for past accounting periods are not necessarily indicative of the results to be expected for any future accounting period.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
Selected Historical Statutory Financial Information

	Years Ended December 31,				
	2018	**2017**	**2016**	**% Change 18 vs. 17**	**% Change 17 vs. 16**
	($ In Millions)				
Revenue:					
Premium income	$ 22,929	$ 17,486	$ 21,432	31 %	(18)%
Net investment income	7,774	6,542	6,334	19	3
Fees and other income	1,018	1,425	1,283	(29)	11
Total revenue	31,721	25,453	29,049	25	(12)
Benefits and expenses:					
Policyholders' benefits	23,007	20,019	18,312	15	9
Change in policyholders' reserves	4,499	740	7,387	508	(90)
Change in group annuity reserves assumed	(1,221)	(887)	(1,510)	(38)	41
General insurance expenses	2,366	2,604	2,251	(9)	16
Commissions	1,062	1,009	938	5	8
State taxes, licenses and fees	258	245	237	5	3
Total benefits and expenses	29,971	23,730	27,615	26	(14)
Net gain from operations before dividends and federal income taxes	1,750	1,723	1,434	2	20
Dividends to policyholders	1,695	1,569	1,566	8	-
Net gain from operations before federal income taxes	55	154	(132)	(64)	217
Federal income tax (benefit) expense	(168)	(320)	(326)	48	2
Net gain from operations	223	474	194	(53)	144
Net realized capital (losses) gains	(1,044)	(422)	(208)	(147)	(103)
Net (loss) income	**$ (821)**	**$ 52**	**$ (14)**	**NM%**	**471 %**

NM = not meaningful

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
Selected Historical Statutory Financial Information

	December 31, 2018	2017	% Change
	($ In Millions)		
Assets:			
Bonds	$ 97,079	$ 90,435	7 %
Preferred stocks	744	768	(3)
Common stocks - subsidiaries and affiliates	12,327	14,424	(15)
Common stocks - unaffiliated	500	1,212	(59)
Mortgage loans	23,624	22,580	5
Policy loans	13,873	13,327	4
Real estate	488	857	(43)
Partnerships and limited liability companies	8,599	7,678	12
Derivatives	8,741	8,857	(1)
Cash, cash equivalents and short-term investments	4,318	3,580	21
Other invested assets	943	203	365
Total invested assets	171,236	163,921	4
Investment income due and accrued	3,018	2,199	37
Federal income taxes	612	544	13
Deferred income taxes	983	761	29
Other than invested assets	3,320	3,476	(4)
Total assets excluding separate accounts	179,169	170,901	5
Separate account assets	64,478	69,162	(7)
Total assets	**$ 243,647**	**$ 240,063**	**1 %**
Liabilities and Surplus:			
Policyholders' reserves	$ 121,978	$ 115,764	5 %
Liabilities for deposit-type contracts	14,370	13,014	10
Contract claims and other benefits	479	513	(7)
Policyholders' dividends	1,713	1,601	7
General expenses due or accrued	1,096	1,074	2
Asset valuation reserve	3,307	3,207	3
Repurchase agreements	4,768	4,204	13
Commercial paper	250	250	NM
Collateral	2,946	2,661	11
Derivatives	4,912	5,979	(18)
Funds held under coinsurance	4,099	4,001	2
Other liabilities	3,641	2,928	24
Total liabilities excluding separate accounts	163,559	155,196	5
Separate account liabilities	64,478	69,162	(7)
Total liabilities	**228,037**	**224,358**	2
Surplus	15,610	15,705	(1)
Total liabilities and surplus	**$ 243,647**	**$ 240,063**	**1 %**

NM = not meaningful

See notes on following page

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY

Selected Historical Statutory Financial Information

Notes:

Dividends to policyholders are discretionary and subject to the approval of MassMutual's Board of Directors.

SAP require that the liability for policyholders' dividends include dividends currently payable and the full amount of dividends apportioned for payment over the 12 months following the date of the applicable payment.

Surplus as of December 31, 2018 includes surplus notes with a carrying value of $2,268 million, comprised of the following surplus notes at face value issued and outstanding: $250 million of surplus notes maturing in 2023, $100 million of surplus notes maturing in 2024, $250 million of surplus notes maturing in 2033, $310 million of surplus notes maturing in 2039, $400 million of surplus notes maturing in 2041, $500 million of surplus notes maturing in 2065 and $475 million of surplus notes maturing in 2077. MassMutual recorded the proceeds from the sale of these notes as surplus. Pursuant to approval by the Commissioner, any payment of interest or principal of the surplus notes, and any redemption payment, may be made only to the extent that MassMutual's unassigned funds reflect sufficient funds to cover the amount of such payment.

BUSINESS OF MASSMUTUAL

MassMutual is a mutual life insurance company organized in the Commonwealth of Massachusetts as a corporation and was chartered on May 15, 1851. MassMutual's legal entity identifier is: R6ZXK5P01NP6HXSY1S07. MassMutual's primary business is ordinary life insurance. In addition to ordinary life insurance, MassMutual also provides, directly or through MassMutual's subsidiaries, a wide range of annuity and disability insurance products, supplemental medical products, retirement plans and other pension-related products and services, and investment products and services to individuals, corporations and other institutions, in all 50 states of the U.S., the District of Columbia and Puerto Rico. MassMutual, or its subsidiaries, also have operations in Asia, Europe and Australia. However, subsidiary operations are not included in MassMutual's unconsolidated statutory results.

MassMutual is a growth-oriented, diversified life insurance company that seeks to provide superior value for policyholders and other customers by achieving exceptional results. MassMutual's mission is to help its customers secure their future and protect the ones they love. MassMutual is committed to be the best company in the industry based on superior financial strength, high dividends and delivering a high quality customer experience.

MassMutual aims to accomplish this by developing and distributing a broad and superior portfolio of innovative financial solutions and services and maintaining prudent underwriting standards, strong retention, rigorous expense control, and sophisticated asset/liability management with a continued commitment to high credit quality.

MassMutual's domestic operations provide a broad set of comprehensive financial solutions to more than five million customers using a variety of channels to meet the protection, accumulation, investment and income needs of individuals, small businesses and institutions. Offerings include a wide variety of life insurance, disability income insurance, long term care insurance, annuities, retirement plans and other institutional funding and protection vehicles, as well as broker-dealer and trust services. MassMutual's registered offerings are sold by registered representatives of MML Investor Services, LLC ("**MMLIS**"), a registered broker-dealer subsidiary of MassMutual, and by registered representatives of other broker-dealers who have entered into distribution agreements with MML Strategic Distributors, LLC ("**MSD**") or MML Distributors, LLC ("**MMLD**"), registered broker-dealer subsidiaries of MassMutual. Pursuant to separate underwriting agreements with MassMutual and the separate accounts, MMLIS serves as principal underwriter of the registered variable annuity and variable life products sold by its registered representatives, and MSD and MMLD serve as principal underwriter of the registered variable products sold by registered representatives of other broker-dealers who have entered into distribution agreements with MSD or MMLD. MMLIS also provides a wide variety of investment products and services through MassMutual agents, including open-ended mutual funds, fee-based investment advisory programs, variable insurance products, unit investment trusts, and general securities. MSI Financial Services, Inc. ("**MSI**") merged with MMLIS in March 2017.

MassMutual's subsidiaries participate in the following lines of business:

- **MassMutual International LLC** offers insurance and other financial services to customers primarily in Asia. Products include endowment and whole life insurance, universal life insurance, term life insurance, group life insurance, credit life insurance, health benefit insurance and annuities. On May 31, 2018, MMI completed the sale of MassMutual Japan to Nippon Life Insurance Co. ("**Nippon**") for a purchase price of approximately $960 million in cash consideration. As a result of the transaction, Nippon holds an 85.1% stake in MassMutual Japan, with MMI retaining approximately 14.9% ownership in MassMutual Japan, and MassMutual Japan has become an affiliate of Nippon and will be known as Nippon Wealth Life Insurance Company Ltd., effective January 1, 2019. In addition, in November 2018, MMI completed the sale of MassMutual Asia to Yunfeng Financial Group ("**Yunfeng FG**") and several Asia-based investors. Under the terms of the agreement, MMI received $1.0 billion in cash and 800 million shares of Yunfeng FG, which represented approximately a 24.8% ownership interest at the time of the close. In turn, as at the time of the closing, Yunfeng FG holds a 60% ownership interest in MassMutual Asia and the other investors owned the remainder. The transaction was initially announced in August 2017.

- **MM Asset Management Holding LLC** is a financial holding company that holds MassMutual's investment management subsidiary, Barings. Barings and its subsidiaries manage assets for a broad range of institutional retail and private clients, including MassMutual's general investment accounts and clients of MassMutual's insurance and retirement businesses using investment strategies that seek to yield risk-appropriate returns including corporate credit (investment grade and high yield), ABS, quantitative strategies, leveraged loans, real estate finance, private placements and private equity. They also provide asset management services in developed and emerging equity and bond markets on behalf of other third party institutional, retail and private clients.

On May 24, 2019, MassMutual announced the completion of the sale of its retail asset management affiliate, OFI, to Invesco, a global asset manager. Under the terms of the sale, MassMutual and OFI employee shareholders received 81.8 million of Invesco common shares and $4.0 billion in perpetual, non-cumulative preference shares with a fixed cash dividend rate of 5.9%. In turn, MassMutual received a 15.7% common equity interest in the combined company, and Invesco and MassMutual entered into a shareholder agreement pursuant to which MassMutual has customary minority shareholder rights, including the appointment of a director to Invesco's board of directors.

- **MassMutual Asset Finance LLC** is an equipment financing company offering collateralized lending, financing and leasing services.

DOMESTIC OPERATIONS OVERVIEW

CHANNELS

The MM Financial Advisors ("**MMFA**") channel uses a large, productive and loyal career agency network of financial professionals to provide holistic financial solutions through an advisor-centric model, with protection products at the core. The acquisition in July 2016 of Premier Client Group ("**PCG**") increased the agent workforce by more than half and improved the MMFA channel's geographic reach and network scale.

Products – Advisors holistically service clients' protection, wealth and retirement needs; core products distributed through MMFA include life insurance, disability income insurance, long term care insurance, and annuities.

The direct-to-consumer channel provides insurance products and services to underserved and emerging markets by focusing on innovation, customer experience, and digital enablement. The direct-to-consumer channel targets the underinsured U.S. middle market, and is primarily focused on providing affordable coverage to near retiree and retiree consumers and millennials.

Products – Products distributed through the direct-to-consumer channel include guaranteed-acceptance whole life and term life insurance.

The workplace solutions channel provides products and services for employer-sponsored retirement and insurance benefits, delivering needs-based solutions to promote plan health, retirement readiness, and financial protection. Core defined contribution ("**DC**") business is supplemented by offerings in niche markets including Taft Hartley, Professional Employee Organizations, Government and Non-Profit.

Products – Core products distributed through the workplace solutions channel include defined contribution retirement plans as well as life and disability income, accident and sickness insurance products designed to meet the needs of middle income employees and executives.

The institutional solutions channel serves customers on an institutional basis to meet the protection, accumulation, investment, longevity and income needs of businesses. It provides innovative solutions designed to enhance a company's financial effectiveness, benefit funding and risk management.

Products - Products distributed through the institutional solutions channel include bank-owned life insurance ("**BOLI**"), corporate-owned life insurance ("**COLI**"), pension buyout annuities, defined benefit plans ("**DB**"), investment only solutions, stable value investment options, and funding agreements.

COMPETITIVE LANDSCAPE

The life insurance industry is highly competitive. As published by the American Council of Life Insurers (the "**ACLI**"), as of the end of 2017, there were 781 life insurance companies operating in the U.S., with approximately 75% owned by stockholders and the remainder consisting of mutual, fraternal, and other ownership types. Much of the industry offers individual insurance products similar to those marketed by MassMutual. Individual life insurance protection totaled $12.0 trillion at the end of 2017, according to the ACLI. Life insurers continue to face competition from non-traditional sources in the financial services industry including mutual fund companies, banks, securities brokerage houses, and other financial services entities, many of which provide alternative investment and savings vehicles for consumers that compete directly with insurance products. MassMutual is well-positioned to continue its focus on whole life and other life products through its highly productive network of advisors and complementary distribution channels.

The disability insurance industry still holds opportunity as only 20% of Americans own disability insurance, yet most consumers agree that people need coverage (2018 Insurance Barometer Study – Life Insurance Research Association ("**LIMRA**")). In a 2018 Insurance Barometer Study, LIMRA found that 44% of consumers were concerned about supporting themselves if they were disabled and not able to work. The percentage among younger workers ("Millennials" and "Gen X") was 42% and 45% respectively. MassMutual competes in the Individual non-cancelable disability income market with the goal to protect policyholder income in such an event.

The annuity market is highly competitive, as insurance companies, banks and mutual fund companies have been introducing a variety of new retirement income products. With the projected increase of the pre-retirement population, the annuity market is considered to be a high-growth opportunity as consumers seek to draw down retirement assets. MassMutual believes it is competitively positioned given its wide product portfolio and expanding distribution for its annuity products, strong product performance and financial strength.

There is a relatively consistent group of providers in the retirement plan market. Competition for market share has intensified and plan sponsors have exerted increased pressure on prices. MassMutual believes that its financial strength, diverse product line, investment offerings and servicing levels enhance its competitive position.

MassMutual competes with only a relatively small group of competitors in each of the markets for various institutional solutions. Consequently, the goal is to offer products with better risk-return profiles than MassMutual's competitors while equaling or surpassing them in areas such as administrative service and customer responsiveness.

PRODUCT OFFERINGS AND PRODUCT MANAGEMENT

Product Descriptions

MassMutual's principal products are described below:

Life Insurance products are designed to meet a variety of financial needs, including death benefit protection, wealth transfer, income replacement and cash value accumulation, as well as supplemental retirement, estate and business planning. Life insurance products consist of a diverse portfolio encompassing whole life insurance, term life insurance, universal life insurance and variable universal life insurance. Some of these products offer a range of riders that provide such benefits as waiver of premium, accidental death benefits, long term care coverage, paid-up additions of insurance and accelerated death benefits and other guarantees. The primary product descriptions follow:

Whole Life. Whole life insurance provides guaranteed death benefits and guaranteed cash values in return for periodic premium payments of a fixed amount over a specified period of time or for life. MassMutual offers several types of whole life products. Whole Life Legacy 100, Whole Life Legacy 10 Pay, Whole Life Legacy 20 Pay, Whole Life Legacy 65 and Survivorship Whole Life provide a level guaranteed face amount for the lifetime of the insured. Survivorship whole life is a product that pays a death benefit upon the death of the second of two insureds. Whole Life Legacy High Early Cash Value is designed to provide a high early cash value to the insured. Guaranteed Acceptance Life Insurance is whole life insurance, issued without underwriting, and offered in smaller face amounts than traditional whole life. Worksite Whole Life is sold in the workplace using actively-at-work underwriting. With the exception of

Guaranteed Acceptance Whole Life, MassMutual's Whole Life products are participating, which means that MassMutual may provide a dividend, which generally represents a partial premium refund resulting from more favorable interest, mortality, expense and persistency experience than was reflected in the premium.

Term Life. Term life insurance provides life insurance protection for a fixed period and has no cash value. MassMutual offers a variety of term life insurance products designed to meet varying client needs. Almost all term life insurance products allow conversion within a specified time period to one of MassMutual's other insurance products.

Combination Products. Combination products provide coverage for multiple protection needs in one product. MassMutual's CareChoice One is a participating, single premium life and long term care insurance product with guaranteed death benefits and guaranteed cash values, the right to accelerate the policy's death benefit to help pay for long term care expenses, and an extended long term care coverage amount that is available to pay additional long term care benefits.

Universal Life. Universal life insurance provides life insurance protection and the opportunity to build account value, with a guaranteed minimum interest rate, while offering the policyholder a flexible premium payment schedule, within guidelines established by the terms of the policy. MassMutual also offers survivorship universal life, a product that insures two lives and pays a death benefit at the second death. Worksite Universal Life is sold in the workplace using actively-at-work underwriting.

Variable Universal Life. Variable universal life insurance provides life insurance protection and the opportunity to build account value, while offering the policyholder a flexible premium payment schedule and the choice of allocating policy account value among a variety of investment options, within guidelines established by the terms of the policy. For variable universal life products, the policyholder generally bears the investment risk for cash values in the separate accounts.

Certain individual universal and variable universal life products include features such as guarantees that ensure continued death benefit coverage when the policy would otherwise lapse. The value of the guarantee is only available to the beneficiary in the form of a death benefit.

Individual Disability Income provides products to insure a portion of income in the event of disability. Products are sold in the individual, multi-life and small business markets. Individual disability income insurance from MassMutual can help offset a portion of lost earnings, ensure continued retirement savings, cover small business operating costs, and facilitate partnership buy-outs in the event of a disability.

Individual Long Term Care provides coverage for the long term care services for chronically ill individuals, through the SignatureCare 500 and 600 (where approved) product series, MassMutual's participating Long Term Care products. In addition, MassMutual offers accelerated death benefit riders on certain whole life insurance policies that reimburse for long term care expenses. Long term care insurance covers a wide array of long term care services, including in-home, community, assisted living, and nursing facility care.

Annuities provide a way to meet the needs of people saving for retirement or approaching or living in retirement, using a variety of products including income annuities, deferred fixed annuities, and deferred variable annuities. Summary product descriptions follow:

Income Annuities. Income annuities provide annuity payments at regular intervals that begin on a specified date, either immediately upon contract issuance or at a later date, and continue for a specific period of time or for life, and are offered in a variety of forms.

Deferred Fixed Annuities. Deferred fixed annuities allow for either a single or periodic purchase payment, which accumulates at guaranteed interest rates, for a specified period of time. The deferred fixed annuities offer the contract owner the ability to withdraw or apply their contract value to annuity payments that guarantee income for life or a specific period of time.

Deferred Fixed Index Annuities. Deferred fixed index annuities allow for a single purchase payment, which accumulates at a growth rate which is benchmarked, within a range that is floored at zero and capped at pre-determined rate, to a stock market index, for a specified period of time. The deferred fixed index annuities offer the contract owner the ability to withdraw or apply their contract value to annuity payments that guarantee income for life or a specific period of time. Additionally, for an additional fee, an optional rider available at issue allows for the possibility of lifetime withdrawals with the amount dependent on the date of first withdrawal.

Deferred Variable Annuities. Deferred variable annuities allow for either a single or periodic purchase payment, which may be directed to the fixed account or one of several separate account investment options. Deferred variable annuities offer the contract owner the ability to withdraw or apply contract value to annuity payments that guarantee income for life or a specific period of time.

Certain variable annuity products issued by MassMutual offer optional guarantees on death benefits for an additional cost. GMDBs may provide a death benefit that is greater than the contract value. Currently, MassMutual does not offer any living benefits on newly issued variable annuities. MassMutual has offered living benefits in the past. These have included GMABs, GMIBs and GMWBs. The benefits provided by these guarantees varied by the version offered at the time the client selected the guarantee.

Retirement Plans deliver needs-based solutions to employers and their participants, promoting plan health, retirement readiness, and financial protection. Summary product descriptions follow:

Defined Benefits. MassMutual offers investment options for plan sponsors' DB funds as well as actuarial services and administration of retirement benefit payments to DB participants.

Defined Contribution. MassMutual offers full service (investment, administrative, and consultative) DC products, which offers an array of investment options to participants. Certain DC plans offer GMDBs and deferred income annuities.

Non-Qualified Product. MassMutual offers a wide variety of non-qualified plans in partnership with a third party, including 409A plans for for-profit entities and 457(b) and 457(f) plans for not-for-profit entities.

Investment Only. Investment Only ("**IO**") arrangements are offered to DB and DC plans, wherein MassMutual investment and stable value options are provided, but the recordkeeping and administration of the plans are performed by an entity other than MassMutual.

Stable Value Funds. Various Stable Value investment options are offered within the products described above. These include both general account and separate account varieties which provide for guarantee of principal, guaranteed minimum interest rates, stabilized crediting rates and various termination provisions.

Separate Accounts. MassMutual provides an array of non-guaranteed separate accounts for many of the products described above. Similar to mutual funds, these are pooled funds in which the investment results of the assets, net of a management fee, are passed directly to the contract holders. MassMutual offers separate accounts that invest in large and small capitalization equities, bonds, international equities, real estate and money market instruments, offering the client a variety of investment choices with varying degrees of risk.

Pension Risk Transfer Annuities ("**PRTs**") guarantee the payment of pension benefits to retirees of defined benefit plans in return for a single premium paid by the plan sponsor. These group annuity contracts are generally issued to DB plan sponsors seeking to remove the liability and risk from their balance sheet. The pensioners then become annuitants of the insurance company.

Structured Settlements. MassMutual administers a closed block of structured settlements, which were used to resolve settlements of personal physical injury tort liability.

BOLI and COLI are life insurance products designed for sale to bank and corporate purchasers to meet benefit funding, insurance and diversification needs.

Worksite Insurance. MassMutual provides a range of worksite insurance products including executive group life insurance, multi-life individual disability income insurance, group whole life insurance, group universal life insurance, group critical illness or specified disease insurance and group accident insurance to employees of employer groups.

Product Pricing and Management

MassMutual prices insurance products to produce an appropriate return (adjusted for the inherent risks of the product) on invested capital consistent with MassMutual's financial strength objectives. MassMutual achieves long-term value for policyholders by competitively managing the key financial fundamentals for each product, including investment earnings, expenses, policy persistency, longevity, mortality and morbidity (*i.e.*, the incidence and duration of disability). For participating products, MassMutual reflects the actual experience in dividends, which generally represent premium refunds resulting from more favorable interest, mortality, expense and persistency experience than was reflected in the premium.

Insurance Underwriting

MassMutual balances the underwriting risk assessment process to ensure an evaluation of relative risks consistent with the issuance of new business and competitive product performance. Underwriting risk represents the exposure to loss resulting from actual policy experience adversely emerging in comparison to product pricing assumptions such as mortality, morbidity and persistency risk. The type of underwriting varies by product and market. For some life insurance, long term care insurance and supplemental medical policies, MassMutual's underwriting risk is mitigated by using reinsurance.

FUNDING AGREEMENTS

MassMutual offers funding agreement products for domestic and international institutional investors. MassMutual uses these funds in an investment spread strategy, consistent with its other investment spread operations. As of December 31, 2018, funding agreement balances in the general account totaled $8.8 billion, consisting of $6.0 billion in note programs, $1.1 billion in Federal Home Loan Bank of Boston ("**FHLB Boston**") funding agreements, $919 million in various other agreements and $815 million in municipal guaranteed investment contracts ("**Municipal Contracts**"). As of December 31, 2017, funding agreement balances in the general account totaled $8.8 billion, consisting of $6.2 billion in note programs, $1.1 billion in FHLB Boston funding agreements, $787 million of various other agreements and $761 million of Municipal Contracts.

Funding agreements are investment contracts sold to domestic and international institutional investors. Funding agreement liabilities are equal to the account value and are established by contract deposits, increased by interest credited and decreased by contract coupon payments and maturities. Contract holders do not have the right to terminate the contract prior to the contractually stated maturity date. MassMutual may retire funding agreements prior to the contractually stated maturity date by repurchasing the agreement in the market or, in some cases, by calling the agreement. If this occurs, the difference in value is an adjustment to interest credited to liabilities for deposit-type contracts in the Statutory Statements of Operations. Credited interest rates vary by contract and can be fixed or floating. Agreements do not have put provisions or ratings-based triggers. The liability of non-U.S. dollar denominated funding agreements may increase or decrease due to changes in foreign exchange rates. Currency swaps are employed to eliminate foreign exchange risk from all funding agreements issued to back non-U.S. dollar denominated notes.

Note programs

Under the note programs, MassMutual creates special purpose entities ("**SPEs**"), which are investment vehicles or trusts, for the purpose of issuing medium-term notes to investors. Proceeds from the sale of the medium-term notes issued by these SPEs are used to purchase funding agreements from MassMutual. The payment terms of any particular series of notes are matched by the payment terms of the funding agreement securing the series. Notes were issued from MassMutual's $2.0 billion European Medium-Term Note Program with approximately $113 million outstanding as of December 31, 2018. Notes are currently issued from MassMutual's $21.0 billion Global Medium-Term Note Program with approximately $6.0 billion outstanding as of December 31, 2018.

Federal Home Loan Bank of Boston

MassMutual has funding agreements with FHLB Boston in an investment spread strategy, consistent with its other funding agreements. These funding agreements are collateralized by securities with estimated fair values of $1.1 billion as of December 31, 2018. MassMutual's borrowing capacity with FHLB Boston is subject to the lower of the limitation on the pledge of collateral for a loan set forth by law or by MassMutual's internal limit. MassMutual's unused capacity was $896 million as of December 31, 2018. As a member of FHLB Boston, MassMutual held common stock of FHLB Boston with a statement value of $74 million as of December 31, 2018 and December 31, 2017.

Municipal contracts

Municipal Contracts include contracts that contain terms with above market crediting rates. Liabilities for these contracts includes the Municipal Contracts' account values, which are established by contract deposits, increased by interest credited (fixed or floating) and decreased by contract coupon payments, additional withdrawals, maturities and amortization of premium. Certain Municipal Contracts allow additional deposits, subject to restrictions, which are credited based on the rates in the contracts. Contracts have scheduled payment dates and amounts and interest is paid periodically. In addition, certain contracts allow additional withdrawals above and beyond the scheduled payments. These additional withdrawals have certain restrictions on the number per year, minimum dollar amount and are limited to the maximum contract balance. The majority of the Municipal Contracts allow early contract termination under certain conditions.

Certain Municipal Contracts contain make-whole provisions, which document the formula for full contract payout. Certain Municipal Contracts have ratings-based triggers that allow the trustee to declare the entire balance due and payable. Municipal Contracts may also have terms that require MassMutual to post collateral to a third party based on the contract balance in the event of a downgrade in ratings below certain levels under certain circumstances. When the collateral is other than cash, the collateral value is required to be greater than the account balance. MassMutual employs a rigorous asset/liability management process to help mitigate the economic impacts of various liability risks. By performing asset liability management and performing other risk management activities, MassMutual believes that these contract provisions do not create an undue level of operating risk to MassMutual.

The objective of MassMutual's funding agreement program is to leverage MassMutual's financial strength, industry reputation and investment prowess by marketing its existing spread lending products, expanding these offerings into new markets and pursuing new business opportunities, which capitalize on MassMutual's investment and risk management expertise.

INVESTMENT MANAGEMENT

MassMutual's asset management subsidiary provides investment advisory services to MassMutual, its affiliates, and various unaffiliated individual and institutional investors. Barings and its subsidiaries manage fixed income, equity, real estate, and alternative assets for a broad range of global institutional, mutual fund and wealth investors. Among Barings' affiliated clients are MassMutual's general investment accounts and separate accounts, and clients of MassMutual's insurance and retirement businesses. For such accounts, Barings employs investment strategies that seek to yield risk-appropriate returns including corporate credit (investment grade, high yield and emerging markets), ABS, real assets, senior secured loans, mezzanine debt, structured credit, real estate finance, public equity, private placements and private equity.

MassMutual's general account assets continue to grow, reaching approximately $179.2 billion and $170.9 billion as of December 31, 2018 and 2017, respectively. The costs of managing MassMutual's investments are allocated to and are reflected in the financial results of MassMutual businesses that use those investment advisory services.

MassMutual's investment strategy focuses on supporting product liabilities in light of yield, liquidity and diversification considerations. MassMutual investments, which back MassMutual's participating and nonparticipating insurance and pension products and other liabilities, are divided into a number of separate portfolios, each of which is structured to meet the obligations of particular liabilities. The goal of asset/liability management is to structure the risk/reward profile of the asset portfolio in an optimal manner relative to the liabilities. MassMutual uses a wide array of investment instruments to carry out its portfolio management activities. The investment strategies MassMutual uses in managing its separate accounts are generally aimed at maximizing the total rate of return against an agreed upon market benchmark.

REINSURANCE

MassMutual enters into reinsurance agreements with affiliated and unaffiliated insurers in the normal course of business in order to limit its insurance risk. Premium income, benefits to policyholders and policyholders' reserves are stated net of reinsurance. Total premium ceded for the year ended December 31, 2018 was $1.7 billion. MassMutual remains liable to the insured for the payment of benefits if the reinsurer cannot meet its obligations under the reinsurance agreements.

MassMutual participates in automatic reinsurance and facultative reinsurance. Automatic reinsurance is reinsurance in which the ceding company is obligated to cede, and the reinsurer is obligated to assume risks, which meet specific criteria based on the provisions of the reinsurance agreement and the ceding company's underwriting. Facultative reinsurance is reinsurance of individual risks at the option of the reinsurer and the ceding company, whether under a treaty of reinsurance or by negotiation with respect to an individual risk. The reinsurer is free to accept or reject the offerings of the ceding company and the reinsurer may specify its own ratings or terms for the reinsurance. Automatic reinsurance can be ceded to a pool of reinsurers on a quota-share or excess of retention basis. Facultative reinsurance can be ceded for a portion or all the risk, as well as on an excess of retention basis. Quota-share reinsurance is the methodology in which premiums and losses are shared proportionately between the ceding company and the reinsurer. Under quota-share, the same percentage applies to all reinsured policies in a given class of business.

As of December 31, 2018, MassMutual's highest retention limit per life policy issued ranged from $20 million per individual policy to $25 million per survivorship policy. Amounts in excess of MassMutual's retention limits are ceded to reinsurers.

Reinsurance with Affiliates

MassMutual has a stop-loss reinsurance agreement on all of C.M. Life's policies. MassMutual has two coinsurance agreements with C.M. Life whereby MassMutual assumes additional universal life policies sold by C.M. Life. MassMutual has a stop-loss agreement with its indirectly owned unconsolidated subsidiary, MML Bay State, on all of its policies. MassMutual assumes specific plans of insurance on a yearly renewable term ("**YRT**") basis from MML Bay State. There is an automatic quota-share modified coinsurance treaty whereby MassMutual assumes the risk for certain BOLI policies sold by MML Bay State on or before December 31, 2000.

Reinsurance with Unaffiliated Companies

The general approach for reinsurance on new business sold in 2018 was to coinsure term life products or cede under YRT agreements certain whole life, universal life and variable universal life products on a 90% automatic quota share basis. MassMutual ceded certain whole life policies under a 90% coinsurance funds withheld agreement. Similarly, for MassMutual's worksite products, new business is generally ceded on an automatic, quota share YRT basis. MassMutual's recent Individual Health product (LTCi 500-600 series products) was ceded on a 25% YRT basis.

Its Medicare Supplement product was ceded at 90% on a coinsurance basis and its Critical Illness product was ceded at 70% on a coinsurance basis. In addition, MassMutual ceded certain annuity contracts on a 50% coinsurance basis.

For cases where MassMutual's retention is exceeded, MassMutual has an automatic program ceded at 100%. Additionally, there is a facultative program that can be used for excess as well as non-excess standard and substandard business.

MassMutual also maintains several in force closed blocks of automatic quota-share YRT treaties that cover a wide range of in force policies.

MassMutual assumes a portion of the private placement policy risk ceded by an unaffiliated insurer. MassMutual also assumes some traditional life business from unaffiliated reinsurers (this is a very small percentage of all business reinsured).

As of December 31, 2018, one reinsurer accounted for 28% of the outstanding reinsurance recoverable and the next largest reinsurer had 27% of the balance. As of December 31, 2018, one reinsurer accounted for 46% of the total reserve credit and the next largest reinsurer accounted for 22% of the total reserve credit. In 2018, MassMutual strengthened its long-term care policyholders' reserves to reflect the risk inherent in the cash flows of this business. MassMutual continues to monitor its morbidity risk ceded to one unaffiliated reinsurer for its long-term care business. Overall, MassMutual believes that no exposure to a single reinsurer represents an inappropriate concentration of risk to MassMutual, nor is MassMutual's business substantially dependent upon any single reinsurer.

UNCONSOLIDATED SUBSIDIARIES

MassMutual has two primary domestic insurance subsidiaries, C.M. Life, a direct subsidiary, which primarily provides fixed and variable annuities and variable and universal life insurance, and MML Bay State, an indirectly owned subsidiary, which primarily provides variable life insurance. In addition, MassMutual owns MassMutual International LLC, with international insurance operations in Japan and Hong Kong. MassMutual's wholly owned subsidiary, MMHLLC, owns subsidiaries, including OAC and its subsidiaries, and Barings and its subsidiaries.

Summarized below is combined statutory financial information for the unconsolidated domestic life insurance subsidiaries:

	As of and for the Years Ended December 31,	
	2018	**2017**
	($ In Millions)	
Domestic life insurance subsidiaries:		
Total revenue	$ 0.8	$ 0.7
Net income	0.1	0.1
Assets	12.9	13.3
Liabilities	11.2	11.8
Shareholder's equity	1.6	1.6

Summarized below is U.S. GAAP financial information for MMHLLC:

	As of and for the Years Ended December 31,	
	2018	**2017**
	($ In Millions)	
Total revenue	$ 5.3	$ 4.7
Net income	1.0	0.8
Assets	19.1	17.1
Liabilities	8.3	6.6
Equity	10.8	10.5

MMHLLC's U.S. GAAP equity values of $10.8 billion and $10.5 billion consist of its statutory carrying values of $9.3 billion and $9.1 billion as of December 31, 2018 and 2017, respectively, plus the carrying value of MMHLLC that is nonadmitted under SAP. Net investment income is recorded by MassMutual to the extent that dividends are declared by the subsidiaries. For the years ended December 31, 2018 and 2017, MassMutual received $250 million and $425 million of cash dividends from MMHLLC, respectively. Operating results, less dividend distributions, for such subsidiaries are reflected as net unrealized capital gains (losses) in the Statutory Statements of Changes in Surplus. MassMutual held debt issued by MMHLLC and its subsidiaries that amounted to $2.2 billion as of December 31, 2018 and $1.8 billion as of December 31, 2017.

MassMutual does not rely on dividends from its subsidiaries to meet its operating cash flow requirements. For C.M. Life, substantially all of the statutory shareholder's equity of approximately $1.6 billion as of December 31, 2018 was subject to dividend restrictions imposed by state regulations.

Historically, MassMutual has reinvested a substantial portion of its unrestricted earnings in its international insurance subsidiaries operations.

LEGAL PROCEEDINGS

MassMutual is involved in litigation arising in the normal course of business, which seeks compensatory damages, punitive damages and equitable remedies. Although MassMutual is not aware of any actions or allegations that reasonably should give rise to a material adverse impact to MassMutual's financial position or liquidity, the outcome of litigation cannot be foreseen with certainty. It is the opinion of management that the ultimate resolution of these matters will not materially impact MassMutual's financial position or liquidity. However, the outcome of a particular proceeding may be material to MassMutual's results of operations for a particular period depending upon, among other factors, the size of the loss and the level of MassMutual's results of operations for the period.

REGULATION

General. MassMutual is licensed to transact its insurance business in, and is subject to, regulation and supervision by all 50 states of the U.S., the District of Columbia and Puerto Rico. MassMutual and its insurance subsidiaries are licensed, regulated and supervised in all jurisdictions where they conduct insurance business. The extent of such regulation varies. However, most jurisdictions have laws and regulations requiring the licensing of insurers and their agents and setting standards of solvency and business conduct to be maintained by licensed insurance companies, and may regulate withdrawal from certain markets. In addition, statutes and regulations usually require the approval of policy forms and, for certain lines of insurance, the approval of rates. Such statutes and regulations in certain states also prescribe the permitted types and concentration of investments. MassMutual, along with each of its insurance subsidiaries, is required to file detailed annual financial statements with supervisory agencies in each of the jurisdictions in which MassMutual does business. MassMutual's operations and accounts are also subject to examination by such agencies. The primary purpose of this insurance industry regulation is to protect policyholders, not holders of any securities, such as the Notes. MassMutual is also subject to federal and state laws and regulations affecting the conduct of MassMutual's businesses.

State insurance regulatory authorities and other state enforcement agencies may from time to time make inquiries regarding MassMutual's compliance with regulations regarding the conduct of its insurance business. MassMutual endeavors to respond to such inquiries in an appropriate way and to take corrective action if warranted. Based upon regulatory inquiries, which have been made, it is MassMutual's opinion that any regulatory proceedings, which might be initiated following such inquiries are not likely to have a material adverse effect on MassMutual's financial position or results of operations.

From time to time, increased scrutiny has been placed upon the insurance regulatory framework, and a number of state legislatures have considered or enacted legislative measures that alter, and in many cases increase, state authority to regulate insurance companies. In addition to legislative initiatives of this type, the NAIC and insurance regulators are continuously involved in a process of reexamining existing laws and regulations and their application to insurance companies. Furthermore, while the federal government currently does not directly regulate the insurance business, federal legislation and administrative policies in a number of areas, such as employee benefits regulation, age, sex and disability-based discrimination, financial services regulation and federal taxation, can significantly affect the insurance business. In addition, the Dodd-Frank Act established the FIO to monitor the insurance industry and certain lines of business. *See* "—Federal Oversight." It is not possible to predict the future impact of changing regulation on the operations of MassMutual. *See* "Risk Factors—Risk Factors Related to MassMutual, as Provider of the Funding Agreements—MassMutual is subject to extensive regulation and actions of the U.S. Government, Federal Reserve, and other governmental and regulatory bodies that may adversely affect MassMutual."

National Association of Insurance Commissioners. The NAIC is an organization, the mandate of which is to benefit state insurance regulatory authorities and consumers by promulgating model insurance laws and regulations for adoption by the states. The NAIC also provides standardized insurance industry accounting and reporting guidance through its Accounting Practices and Procedures Manual (the "**Accounting Manual**"). However, model insurance laws and regulations are only effective when adopted by the states, and statutory accounting and reporting principles continue to be established by individual state laws, regulations and permitted practices. Changes to the Accounting Manual or modifications by the various state insurance departments may affect the statutory capital and surplus of MassMutual and its U.S. insurance subsidiaries.

Pursuant to its "**Solvency Modernization Initiative**," the NAIC reviewed the U.S. financial regulatory system and all aspects of financial regulation affecting insurance companies. Though broad in scope, the Solvency Modernization Initiative focused on: (1) capital requirements; (2) corporate governance and risk management; (3) group supervision; (4) statutory accounting and financial reporting; and (5) reinsurance. This initiative has resulted in the recent adoption by the NAIC of the Risk Management and Own Risk and Solvency Assessment Model Act (the "**ORSA Model Act**"), which has been enacted by a majority of states and requires insurance companies to assess the adequacy of their and their group's risk management and current and future solvency position. Under the ORSA Model Act, an insurer must undertake an internal risk management review no less often than annually (but also at any time when there are significant changes to the risk profile of the insurer or its insurance group), in accordance with the NAIC's ORSA Guidance Manual, and prepare a summary report ("**ORSA Report**") assessing the adequacy of the insurer's risk management and capital in light of its current and future business plans. The ORSA Report will be filed with a company's lead state regulator and will be available to other domiciliary regulators within the holding company system. The ORSA Model Act must be adopted by the individual states for the new requirements to apply, and specifically in Massachusetts for the changes to apply to MassMutual. Massachusetts is among several states that have substantially adopted the ORSA Model Act. The ORSA Model Act as adopted by Massachusetts became effective on April 1, 2017.

In November 2014, the NAIC adopted the Corporate Governance Annual Disclosure Model Act and Model Regulation (together, the "**Corporate Governance Model Act**"), which requires an insurer to provide an annual disclosure regarding its corporate governance practices to its lead state and/or domestic regulator. As adopted by the NAIC, the requirements of the Corporate Governance Model Act were intended to become effective January 1, 2016, with the first annual disclosure due by June 1, 2016. The Corporate Governance Model Act must be adopted by the individual states for the new requirements to apply, and specifically in Massachusetts for the changes to apply to MassMutual. Massachusetts has not adopted the Corporate Governance Model Act, and MassMutual cannot predict whether Massachusetts may do so in the future; however, the NAIC has made the Corporate Governance Model Act part of its accreditation standards for state solvency regulation, which is likely to motivate states to adopt the Corporate Governance Model Act. MassMutual cannot predict what additional compliance costs these requirements may impose if adopted by Massachusetts in the future.

In addition, in December 2012, the NAIC approved a new valuation manual containing a principles-based approach to life insurance company reserves. Principles-based reserving ("**PBR**") is designed to tailor the reserving process to specific products in an effort to create more precise reserving than the factor-based approach historically employed. PBR became effective on January 1, 2017, after the NAIC's Standard Valuation Law ("**SVL**") was enacted by the requisite number of states representing the required premium volume. Massachusetts has not yet adopted a form of the SVL. MassMutual has up to three years after January 1, 2017 to implement PBR, and has currently elected to defer implementation.

Holding Company Act Regulation. MassMutual is subject to regulation under the insurance holding company act in Massachusetts, its state of domicile. Each of MassMutual's U.S. insurance subsidiaries is subject to similar regulation in their respective states of domicile. These laws vary from jurisdiction to jurisdiction but generally contain certain reporting requirements as well as restrictions on transactions involving an insurer and its subsidiaries and affiliates. Generally, under these laws, transactions between MassMutual and its affiliates must be fair and reasonable and, if material, require prior notice to and approval or non-disapproval from applicable state insurance regulators.

The NAIC has adopted a revised version of the *Model Insurance Holding Company System Regulatory Act* (the "**Amended Holding Company Model Act**"). The Amended Holding Company Model Act introduces the concept of "enterprise risk" within an insurance holding company system and imposes more extensive informational requirements on parents and other affiliates of licensed insurers or reinsurers, with the purpose of protecting the licensed companies from enterprise risk, including requiring an annual enterprise risk report by the ultimate controlling person identifying the material risks within the insurance holding company system that could pose enterprise risk to the licensed companies. An enterprise risk is generally defined as an activity or event involving affiliates of an insurer that could have a material adverse effect on the insurer or the insurer's holding company system. The Amended Holding Company Model Act must be adopted by the individual states for the new requirements to apply. Massachusetts has adopted a form of the Amended Holding Company Model Act.

In December 2014, the NAIC adopted additional amendments to the Amended Holding Company Model Act for consideration by the various states that address the authority of an insurance commissioner to act as the group-wide supervisor for an internationally active insurance group or to acknowledge the authority of another regulatory official, from another jurisdiction, to so act. These changes to the Amended Holding Company Model Act must be enacted by the individual states before they will become effective, and specifically in Massachusetts for the changes to apply to MassMutual. The NAIC is also in the process of developing a U.S. group capital calculation using an RBC aggregation methodology that could eventually be applied to assess the group-level capital of insurance groups. It is not possible to predict with any degree of certainty the additional capital requirements, compliance costs or other burdens these changes may impose if adopted by Massachusetts in the future.

Most states, including Massachusetts, have insurance laws that require regulatory approval of a direct or indirect change of control of an insurer, which would include a change of control of its holding company. Laws such as these prevent any person from acquiring direct or indirect control of MassMutual unless that person has filed a statement with specified information with the Massachusetts Commissioner of Insurance (the "**Commissioner**") and has obtained the Commissioner's prior approval. Under most states' statutes, including Massachusetts', acquiring 10% or more of an interest in an insurance company or its parent company is presumptively considered a change of control, although such presumption may be rebutted. Accordingly, any person who acquires an interest of 10% or more in MassMutual without the prior approval of the Commissioner will be in violation of Massachusetts law and may be subject to injunctive action requiring the disposition or seizure of those securities by the Commissioner or prohibiting the voting of those securities and to other actions determined by the Commissioner. Further, a willful violation of these laws is punishable in Massachusetts as a criminal offense.

Guaranty Funds. All 50 states of the U.S., the District of Columbia and Puerto Rico have insurance guaranty fund laws requiring insurance companies doing business within those jurisdictions to participate in guaranty associations. Guaranty associations are organized to cover, subject to limits, contractual obligations under insurance policies and certificates issued under group insurance policies, issued by impaired or insolvent life insurance companies. These associations levy assessments, up to prescribed limits, on each member insurer doing business in a particular state on the basis of their proportionate share of the premiums written by all member insurers in the lines of business in which the impaired or insolvent insurer is engaged. Some states permit member insurers to recover assessments paid through full or partial premium tax offsets, usually over a period of years. Assessments levied against MassMutual by guaranty associations during each of the past five years have not been material. While MassMutual cannot accurately predict the amount of future assessments, MassMutual believes that assessments with respect to other pending insurance company impairments and insolvencies will not have a material effect on MassMutual's financial position or results of operations.

Statutory Investment Valuation Reserves. Life insurance companies are required to establish an AVR to stabilize statutory contract holder surplus from fluctuations in the market value of investments. The AVR consists of two components: (i) a "default component" for possible credit-related losses on fixed maturity investments and (ii) an "equity component" for possible market-value losses on all types of equity investments, including real estate-related investments. Insurers also are required to establish an IMR for net realized capital gains and losses, net of tax, on fixed maturity investments where such gains and losses are attributable to changes in interest rates, as opposed to credit-related causes. The IMR is required to be amortized into statutory earnings on a basis reflecting the remaining period to maturity of the fixed maturity securities sold. These reserves are required by state insurance regulatory authorities to be established as a liability on a life insurer's statutory financial statements. MassMutual does not believe that the impact of changes in AVR (under current regulations of such reserve requirements) will materially affect MassMutual's ability to increase its statutory capital and surplus and to pay future dividends.

Reserve Sufficiency Analysis. Massachusetts and other states have adopted an NAIC model law and regulation with respect to reserve sufficiency for policyholder reserves and liabilities for deposit-type contracts. Each year MassMutual must submit an opinion of a qualified actuary that states that MassMutual's reserves, when considered in light of the assets held with respect to the reserves, make good and sufficient provision for MassMutual's associated contractual obligations and related expenses. If reserves are viewed as being inadequate, MassMutual must set up additional reserves by moving funds from surplus. As part of MassMutual's 2018 Annual Statement, MassMutual provided an actuarial opinion without qualifications regarding these reserve requirements as of December 31, 2018.

Statutory Examinations. As part of their routine regulatory oversight process, state insurance departments conduct periodic detailed examinations, generally once every three to five years, of the books, records, accounts and operations of insurance companies that are domiciled in their states. Examinations are generally carried out in cooperation with the insurance departments of other, non-domiciliary states under guidelines promulgated by the NAIC. The most recent examination report of MassMutual completed by the Massachusetts Office of Consumer Affairs & Business Regulation, Division of Insurance, was issued in June 2016 for the five-year period ended December 31, 2014. The examination reports are available to the public.

Risk-Based Capital. In order to enhance the regulation of insurers' solvency, the NAIC adopted a model law to implement RBC requirements for life, health and property and casualty insurance and reinsurance companies. All states have adopted the NAIC's model law or a substantively similar law. The NAIC Risk-Based Capital for Insurers Model Act (the "**RBC Model Act**") requires life insurance companies to submit an annual report (the "**RBC Report**"), which compares a company's Total Adjusted Capital to its Authorized Control Level Risk-Based Capital, each such term, as defined pursuant to applicable state law.

RBC is a method of measuring the minimum amount of capital appropriate for an insurance company to support its overall business operations in consideration of its size and risk profile. It provides an elastic means of setting the minimum capital requirement in which the degree of risk taken by the insurer is the primary determinant.

A company calculates RBC by using a specified formula that applies factors to various risks inherent in the insurer's operations, including risks attributable to its assets, underwriting experience, interest rates and other business expenses. The factors are higher for those items deemed to have greater underlying risk and lower for items deemed to have less underlying risk. Then the adequacy of a company's actual capital can be measured by a comparison to its RBC as determined by a formula.

RBC standards are used by regulators to set in motion appropriate regulatory actions relating to insurers that show indications of weak or deteriorating conditions. RBC also provides an additional standard for minimum capital requirements that insurers should meet to avoid being placed in rehabilitation or liquidation. The annual RBC Report, and the information contained therein, is not intended by the NAIC as a means to rank insurers. Broad confidentiality requirements have been imposed on those engaged in the insurance business, including insurers, agents, brokers and others, as to the use and publication of RBC data.

Total Adjusted Capital and RBC are calculated annually by insurers, as of December 31 of each year. As of December 31, 2018, MassMutual's Total Adjusted Capital was significantly in excess of the levels that would prompt regulatory action under Massachusetts law. The calculation of RBC requires certain judgments to be made, and, accordingly, MassMutual's current RBC may be greater or less than the RBC calculated as of any date of determination. In addition, the NAIC has adopted revisions to existing calculations within the RBC Model Act to reflect recent changes to the corporate income tax rate under Public Law No. 115-97.

Annuity Suitability. The NAIC has adopted a revised Suitability in Annuity Transactions Model Regulation ("**SAT**"), which places new responsibilities upon issuing insurance companies with respect to the suitability of annuity sales, including responsibilities for training agents. Many states have already enacted laws and/or regulations based on the SAT. The New York State Department of Financial Services (the "**NYDFS**") recently issued a circular letter emphasizing insurers' obligations under laws and regulations based on SAT when replacing a deferred annuity contract with an immediate contract. The NAIC is also considering amendments to the SAT. As currently proposed, the amendments to the SAT do not adopt a standard that expressly references the "best interest" of the consumer. Rather, the proposed amendments would require a producer (or an insurer where no producer is involved), when making a recommendation to an individual consumer regarding the purchase, exchange or replacement of an annuity, to "act in the interests of the consumer at the time the recommendation is made, without placing the producer's or the insurer's financial interest ahead of the consumer's interests." On July 18, 2018, the NYDFS adopted amendments to its regulation based on SAT incorporating a "best interest" standard with respect to the suitability of life insurance and annuity sales, which amendments take effect on August 1, 2019. Future changes in such laws could adversely impact the way MassMutual markets and sells its annuity and life insurance products.

IRIS Ratios. The NAIC has established the Insurance Regulatory Information System ("**IRIS**"), to assist state insurance departments in their oversight of the financial condition of insurance companies operating in their respective states. IRIS is a series of financial ratios calculated by the NAIC based on financial information submitted by insurers on an annual basis. Each ratio has an established "usual range" of results. The NAIC shares the IRIS ratios calculated for each insurer with the interested state insurance departments. Generally, an insurance company may be subject to regulatory scrutiny and action if its ratios fall outside specified ranges. Neither MassMutual nor any of its U.S. insurance subsidiaries is currently subject to regulatory scrutiny based on their respective IRIS ratios.

Policyholder Dividend Requirements. The Massachusetts insurance law limits the amount of surplus attributable to participating business that a domestic life insurance company may accumulate. MassMutual believes it is in compliance with that limit. MassMutual distributes a portion of its surplus annually in the form of dividends on MassMutual's participating policies in accordance with dividend scales approved annually by MassMutual's board of directors.

Regulation of Investments. MassMutual is subject to state laws and regulations that require diversification of its investment portfolio and limit the amount of investments in certain asset categories such as below investment grade fixed income securities, real estate-related equity, other equity investments and derivatives. Failure to comply with these laws and regulations would cause investments exceeding regulatory limitations to be treated as nonadmitted assets for purposes of measuring statutory surplus, and, in some instances, could require divestiture of such non-qualifying investments. At March 31, 2019, MassMutual believed its investments materially complied with all such laws and regulations.

Consumer Protection Laws. Numerous other federal and state laws also affect MassMutual, including federal and state consumer protection laws. As part of the Dodd-Frank Act, Congress established the Consumer Financial Protection Bureau ("**CFPB**") to supervise and regulate institutions that provide certain financial products and services to consumers. Although the consumer financial services subject to the CFPB's jurisdiction generally exclude insurance business of the kind in which MassMutual engages and the CFPB does not have authority to regulate the non-insurance consumer services MassMutual provides, with permission from DOL**,** the CFPB may exercise limited authority over MassMutual's ERISA-related business. "**ERISA**" refers to the Employee Retirement Income Security Act of 1974, as amended.

Privacy and Data Security Regulation. Federal and state laws and regulations require financial institutions, including insurers, to protect the security and confidentiality of nonpublic personal information, including certain health-related and customer information, and to notify customers and other individuals about their policies and practices relating to their collection and disclosure of health-related and customer information and their practices relating to protecting the security and confidentiality of that information. State laws regulate use and disclosure of social security numbers and federal and state laws require notice to affected individuals, law enforcement, regulators and others if there is a breach of the security of certain non-personal information, including social security numbers. Federal and state laws and regulations regulate the ability of financial institutions to make telemarketing calls and to send unsolicited email or fax messages to consumers and customers.

Federal and state lawmakers and regulatory bodies may be expected to consider additional or more detailed regulation regarding these subjects and the privacy and security of personal information. Furthermore, the issues surrounding data security and the safeguarding of consumers' protected information are under increasing regulatory scrutiny by state and federal regulators, particularly in light of the number and severity of recent U.S. companies' data breaches. The Federal Trade Commission, the Federal Bureau of Investigation, the Federal Communications Commission, the NYDFS, and the NAIC have undertaken various studies, reports, and actions regarding data security for entities under their respective supervision. Some states have recently enacted new insurance laws that require certain regulated entities to implement and maintain comprehensive information security programs to safeguard the personal information of insureds and enrollees. The new cybersecurity regulation published by the NYDFS, which became effective on March 1, 2017, with ongoing compliance deadlines over the next 24 months, and which requires financial institutions regulated by the NYDFS, including MassMutual, to establish a cybersecurity program. The regulation includes specific technical safeguards as well as requirements regarding governance, incident planning, data management, system testing and regulator notification. MassMutual is taking steps to comply with the regulation.

In October 2017, the NAIC adopted a new Insurance Data Security Model Law, which is intended to establish the standards for data security and standards for the investigation and notification of data breaches applicable to insurance licensees in states adopting such law, with provisions that are generally consistent with the NYDFS cybersecurity regulation discussed above. As with all NAIC model laws, this model law must be adopted by a state before becoming law in such state. Massachusetts has not adopted a version of the Insurance Data Security Model Law. The NAIC has also adopted a guidance document that sets forth twelve principles for effective insurance regulation of cybersecurity risks based on similar regulatory guidance adopted by the Securities Industry and Financial Markets Association and the "Roadmap for Cybersecurity Consumer Protections," which describes the protections to which the NAIC believes consumers should be entitled from their insurance companies, agents and other businesses concerning the collection and maintenance of consumers' personal information, as well as what consumers should expect when such information has been involved in a data breach.

Federal Oversight. Although the insurance business in the U.S. is primarily regulated by the states, federal initiatives can affect the businesses of MassMutual and its U.S. insurance subsidiaries in a variety of ways. From time to time, federal measures are proposed which may significantly affect the insurance business. These areas include financial services regulation, securities regulation, derivatives regulation, pension regulation, privacy regulation and taxation. In addition, various forms of direct and indirect federal regulation of insurance have been proposed from time to time, including proposals for the establishment of an optional federal charter for insurance companies.

The Dodd-Frank Act, which affected the most far-reaching overhaul of financial regulation in the U.S. in decades, established the FIO within the Treasury Department. While currently not having a general supervisory or regulatory authority over the business of insurance, the Director of the FIO performs various functions with respect to insurance, including serving as a non-voting member of the FSOC and making recommendations to the FSOC regarding non-bank financial companies to be designated as SIFIs. The Director of the FIO has also submitted reports to Congress regarding (i) how to modernize and improve the system of insurance regulation in the U.S., (ii) the impact of Part II of the Nonadmitted and Reinsurance Reform Act of 2010 and (iii) the global reinsurance market and the regulation of reinsurance. Such reports could ultimately lead to changes in the regulation of insurers and reinsurers in the U.S. Further, on April 21, 2017, President Trump issued an executive memorandum directing the Secretary of the Treasury Department to conduct a review of, and report to the President regarding FSOC processes and imposing a temporary moratorium on non-emergency SIFI determinations and designations pending completion of review and receipt of such report. The requested report, which the Treasury Department published on November 17, 2017, recommends significant changes to FSOC processes for making SIFI determinations and designations. On March 6, 2019, the FSOC issued proposed guidance regarding the designation of nonbank financial companies as SIFIs, to move from an "entity-based" designation approach towards an "activities-based" approach. This approach would eliminate the prior quantitative thresholds for designation as a SIFI in lieu of pursuing designations only if potential risk or threat cannot be addressed through an activities-based approach through the entities primary regulator and the potential risk is one that could be addressed through such designation process. As a result, there is considerable uncertainty as to the future of federal regulation of non-bank SIFIs and, specifically, as to whether MassMutual could be designated a SIFI. If the FSOC were to designate MassMutual as a SIFI, MassMutual would become subject to prudential regulation by the Federal Reserve Board.

The Dodd-Frank Act also authorizes the FIO to assist the Secretary of the Treasury Department in negotiating covered agreements. A covered agreement is an agreement between the U.S. and one or more foreign governments, authorities or regulatory entities, regarding prudential measures with respect to insurance or reinsurance. The FIO is further charged with determining, in accordance with the procedures and standards established under the Dodd-Frank Act, whether state laws are preempted by a covered agreement.

Pursuant to this authority, in September 2017, the U.S. and the European Union signed the EU Covered Agreement. In addition, on December 11, 2018, the Treasury Department and the Office of the U.S. Trade Representative announced their intent to sign the UK Covered Agreement. U.S. state regulators have sixty months, or five years from the date of the signing of the EU Covered Agreement, to adopt reinsurance reforms removing reinsurance collateral requirements for EU and UK reinsurers that meet the prescribed minimum conditions set forth in the applicable EU Covered Agreement or UK Covered Agreement or else state laws imposing such reinsurance collateral requirements may be subject to federal preemption. The NAIC is currently working to adopt amendments to the Credit for Reinsurance Model Law and Regulation to conform to the requirements of the EU Covered Agreement and UK Covered Agreement. The reinsurance collateral provisions of the EU Covered Agreement and UK Covered Agreement may increase competition, in particular with respect to pricing for reinsurance transactions, by lowering the cost at which competitors are able to provide reinsurance to U.S. insurers. MassMutual cannot predict what impact, if any, the EU Covered Agreement or UK Covered Agreement or their implementation could have on the business, results of operations and financial condition of MassMutual.

The Dodd-Frank Act also includes provisions that may affect the investments and investment activities of MassMutual and its affiliates, including the federal regulation of such activities, and the full impact of the Dodd-Frank Act on such activities remains unclear. Changes in general political, economic or market conditions, including as a result of the recent U.S. presidential and congressional elections, could affect the scope, timing and final implementation of the Dodd-Frank Act. MassMutual cannot predict if or when future legislation or administrative guidance will be enacted or issued or what impact any changing regulation may have on the operations of MassMutual.

International Oversight. The International Association of Insurance Supervisors ("**IAIS**") is an organization of insurance regulators with members from 140 countries representing over 95% of insurance premiums across the world. While the IAIS is not itself a regulator, it establishes standards which member countries can apply. The G-20's Financial Stability Board had directed the IAIS to develop a work plan to develop a "comprehensive, group-wide supervisory and regulatory framework" for Internationally Active Insurance Groups ("**IAIGs**"), including a "quantitative capital standard." By the end of 2019, the IAIS aims to adopt a risk-based global insurance capital standard ("**ICS**") that will apply for all large internationally active insurance groups for inclusion in the IAIS's Common Framework for the Supervision of IAIGs ("**ComFrame**"). ComFrame is an international framework for integrated and multilateral group-wide supervision, which builds on the IAIS Insurance Core Principles that apply to all insurers and insurance groups, but contains requirements for supervisors that are intended to result in greater cooperation and coordination for IAIGs. MassMutual has been designated as an IAIG. In November 2017, the IAIS announced a plan to introduce the ICS in two phases – a five-year monitoring phase followed by an implementation phase in 2025 as a group-wide prescribed capital standard. The IAIS expects to finalize ComFrame by 2019; however, it is unclear how ComFrame will be adopted in and implemented by individual countries.

Federal Income Taxation. Under the Internal Revenue Code of 1986 (the "**Code**"), MassMutual is taxed on its life insurance taxable income. MassMutual's taxable income differs from the income reported on its financial statements due to temporary differences, such as reserves and policy acquisition costs, and certain permanent differences, such as tax credits. As a result, the Company's effective tax rate differs from the federal statutory tax rate. In addition, existing federal laws and regulations affect the taxation of life insurance, annuity, retirement, and investment products, which in turn affect the holders of those products, and the relative desirability of various insurance and investment vehicles.

Congress has from time to time considered proposals that, if enacted, would have had an adverse effect on the federal income tax treatment of MassMutual or of certain insurance, annuity, retirement or investment products offered by MassMutual. If these proposals had been adopted, they would have adversely affected MassMutual's ability to sell such products and could have resulted in the surrender of existing contracts and policies. MassMutual cannot predict whether future legislation or administrative guidance will be enacted or issued or, if so, will contain provisions that would adversely alter the tax treatment of these or other products.

Securities Laws. MassMutual, along with certain of its subsidiaries and certain policies and contracts offered by them, are subject to various levels of regulation under the federal and state securities laws. Several of MassMutual's direct and indirect subsidiaries, are investment advisers registered under the Investment Advisers Act of 1940. MassMutual's investment adviser subsidiaries include:

- MML Investment Advisers, LLC
- MMLIS
- MMLISI Financial Alliances, LLC
- Tremont Partners, Inc. (no longer engaged in managing new business)
- Barings, Barings Global Advisors Limited and Baring International Investment Limited

In addition, certain of MassMutual's separate accounts and other pooled investment vehicles and a variety of mutual funds advised by MassMutual's subsidiaries are registered under the Investment Company Act. These include, but are not limited to:

- MML Series Investment Fund
- MML Series Investment Fund II
- MassMutual Premier Funds
- MassMutual Select Funds
- Barings Corporate Investors
- Barings Participation Investors
- Barings Global Short Duration High Yield Fund
- Barings Funds Trust

Certain insurance and annuity contracts issued by MassMutual, MML Bay State and C.M. Life are registered under the Securities Act.

MMLIS, MSD, MMLD, OFDI, Barings Securities LLC and other direct and indirect subsidiaries, are registered as broker-dealers under the Securities Exchange Act of 1934 and are members of the Financial Industry Regulatory Authority.

These laws and regulations are primarily intended to promote investor protection and market integrity, including the enforcement of certain of the federal securities laws, and generally grant supervisory agencies broad administrative powers, including the power to limit or restrict the carrying on of business for failure to comply with such laws and regulations. MassMutual and its subsidiaries may also be subject to similar laws and regulations in the states and foreign countries in which MassMutual or its subsidiaries engage in securities or securities-related activities.

Regulation of OTC Derivatives. Title VII of the Dodd-Frank Act creates a comprehensive framework for the federal oversight and regulation of the over-the-counter ("**OTC**") derivatives market and entities, such as MassMutual, that participate in the market and requires the Commodities Futures Trading Commission (the "**CFTC**") and the Securities and Exchange Commission (the "**SEC**")to promulgate rules and regulations implementing its provisions. Regulations have been finalized and implemented in many areas and are being finalized for implementation in others. The Dodd-Frank Act and regulations thereunder could significantly increase the cost of OTC derivatives, reduce the availability of derivatives to protect against risks and increase MassMutual's exposure to both market and credit risk.

The Dodd-Frank Act divides the regulatory responsibility for swaps in the U.S. between the SEC and CFTC. The CFTC regulates swaps and swap entities, and the SEC regulates security-based swaps and security based swap entities. The CFTC and SEC have jointly finalized certain regulations under the Dodd-Frank Act, including critical rulemakings on the definitions of "swap," "security-based swap," "swap dealer," "security-based swap dealer," "major swap participant" and "major security-based swap participant." In addition, the CFTC has substantially finalized its required rulemaking under the Dodd-Frank Act, including regulations relating to registration and regulation of swap dealers and major swap participants, reporting, recordkeeping, mandatory clearing, mandatory margin for uncleared swaps and mandatory on-facility trade execution. The SEC has yet to finalize many of its similar regulations that would apply to security-based swaps and security-based swap market participants, including registration of security-based swap dealers and major security-based swap participants. As a result of this regulatory bifurcation and the different pace at which the agencies have promulgated regulations, different transactions are subject to different levels of regulation. In addition, because the CFTC has not yet finalized all of its regulations with respect to swaps, the SEC has yet to finalize many of its regulations with respect to security-based swaps and because regulations that have been finalized may change or be subject to relief with respect to certain market participants, it is not possible to predict with certainty the full effect of the Dodd-Frank Act on MassMutual or the timing of such effects.

The Dodd-Frank Act and the CFTC rules thereunder currently require MassMutual, in connection with certain swap transactions, to comply with mandatory clearing and on-facility trade execution requirements, and it is anticipated that the types of swaps subject to these requirements will be expanded over time. In addition, MassMutual is now subject to mandatory minimum margin requirements for uncleared swap transactions. These requirements have increased the cost of risk mitigation and could have other material adverse effects on MassMutual's business. For example, increased margin requirements, combined with restrictions on assets that qualify as eligible collateral, could reduce MassMutual's liquidity and require increased holdings of cash and liquid assets with lower yields causing a reduction in income. In addition, the requirement that certain trades be centrally cleared through clearinghouses concentrates counterparty risk in both clearinghouses and clearing members. The failure of a clearinghouse or a clearinghouse member could have a significant impact on the financial system. Even if a clearinghouse itself does not fail, large losses caused by the default of a single clearing member could force significant capital calls on the remaining clearinghouse members during a financial crisis, which could then lead other clearinghouse members to default. Because the regulations and relationships surrounding clearinghouses and their members are still developing and the related bankruptcy process is untested, it is difficult to speculate as to the actual risks related to the default of a clearinghouse or a clearinghouse member.

In addition to the enumerated regulations under the Dodd-Frank Act, regulations upon other participants in the derivatives markets are increasing as well. Capital requirements on dealers, clearing members and clearinghouses are fundamentally altering the willingness of certain participants to engage in clearing or trading, the prices at which such products or services are available and the nature of products themselves. Such changes may have additive effects on the derivatives markets that may limit MassMutual's ability to hedge its liabilities using derivatives or drive up the cost of such hedging.

Environmental Considerations. As an owner and operator of real property, MassMutual is subject to extensive federal, state and local environmental laws and regulations. Inherent in such ownership and operation is the risk that there may be potential environmental liabilities and costs in connection with any required remediation of such properties. MassMutual routinely conducts environmental assessments for real estate MassMutual is acquiring for investment and before taking title to real property through collateralized mortgages MassMutual holds. Based on these environmental assessments and compliance with MassMutual's internal environmental procedures, MassMutual believes that any costs associated with compliance with environmental laws and regulations or any remediation of such properties would not have a material adverse effect on MassMutual's financial position or results of operations.

MassMutual, and certain of its subsidiaries, hold equity stakes in entities that could potentially be subject to environmental liabilities. MassMutual believes, based on its assessment of the businesses and properties of these entities and MassMutual's level of involvement in the operation and management of such entities, MassMutual would not be subject to any material environmental liabilities with respect to these investments. However, unexpected environmental liabilities can arise.

ERISA Considerations. To the extent MassMutual acts as a fiduciary for employee benefit plans governed by ERISA, MassMutual is subject to regulation by the DOL. MassMutual's fiduciary responsibilities with respect to customers' benefit plans are generally limited to the management of certain of MassMutual's separate investment accounts in which the plans invest. ERISA restricts the activities of a fiduciary of an employee benefit plan covered by ERISA, including as an investment manager or advisor with respect to the plan's assets. MassMutual believes it has complied with and intends to continue to comply with all statutory and regulatory requirements applicable to it as a fiduciary of plans subject to ERISA.

PROPERTIES

MassMutual owns eight buildings located in Springfield, Massachusetts on approximately 100 acres, comprising MassMutual's North Campus office complex. MassMutual occupies all of the approximately 1.4 million square feet of gross building area in such buildings. MassMutual also owns buildings in Chicopee, Massachusetts, the site of the MassMutual Learning and Conference Center and a 66-acre corporate office park in Enfield, Connecticut.

MassMutual has approximately 225 leases of office space for its agency and corporate operations. Such leases typically have terms of three to ten years with renewal options. MassMutual's annual rental obligations under these leases aggregated approximately $92 million at December 31, 2018.

MassMutual believes that such owned and leased properties are suitable and adequate for its current business operations.

AGENTS

As of December 31, 2018, approximately 8,900 financial advisors are contracted to sell MassMutual's products in 87 agencies across the U.S. and Puerto Rico. Such independently contracted agents are not employees of MassMutual.

None of MassMutual's employees are represented by a labor union. MassMutual believes that its employee relations are generally good.

DIRECTORS OF MASSMUTUAL

Set forth below is information regarding the directors and executive officers of MassMutual, all with a business address of 1295 State Street, Springfield, Massachusetts 01111.

Directors

Name	**Title**	**Since**
Karen H. Bechtel	Director	2016
Mark T. Bertolini	Director	2015
Kathleen A. Corbet	Director	2008
Roger W. Crandall	Chairman of the Board and Chief Executive Officer	2010
	Director and President	2008
James H. DeGraffenreidt, Jr.	Director	2002
Robert A. Essner	Director	2002
Isabella D. Goren	Director	2014
Jeffrey M. Leiden	Director	2015
Laura J. Sen	Director	2012
William T. Spitz	Director	2007
H. Todd Stitzer	Lead Director	2018

Karen H. Bechtel

The Carlyle Group
Senior Advisor (2018 – Present)
Managing Director (2005 – 2018)
Co-head of Global Healthcare (2015)
Founding Group Head and Head of Global Healthcare (2007 – 2015)

Morgan Stanley & Co.
Managing Director, Private Equity Group (1977 – 2005)

Mark T. Bertolini

Aetna, Inc.
Chairman (2011 – Present)
Chief Executive Officer (2010 – Present)
President (2007 – 2014)
Executive Vice President (2006 – 2007)
Senior Vice President (1999 – 2006)

Kathleen A. Corbet

Municipal Enterprise Solutions, LLC
Co-Founder and Principal (2012 – 2013)

Cross Ridge Capital, LLC
Founder and Principal (2008 – Present)

Standard & Poor's
President (2004 – 2007)

Alliance Bernstein
Chief Executive Officer of Alliance Capital Management Fixed Income Division (1983 – 2004)

Roger W. Crandall

MassMutual
Chairman, President and Chief Executive Officer (2010-Present)
President (2008 – present)
Executive Vice President, Chief Investment Officer and Co-Chief Operating Officer (2007 – 2008)
Executive Vice President and Chief Investment Officer (2005 – 2007)

James H. DeGraffenreidt, Jr.	**WGL Holdings, Inc.** Chairman and Chief Executive Officer (2001 – 2009) **Washington Gas Light Company** Chairman, President and Chief Executive Officer (2000 – 2001) Chairman and Chief Executive Officer (1998 – 2000)
Isabella D. Goren	**AMR Corporation** Chief Financial Officer (2010 – 2013) Director, Investor Relations (1992 – 1996) **American Airlines (subsidiary of AMR)** Chief Financial Officer (2010 – 2013) Senior Vice President Customer Relationship Marketing (2006 – 2010) Vice President of Interactive Marketing (2003 – 2006) Vice President Customer Service Planning (1998 – 2003) **AMR Services (subsidiary of AMR)** President (1996 – 1998)
Jeffrey M. Leiden, M.D., Ph.D.	**Vertex Pharmaceuticals, Inc.** Chairman, President and Chief Executive Officer (2012 – Present) Director (2009 – Present) **Clarus Ventures, LLC** Managing Director (2006 – 2012)
Laura J. Sen	**BJ's Wholesale Club, Inc.** Non-Executive Chairman and Director (2016 – Present) Director and Chief Executive Officer (2009 –2016) Director, President and Chief Operating Officer (2009 – 2015) Director and President (2008 – 2015) **Sen Retail Consulting** Principal (2003 – 2006)
William T. Spitz	**Vanderbilt University** Vice Chancellor for Investments Emeritus (2007 – 2009) Vice Chancellor & Chief Investment Officer (1985 – 2007) **Diversified Trust Company** Principal (2009 – Present) Co-Founder and Director (1995 – Present)
H. Todd Stitzer	**Cadbury PLC** Chief Executive Officer and Director (2008 – 2010) **Cadbury Schweppes PLC** Chief Executive Officer and Director (2003 – 2008) Deputy Chief Executive Officer (2002 – 2003) Chief Strategy Officer and Executive Director (2000 – 2002)

The above-named members of the board of directors are required to adhere to MassMutual's Code of Business Conduct and Ethics for Directors, under which they agree to avoid conflicts of interest and, to the extent possible, even appearances of conflicts of interest between themselves and MassMutual. There are no conflicts of interest between the private duties of the directors and their duties as directors of MassMutual.

Executive Leadership Team

Roger Crandall	MassMutual (*see* biography in "Directors of MassMutual" above)

Sue Cicco	**MassMutual** Chief Human Resources & Communications Officer (2017 – Present) Chief of Staff & Head of Strategic Communications (2014 – 2017) Chief of Staff for Chairman, President & CEO (2012 – 2017) Vice President & Head of Internal Communications (2009 – 2012)
M. Timothy Corbett	**MassMutual** Executive Vice President and Chief Investment Officer (2011 – Present) **Connecticut State Pension Funds** Chief Investment Officer (2009 – 2011)
Geoffrey Craddock	**MassMutual** Chief Risk Officer (2017 – Present) **Oppenheimer Funds, Inc.** Executive Vice President and Chief Risk Officer (2008-2017)
Michael R. Fanning	**MassMutual** Executive Vice President and Head of MassMutual U.S. (2008 – Present) Senior Vice President (2006 – 2008)
Pia Flanagan	**MassMutual** Chief of Staff for CEO (2017 – Present) Corporate Secretary (2014 – 2018)
Michael O'Connor	**MassMutual** General Counsel (2017 – Present) Senior Vice President, PCG Integration (2016 – 2017) President & Chief Executive Officer, MassMutual International LLC (2013 – 2016) Senior Vice President, Corporate Development (2012 – 2016)
Gareth Ross	**MassMutual** Chief Digital & Customer Experience Officer (2015 – Present) Vice President (2008 – 2015) **Capmark Financial** Senior Vice President (2006 – 2008) **General Motors** Treasury Analyst (2004 – 2006)
Elizabeth A. Ward	**MassMutual** Chief Financial Officer and Chief Actuary(2016 – Present) Executive Vice President, Chief Enterprise Risk Officer and Chief Actuary (2015 – 2016) Executive Vice President and Chief Enterprise Risk Officer(2011 – 2015) Senior Vice President and Chief Enterprise Risk Officer (2007 – 2011)

The above-named members of the Executive Leadership Team are required to adhere to MassMutual's Code of Business Conduct and Ethics, under which they agree to avoid conflicts of interest and, to the extent possible, even appearances of conflicts of interest between themselves and MassMutual. There are no conflicts of interest between the private duties of the Executive Leaders and their duties as Executive Leaders of MassMutual.

MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

The discussion below is prepared in conformity with SAP of the NAIC and the accounting practices prescribed or permitted by the Massachusetts Division. See "Financial and Accounting Matters – Summary of Principal Differences Between SAP and U.S. GAAP."

General

Management's Discussion and Analysis of the 2018 Financial Condition and Results of Operations should be read in conjunction with the Statutory Financial Statements and "Selected Historical Statutory Financial Information of MassMutual," each of which is included elsewhere in this Offering Memorandum. This Management's Discussion and Analysis of Financial Condition and Results of Operations reviews the financial condition of MassMutual at March 31, 2019 and at December 31, 2018 and 2017, MassMutual's results of operations for the three months ended March 31, 2019 and 2018 and for the two year period ended December 31, 2018 and 2017 and, where appropriate, factors that may affect MassMutual's future financial performance.

Forward-Looking Information

Certain information contained in this discussion is or may be considered forward-looking. Forward-looking statements are those not based on historical information, but rather, relate to future operations, strategies, financial results or other developments, and contain terms such as "may," "expects," "should," "believes," "anticipates," "intends," "estimates," "projects," "goals," "objectives" or similar expressions.

Forward-looking statements are based upon estimates and assumptions. These statements may change due to business uncertainties, economic uncertainties, competitive uncertainties, and other factors, many of which are beyond MassMutual's control. Additionally, MassMutual's business decisions are also subject to change. MassMutual does not publicly update or revise any forward-looking statements as a result of new information, future developments or otherwise except as may be required by law.

Basis of Presentation

The preparation of financial statements requires management to make estimates and assumptions that impact the reported amounts of assets and liabilities, the disclosure of assets and liabilities as of the date of the statutory financial statements and the reported amounts of revenues and expenses during the reporting periods. The most significant estimates include those used in determining the carrying values of investments including the amount of mortgage loan investment valuation reserves, OTTI, the value of the investment in MMHLLC, the liabilities for policyholders' reserves, the determination of admissible DTAs, the liability for taxes and the liability for litigation contingencies. Future events including, but not limited to, changes in the level of mortality, morbidity, interest rates, persistency, asset valuations and defaults could cause results to differ from the estimates used in the statutory financial statements. Although some variability is inherent in these estimates, management believes the amounts presented are appropriate.

Overview

MassMutual is a mutual life insurance company organized in the Commonwealth of Massachusetts as a corporation and was chartered on May 15, 1851. MassMutual's primary business is ordinary life insurance. In addition to ordinary life insurance, MassMutual also provides, directly or through MassMutual's subsidiaries, a wide range of annuity and disability insurance products, retirement plans, medical supplemental products and other pension-related products and services, and investment products and services to individuals, corporations and other institutions in all 50 states of the U.S. and the District of Columbia and Puerto Rico.

MassMutual is a growth-oriented, diversified financial services company that seeks to provide superior value for policyholders and other customers by achieving exceptional results. MassMutual's mission is to help its customers secure their future and protect the ones they love. MassMutual is committed to be the best company in the industry based on superior financial strength, high dividends and delivering a high quality customer experience.

MassMutual aims to accomplish this by developing and distributing a broad and superior portfolio of innovative financial solutions and services and maintaining prudent underwriting standards, strong retention, rigorous expense control, and sophisticated asset/liability management with a continued commitment to high credit quality.

MassMutual's domestic operations provide a broad set of comprehensive financial solutions to more than five million customers using a variety of channels to meet the protection, accumulation, investment and income needs of individuals, small businesses and institutions. Offerings include a wide variety of life insurance, disability income insurance, long term care insurance, annuities, retirement plans and other institutional funding and protection vehicles, as well as broker-dealer and trust services.

For institutions, MassMutual provides products and services for defined benefit, defined contribution, nonqualified deferred compensation plans, IO solutions and PRTs, as well as a full suite of worksite insurance solutions, such as bank-owned life insurance ("**BOLI**") and corporate-owned life insurance ("**COLI**"), executive group carve out life insurance products, multi-life disability income, group universal life insurance, group whole life insurance and medical supplemental products.

MassMutual also offers specialized institutional investment products currently consisting of funding agreements for domestic and international investors.

In November 2018, MMI completed the sale of MM Asia, a wholly owned Hong Kong based life insurance and wealth management subsidiary, to Yunfeng FG and several Asia-based investors. Under the terms of the agreement, MMI received $1.0 billion in cash and 800 million shares of Yunfeng FG, which represented approximately 24.8% ownership at the time of the closing. In turn, as at the time of closing, Yunfeng FG held a 60% ownership interest in MM Asia and the other investors owned the remainder. The transaction was initially announced in November 2017.

In March 2018, MassMutual and MMI entered into an agreement to sell 85.1% of MassMutual Japan, a wholly-owned life insurance and wealth management subsidiary of MMI, to Nippon. MMI estimated the fair value of the retained portion of MassMutual Japan based upon an internal valuation model. The sale of MassMutual Japan closed in May 2018. MMI received $960 million in cash proceeds from the sale.

The amount of the proceeds from the sale of MassMutual Japan and MM Asia was less than MMI's book value. As such, MMI's book value was reduced to an estimated fair value of $2.7 billion and an impairment of $1.3 billion was recorded in net realized capital gains (losses).

In October 2018, MassMutual announced a strategic transaction in which Invesco, a global asset manager, acquired MassMutual's retail asset management affiliate, OFI. In turn, MassMutual received an approximate 15.7% common equity interest in the combined company. Under the terms of the agreement, MassMutual and OFI employee shareholders received approximately 81.8 million of Invesco common shares and $4.0 billion in perpetual, non-cumulative preference shares with a fixed cash dividend rate of 5.9%. As part of this transaction, Invesco and MassMutual entered into a shareholder agreement pursuant to which MassMutual has customary minority shareholder rights, including the appointment of a director to Invesco's board of directors. The pre-tax impact of this sale was an increase in MassMutual's surplus of $4.4 billion. The transaction closed on May 24, 2019.

During the second quarter of 2018, MassMutual evaluated the accounting for payout annuities and determined that certain contracts did not contain mortality risk and, therefore, should have been classified as a deposit-type contract rather than policyholder reserves. As a result, approximately $1.3 billion classified as policyholders' reserves as of December 31, 2017 were classified as liabilities for deposit-type contracts in 2018. Additionally, the related impacts within MassMutual's Statutory Statements of Operations and Statements of Cash Flows reflect this classification. There were no corresponding differences in valuation, and as a result, there were no impacts to surplus or net income.

Effective December 31, 2017, MassMutual entered into a reinsurance agreement with a third-party, authorized reinsurer to reinsure certain inforce universal life policies. The agreement is structured as a combination of 90% coinsurance funds withheld on certain universal life policies and 40% yearly renewable term on certain other universal life policies. MassMutual maintains responsibility for servicing the policies and managing the assets. Under the terms of the agreement, at December 31, 2017, MassMutual ceded policyholder reserves of $4.0 billion and recorded a liability for funds held under coinsurance of $4.0 billion on its Statutory Statement of Financial Position and ceded premium of $4.0 billion and reduced changes in policyholder reserves of $4.0 billion in its Statutory Statements of Operations.

For the year ended December 31, 2018, statutory net loss was $821 million and net gain from operations was $223 million. As of December 31, 2018, MassMutual had $179.2 billion in statutory assets excluding separate accounts, $243.6 billion in total statutory assets, 2.5 million individual policies in force and $685 billion of life insurance in force. MassMutual's total adjusted capital, as defined by the NAIC, was $19.9 billion as of December 31, 2018 compared to $17.4 billion as of December 31, 2017.

The following table sets forth the calculation of total adjusted capital:

	December 31,	
	2018	2017
	(In Millions)	
Surplus (1)	$ 15,610	$ 15,705
AVR (2)	3,414	3,309
One-half of the apportioned dividend liability (2)	852	796
Foreign insurance subsidiaries deduction	-	(2,382)
Total adjusted capital (3)	**$ 19,876**	**$ 17,428**

(1) *Surplus as of December 31, 2018 includes surplus notes with a carrying value of $2,268 million, comprised of the following surplus notes at face value issued and outstanding: $250 million of surplus notes maturing in 2023, $100 million of surplus notes maturing in 2024, $250 million of surplus notes maturing in 2033, $310 million of surplus notes maturing in 2039, $400 million of surplus notes maturing in 2041, $500 million of surplus notes maturing in 2065 and $475 million of surplus notes maturing in 2077.*

(2) *Consolidated for MassMutual, C.M. Life Insurance Company and MML Bay State Life Insurance Company.*

(3) *Defined by the NAIC as surplus plus the AVR, one-half of the consolidated apportioned dividend liability and a deduction for applicable foreign insurance subsidiaries.*

As of December 31, 2018, there were no significant statutory or regulatory issues that would impair MassMutual's financial position or liquidity, but there can be no assurance that such issues will not arise in the future. To the best of management's knowledge, MassMutual is not included on any regulatory or similar "watch list."

Business of MassMutual

MassMutual offers products and services primarily through MMFA, Direct to Consumer, Institutional Solutions and Workplace Solutions distribution channels.

MMFA is a sales force that operates in the U.S. via 8,892 financial advisors. MMFA sells individual life ("**Life**"), individual annuities and disability insurance. MassMutual's Direct to Consumer distribution channel sells Life primarily through direct response television advertising, digital media, search engine optimization and search engine marketing. MassMutual's Institutional Solutions distribution channel sells group annuities, group life and guaranteed interest contracts primarily through retirement advisory firms, actuarial consulting firms, investment banks, insurance benefit advisors and investment management companies. MassMutual's Workplace Solutions distribution channel sells group annuities as well as individual and group life products distributed through investment advisors.

Life provides a broad range of products designed to meet a variety of needs, including death benefit protection, wealth transfer, income replacement, cash value accumulation, supplemental retirement and estate and business planning. MassMutual's Life products encompass whole life insurance, universal life insurance, variable life insurance and term life insurance. Participating life products with level premium are available. MassMutual's term products are designed to offer consumers competitive prices, convertibility options, and the peace of mind of doing business with a financially strong company. One key feature of some of MassMutual's term products is the option to convert to a permanent MassMutual life insurance product in future years.

Disability Income offers a wide range of products to provide income protection to match clients' unique and changing needs. Products are sold in the individual and small business markets.

Long Term Care offers products associated with long term care services for chronically ill individuals. Products are sold to individual and multi-life customers.

Annuity employs a full product suite to develop flexible, customized and efficient solutions for MassMutual's customers' retirement needs for asset accumulation, easy access to funds and a guaranteed income stream. The current annuity product suite includes both fixed and variable deferred annuities as well as income annuities.

MassMutual's fixed deferred annuity products are used for accumulation and access needs. They are sold both through the career agency system and on a retail basis.

MassMutual also offers a single premium immediate annuity, sold both through its career agency system and on a retail basis, which provides a guaranteed income stream that cannot be outlived.

Finally, MassMutual offers variable annuity products to meet asset accumulation needs. These products are sold with GMDBs and offer an optional living benefit to protect the principal investment. This living benefit option is a GMAB and provides the annuity contract holder with a guaranteed minimum account value at the end of the guarantee period. MassMutual hedges its variable annuity guarantees using a variety of derivatives managing both its equity market and interest rate exposures on a dynamic basis.

Workplace Solutions and Institutional Solutions offers group annuities, retirement products and services for 401(a) defined benefit plans, defined contribution plans (including 401(k), 403(b) and similar plans) and nonqualified plans for corporate, union, nonprofit and professional employer organizations across the U.S., as well as individual retirement accounts for participants terminating those plans. Additionally, it consists of Institutional Insurance, which markets BOLI and COLI products, and MassMutual@Work Employee Insurance, which markets disability income insurance, executive group life insurance and whole life insurance, as well as the Program.

Funding Agreements are specialized, institutional investment products for domestic and international institutional investors.

Financial Strength Ratings

As of December 31, 2018, MassMutual's financial strength ratings were A++ (Superior, highest rating) from A.M. Best Company, AA+ (Very Strong, second highest rating) from Fitch Ratings, Aa2 rating under review for downgrade (Excellent, third highest rating) from Moody's Investors Service, and AA+ (Very Strong, second highest rating) from Standard & Poor's. On May 28, 2019, Moody's revised MassMutual's rating downward to Aa3 (High Quality, fourth highest rating) with a stable outlook. While noting that MassMutual's financial profile remains strong, Moody's indicated as part of its rationale that MassMutual's updated rating better aligns MassMutual's rating with its peers in terms of profitability, capital adequacy, liquidity and financial flexibility. Each rating agency independently assigns ratings based on its own separate review and takes into account a variety of factors in making its decision. Ratings are subject to change and there can be no assurance of the ratings that will be afforded to MassMutual in the future.

Financial strength ratings are based upon an independent review of MassMutual and its domestic insurance subsidiaries and that of the industry in which MassMutual operates. As of December 31, 2018, MassMutual had one group life insurance contract, certain Municipal Contracts pertaining to an assumed reinsurance agreement with an unaffiliated company and a commercial paper program that contained rating triggers. A rating trigger refers to a clause in MassMutual's contracts requiring action by MassMutual or resulting in financial consequences in the event of a downgrade of its financial strength rating below a specified level.

Financial strength rating triggers pertaining to the group life insurance contract requires MassMutual to pursue the transfer of the risks of this contract to another company if MassMutual's rating were downgraded to "BBB" or its equivalent or below by Standard & Poor's, or "Baa2"or its equivalent or below by Moody's Investors Service.

Financial strength rating triggers on certain Municipal Contracts allow the trustee to declare the entire balance due and payable. Municipal Contracts may also have terms that require MassMutual to post collateral to a third party based on the contract balance in the event of a downgrade in ratings below certain levels under certain circumstances. When the collateral is other than cash, the collateral value is required to be greater than the account balance. MassMutual employs a rigorous asset/liability management process to help mitigate the economic impacts of various liability risks. By performing asset liability management and performing other risk management activities, MassMutual believes that these contract provisions do not create an undue level of operating risk.

Financial strength rating triggers pertaining to an assumed reinsurance agreement with an unaffiliated company may occur if: (a) MassMutual's RBCs ratio falls below 300% as of a quarter-end and MassMutual has not cured such shortfall as of the applicable RBC reporting deadline; provided, that in the event there is a material change in the factors and formulae prescribed by the insurance regulatory authority in MassMutual's state of domicile with respect to the components of and methodologies contained in such calculation; or (b) the financial strength rating of MassMutual falls below "BBB" as rated by Standard & Poor's and "Baa2" as rated by Moody's Investors Service.

Financial strength rating triggers pertaining to MassMutual's commercial paper program has the top rating from both Standard & Poor's (A1+) and Moody's (P1). The program is supported by a $1.0 billion bank credit facility expiring in December 2023. If MassMutual's financial strength ratings fall to AA- (Standard & Poor's) and Aa3 (Moody's), MassMutual will incur additional bank costs related to its bank credit facility.

Interim Update for the Three Months Ended March 31, 2019

The unaudited statements of operations and statements of financial position data of MassMutual for the three months ended March 31, 2019 and March 31, 2018, and as of March 31, 2019, respectively, presented below should be read in conjunction with, and is qualified in its entirety by reference to, the Statutory Financial Statements, Notes to Statutory Financial Statements, "Management's Discussion and Analysis of Financial Condition and Results of Operations - Analysis of Results of Operations – For the Years Ended December 31, 2018, 2017 and 2016" and "Management's Discussion and Analysis of Financial Condition and Results of Operations - Statement of Financial Position at December 31, 2018 compared to December 31, 2017," in each case, included elsewhere in this Offering Memorandum and the Quarterly Statement that is included elsewhere in this Offering Memorandum.

Analysis of Results of Operations – For the Three Months Ended March 31, 2019 Compared to the Three Months Ended March 31, 2018

The following table sets forth the components of MassMutual's statement of operations for the periods presented:

	Three Months Ended March 31,		
	2019	2018	% Change
	(unaudited)	(unaudited)	
	($ In Millions)		
Revenue:			
Premium income	$ 4,927	$ 6,001	(18)%
Net investment income	1,681	1,735	(3)
Fees and other income	336	159	111
Total revenue	6,944	7,895	(12)
Benefits and expenses:			
Policyholders' benefits	5,613	5,933	(5)
Change in policyholders' reserves	242	1,190	(80)
Change in group annuity reserves assumed	(223)	(458)	51
General insurance expenses	559	565	(1)
Commissions	258	257	-
State taxes, licenses and fees	78	68	15
Total benefits and expenses	6,527	7,555	(14)
Net gain from operations before dividends and federal income taxes	417	340	23
Dividends to policyholders	393	364	8
Net gain (loss) from operations before federal income taxes	24	(24)	200
Federal income tax expense	69	71	(3)
Net loss from operations	(45)	(95)	53
Net realized capital gains (losses)	39	(1,441)	103
Net loss	**$ (6)**	**$ (1,536)**	100 **%**

The $1.5 billion decrease in net loss to a $6 million net loss for the three months ended March 31, 2019 compared to the three months ended March 31, 2018 is due to a decrease in net realized capital losses of $1.5 billion and a decrease in net loss from operations of $50 million. The major components of the decrease in net loss from operations includes a decrease in the change in policyholders' reserves of $948 million, a decrease in policyholders' benefits of $320 million and an increase in fees and other income of $177 million, partially offset by a decrease in premium income of $1.1 billion, an increase in the change in group annuity reserves assumed of $235 million and a decrease in net investment income of $54 million.

Selected premium income information is presented below:

	Three Months Ended March 31,		
	2019	2018	% Change
	(unaudited)	(unaudited)	
	($ In Millions)		
Premium income:			
Group annuity	$ 2,552	$ 3,624	(30)%
Whole life	1,343	1,300	3
Individual annuity and supplemental contracts	523	569	(8)
Universal, variable, group and other life	347	247	40
Disability income	126	124	2
Other	36	137	(74)
Total	**$ 4,927**	**$ 6,001**	**(18)%**

Premium income decreased $1.1 billion for the three months ended March 31, 2019, primarily due to decreases in group annuities of $1.1 billion, other of $100 million, and individual annuities and supplemental contracts of $46 million, partially offset by increases to universal, variable and group life of $100 million, whole life of $43 million, and disability income of $2 million. The decrease in group annuities was primarily due to lower sales of investment only, defined contribution, defined benefit and pension buyout products. The decrease in annuities and supplemental contracts was primarily due to lower income annuity and variable annuity sales, partially offset by increased fixed annuity sales. The increase in universal, variable and group life is primarily due to an increase in BOLI. The increase in whole life was primarily due to higher sales and renewal premium.

Net investment income decreased $54 million to $1.7 billion for the three months ended March 31, 2019. The change was primarily due to a decrease in income of $209 million for partnerships and LLCs, partially offset by increases in income of $112 million for bonds and $23 million for mortgage loans. MassMutual's overall net annualized portfolio yield was 4.47% for the three months ended March 31, 2019 and 4.87% for the three months ended March 31, 2018.

Fees and other income increased $177 million for the three months ended March 31, 2019 primarily due to a recapture of a Modco agreement for $102 million in 2018 that did not recur in 2019, an increase in COLI value and reinsurance commissions.

Policyholders' benefits, which include payments for supplementary contracts involving life contingencies, matured endowments, death, annuity, disability and surrender benefits and interest, decreased $320 million for the three months ended March 31, 2019. The decrease was primarily due to decreases in group annuity surrenders of $498 million and individual annuity benefits of $42 million, partially offset by increases in whole life surrenders of $96 million, life death benefits of $79 million and group annuity benefits of $16 million.

Change in policyholders' reserves, including transfers to and from separate accounts, decreased $948 million for the three months ended March 31, 2019. The decrease was primarily due to decreased sales of group annuity products.

The change in group annuity reserves assumed increased $235 million in 2019 and reflects the RPG modified coinsurance assumption contract. This increase in change in reserves was primarily due to lower contract surrenders.

Net realized capital gains (losses), which include OTTI, comprised the following:

	Three Months Ended March 31,	
	2019	2018
	(unaudited)	(unaudited)
	(In Millions)	
Net realized capital gains (losses):		
Bonds	$ (11)	$ (19)
Common stocks - subsidiaries and affiliates	-	(1,257)
Common stocks - unaffiliated	10	20
Mortgage loans	1	1
Real estate	8	164
Partnerships and LLCs	(5)	(19)
Derivatives	173	(538)
Other	2	10
Net realized capital gains (losses) before federal and state taxes and deferral to the IMR	178	(1,638)
Net federal and state tax benefit	17	1
Net realized capital gains (losses) before deferral to the IMR	195	(1,637)
Net after tax (gains) losses deferred to the IMR	(156)	196
Net realized capital gains (losses)	**$ 39**	**$ (1,441)**

Net realized capital losses decreased $1.5 billion for the three months ended March 31, 2019. The decrease is primarily due to an OTTI of common stocks of subsidiaries and affiliates of $1.3 billion in 2018, and an increase in gains from derivatives of $711 million, partially offset by an increase in the gains deferred to the IMR of $352 million and a decrease in gains from real estate of $156 million. OTTI decreased $1.3 billion for common stocks of subsidiaries and affiliates primarily due to the impairment of MassMutual International LLC (MMI) in 2018, $24 million for bonds and $16 million for partnerships and LLCs, partially offset by $7 million for common stocks of unaffiliated. The book values of investments are written down when a decline in value is considered to be other than temporary. OTTI is determined in a disciplined manner using available evidence in both quantitative and qualitative processes.

Residential mortgage-backed exposure

During the three months ended March 31, 2019, there were no significant credit downgrades for the securities held by MassMutual that were backed by residential mortgage pools.

RMBS are included in the U.S. government and agencies, special revenue, and industrial and miscellaneous bond categories. The Alt-A category includes option adjustable-rate mortgages and the subprime category includes 'scratch and dent' or reperforming pools, high loan-to-value pools, and pools where the borrowers have very impaired credit but the average loan-to-value is low, typically 70% or below. In identifying Alt-A and subprime exposure, management used a combination of qualitative and quantitative factors, including FICO scores and loan-to-value ratios.

As of March 31, 2019, RMBS had a total carrying value of $1.2 billion and a fair value of $1.4 billion, of which approximately 20%, based on carrying value, was classified as Alt-A. Alt-A and subprime RMBS had a total carrying value of $451 million and a fair value of $528 million. As of December 31, 2018, RMBS had a total carrying value of $1.3 billion and a fair value of $1.4 billion, of which approximately 20%, based on carrying value, was classified as Alt-A. Alt-A and subprime RMBS had a total carrying value of $472 million and a fair value of $553 million.

Derivative financial instruments

MassMutual uses derivative financial instruments in the normal course of business to manage risks, primarily to reduce currency, interest rate and duration imbalances determined in asset/liability analyses. MassMutual also uses a combination of derivatives and fixed income investments to create synthetic investments. These synthetic investments are created when they are economically more attractive than the actual instrument or when similar instruments are unavailable. Synthetic investments are created either to hedge and reduce MassMutual's credit and foreign currency exposure or to create an investment in a particular asset. MassMutual held synthetic investments with a notional amount of $16.3 billion as of March 31, 2019 and $15.5 billion as of December 31, 2018. These notional amounts included replicated asset transaction values of $14.4 billion as of March 31, 2019 and $13.6 billion as of December 31, 2018, as defined under statutory accounting practices as the result of pairing of a long derivative contract with cash instruments.

MassMutual's principal derivative exposures to market risk are interest rate risk, which includes inflation and credit risk. Interest rate risk pertains to the change in fair value of the derivative instruments as a result of changes in market interest rates. MassMutual is exposed to credit-related losses in the event of nonperformance by counterparties to derivative financial instruments. MassMutual regularly monitors counterparty credit ratings, derivative positions, valuations and the value of collateral posted to ensure counterparties are credit-worthy and the concentration of exposure is minimized, and monitors its derivative credit exposure as part of its overall risk management program.

MassMutual enters derivative transactions through bilateral derivative agreements with counterparties, or through over the counter cleared derivatives with a counterparty and the use of a clearinghouse. To minimize credit risk for bilateral transactions, MassMutual and its counterparties generally enter into master netting agreements based on agreed upon requirements that outline the framework for how collateral is to be posted in the amount owed under each transaction, subject to certain minimums. For over the counter cleared derivative transactions between MassMutual and a counterparty, the parties enter into a series of master netting and other agreements that govern, among other things, clearing and collateral requirements. These transactions are cleared through a clearinghouse and each derivative counterparty is only exposed to the default risk of the clearinghouse. Certain interest rate swaps and credit default swaps are considered cleared transactions. These cleared transactions require initial and daily variation margin collateral postings. These agreements allow for contracts in a positive position, in which amounts are due to MassMutual, to be offset by contracts in a negative position. This right of offset, combined with collateral obtained from counterparties, reduces MassMutual's credit exposure.

Net collateral pledged by the counterparties was $2.0 billion as of March 31, 2019 and $2.5 billion as of December 31, 2018. In the event of default, the full market value exposure at risk in a net gain position, net of offsets and collateral, was $163 million as of March 31, 2019 and $146 million as of December 31, 2018. The statutory net amount at risk, defined as net collateral pledged and statement values excluding accrued interest, was $753 million as of March 31, 2019 and $695 million as of December 31, 2018.

MassMutual had the right to rehypothecate or repledge securities totaling $1.2 billion of the $2.0 billion as of March 31, 2019 and $709 million of the $2.5 billion as of December 31, 2018 of net collateral pledged by counterparties. There were no securities rehypothecated to other counterparties as of March 31, 2019 or December 31, 2018.

Analysis of Financial Condition – at March 31, 2019 Compared to at December 31, 2018

The following table sets forth MassMutual's significant assets, liabilities and surplus for the dates presented:

	March 31, 2019 (unaudited)	December 31, 2018	% Change
	($ In Millions)		
Assets:			
Bonds	$ 98,271	$ 97,079	1 %
Preferred stocks	748	744	1
Common stocks – subsidiaries and affiliates	13,224	12,327	7
Common stocks – unaffiliated	477	500	(5)
Mortgage loans	24,402	23,624	3
Policy loans	13,985	13,873	1
Real estate	469	488	(4)
Partnerships and LLCs	8,644	8,599	1
Derivatives	8,898	8,741	2
Cash, cash equivalents and short-term investments	3,416	4,318	(21)
Other invested assets	1,331	943	41
Total invested assets	173,865	171,236	2
Investment income due and accrued	2,448	3,018	(19)
Federal income taxes	239	612	(61)
Deferred income taxes	1,087	983	11
Other than invested assets	3,233	3,320	(3)
Total assets excluding separate accounts	180,872	179,169	1
Separate account assets	69,073	64,478	7
Total assets	**$ 249,945**	**$ 243,647**	**3 %**
Liabilities and Surplus:			
Policyholders' reserves	$ 122,971	$ 121,978	1 %
Liabilities for deposit-type contracts	15,255	14,370	6
Contract claims and other benefits	591	479	23
Policyholders' dividends	1,726	1,713	1
General expenses due or accrued	920	1,096	(16)
Asset valuation reserve	3,370	3,307	2
Repurchase agreements	4,391	4,768	(8)
Commercial paper and other borrowed money	250	250	-
Collateral	2,379	2,946	(19)
Derivatives	5,688	4,912	16
Funds held under coinsurance	4,124	4,099	1
Other liabilities	3,508	3,641	(4)
Total liabilities excluding separate accounts	165,173	163,559	1
Separate account liabilities	69,073	64,478	7
Total liabilities	**234,246**	**228,037**	**3**
Surplus	15,699	15,610	1
Total liabilities and surplus	**$ 249,945**	**$ 243,647**	**3 %**

Assets

Total assets increased $6.3 billion as of March 31, 2019, primarily due to an increase in separate account assets of $4.6 billion, bonds of $1.2 billion, common stocks of $874 million, mortgage loans of $778 million, other invested assets of $388 million, derivatives of $157 million, policy loans of $112 million and deferred income taxes of $104 million, partially offset by decreases in cash, cash equivalents and short-term investments of $902 million, investment income due and accrued of $570 million and federal income taxes of $373 million.

Bonds increased $1.2 billion to $98.3 billion as of March 31, 2019, primarily due to $1.2 billion of net acquisitions and $34 million of net discount accretion.

Common stocks – subsidiaries and affiliates increased $897 million to $13.2 billion as of March 31, 2019, primarily due to net acquisitions of $547 million and unrealized gains of $349 million mainly due to earnings of subsidiaries.

Mortgage loans increased $778 million to $24.4 billion as of March 31, 2019, primarily due to $759 million of net acquisitions and $42 million of net unrealized foreign currency revaluation gain primarily related to the strengthening of the British Pound against the U.S. Dollar, partially offset by $39 million of transfers to partnerships and LLCs. Residential mortgage loans are primarily seasoned pools of homogeneous residential mortgage loans that are predominantly Federal Housing Administration insured or Veterans Administration guaranteed, though the pools may contain mortgages of subprime credit quality. MassMutual had residential mortgage loan pools with a carrying value of $1.3 billion as of March 31, 2019 and $1.3 billion as of December 31, 2018.

Policy loans increased $112 million to $14.0 billion as of March 31, 2019 primarily due to new loans and interest capitalization of $405 million, partially offset by loan repayments and surrenders of $293 million.

Partnerships and LLCs increased $45 million to $8.6 billion as of March 31, 2019, primarily due to additional investments of $293 million, earnings of $74 million, net transfers of $39 million, unrealized gain of $22 million, change in non–admitted asset of $12 million, realized gains on sales of $7 million, unrealized foreign exchange valuation gain of $5 million, partially offset by returns of capital of $232 million, income distributions of $101 million, liquidation proceeds of $63 million and book value impairments of $11 million.

Derivative assets increased $157 million to $8.9 billion as of March 31, 2019, primarily due to an increase in interest related hedge values resulting from the decrease in the swap curve rates, increased equity related hedge values resulting from the strengthening of equity markets, net of decreased foreign currency hedge values resulting from the strengthening of the British Pound relative to the U.S. Dollar, and decrease in futures resulting from the rolling of positions followed by the decrease in treasury rates, as well as changes in notional related to the repositioning of the portfolio as part of ongoing asset-liability management activity.

Cash, cash equivalents and short-term investments decreased $902 million to $3.4 billion as of March 31, 2019. The decrease was primarily due to net cash applied to investing activities of $2.6 billion and net cash used in financing and other sources of $491 million, partially offset by net cash provided from operations of $2.2 billion.

Other invested assets increased $388 million to $1.3 billion as of March 31, 2019 due to increases in the receivable for collateral posted to counterparties.

Investment income due and accrued decreased $570 million to $2.4 billion as of March 31, 2019. The change is primarily due to a decrease in common stock of affiliates of $650 million from the MMHLLC dividend that was declared in 2018, partially offset by an increase in bonds of $103 million.

Federal income tax receivable decreased $373 million to $239 million as of March 31, 2019 due to $330 million in net tax receipts associated with a combination of IRS refunds from loss carrybacks and appeals settlements and intercompany settle ups associated with 2018 estimated taxes. An additional $43 million decrease stems from the period's tax expense on operations and taxable capital activity.

The deferred income tax assets increased $104 million to $1.1 billion as of March 31, 2019, largely due to a $48 million increase associated with the three-year reversals of policyholder reserves, dividends and tax basis deferred policy acquisition costs. A more significant $88 million increase stems from a greater ability to utilize tax planning strategies to enhance the admitted deferred tax asset.

Separate account assets increased $4.6 billion to $69.1 billion as of March 31, 2019, primarily due to net market appreciation of $4.9 billion and pending security settlements of $114 million, partially offset by net customer cash outflows of $348 million and fees of $93 million.

Liabilities

Total liabilities increased $6.2 billion to $234.2 billion as of March 31, 2019, primarily due to increases in separate account liabilities of $4.6 billion, policyholders' reserves of $1.0 billion, liabilities for deposit-type contracts of $885 million and derivatives of $776 million, partially offset by decreases in collateral of $567 million and repurchase agreements of $377 million.

Policyholders' reserves increased $1.0 billion to $123.0 billion as of March 31, 2019. Whole life products increased $645 million primarily due to sales and renewal premium, partially offset by reserves released due to benefits and policy charges. Group life products increased $269 million primarily in BOLI due to premium and interest on reserves out pacing reserves released. Universal, variable and other life products increased $79 million primarily due to universal life sales and renewal premium. Individual annuity products increased $60 million primarily in income annuities due to increased sales. Group annuity products decreased $78 million primarily due to surrenders and payments outpacing premiums and interest on reserves.

Liabilities for deposit-type contracts increased $885 million to $15.3 billion as of March 31, 2019, primarily due to $850 million of medium term note sales.

Certain variable annuity contracts include additional death or other insurance benefit features, such as guaranteed minimum death benefits (**"GMDBs"**), guaranteed minimum income benefits (**"GMIBs"**), guaranteed minimum accumulation benefits (**"GMABs"**) and guaranteed minimum withdrawal benefits (**"GMWBs"**). In general, living benefit guarantees require the contract holder or policyholder to adhere to a company-approved asset allocation strategy. Election of these benefits is generally only available at contract issue

The following shows the liabilities for GMDSs, GMIBs, GMABs and GMWBs (in millions):

Liability as of January 1, 2018	$ 512
Incurred guarantee benefits	250
Paid guarantee benefits	(6)
Liability as of December 31, 2018	756
Incurred guarantee benefits	(130)
Paid guarantee benefits	(2)
Liability as of March 31, 2019	$ 624

MassMutual held reserves for variable annuity guarantees in accordance with the stochastic scenarios as of March 31, 2019 and December 31, 2018. As of March 31, 2019 and December 31, 2018, MassMutual held additional reserves above those indicated based on the stochastic scenarios in order to maintain a prudent level of reserve adequacy.

The following table summarizes the account values, net amount at risk and weighted average attained age for variable annuity contracts with GMDB, GMIB, GMAB and GMWB classified as policyholders' reserves and separate account liabilities. The net amount at risk is defined as the minimum guarantee less the account value calculated on a policy-by-policy basis, but not less than zero.

	March 31, 2019			December 31, 2018		
	Account Value	Net Amount at Risk	Weighted Average Attained Age	Account Value	Net Amount at Risk	Weighted Average Attained Age
	($ In Millions)					
GMDB..........	$ 18,086	$ 46	64	$ 17,392	$ 132	64
GMIB Basic .	744	52	69	700	97	69
GMIB Plus ...	2,866	619	67	2,687	813	67
GMAB..........	2,681	9	60	2,573	74	60
GMWB.........	163	16	71	160	23	70

As of March 31, 2019, the GMDB account value above consists of $3.9 billion within the general account and $14.2 billion within the separate account that includes $3.9 billion of modified coinsurance assumed. As of December 31, 2018, the GMDB account value above consists of $3.9 billion within the general account and $13.5 billion within the separate account that includes $3.8 billion of modified coinsurance.

General expenses due or accrued decreased $176 million to $920 million as of March 31, 2019, primarily due to the 2019 payout of annual incentive compensation accrued as of December 31, 2018.

AVR increased $63 million to $3.4 billion as of March 31, 2019. The increase was primarily due to net unrealized capital gains of $118 million, an increase in reserve contributions of $91 million and an increase in net realized capital gains of $17 million, partially offset by a decrease of $163 million to adjust the reserve down to the maximum. AVR is a formula driven reserve, the purpose of which is to reduce the surplus volatility of after-tax credit-related realized and unrealized gains and losses. It is calculated based on statement values by asset type, credit quality and reserve factors. AVR can range from zero to a maximum allowable reserve. Any amounts calculated in excess of the maximum allowable reserve will not be included in the calculation of AVR. Any losses that exceed their related component of the AVR will not be absorbed. Changes in statement values, credit quality and capital gains or losses will affect the reserve balance.

Repurchase agreements decreased $377 million to $4.4 billion as of March 31, 2019. Proceeds from repurchase agreements are used in overall portfolio management to help ensure MassMutual has the assets needed to provide yield, spread and duration to support liabilities and other corporate needs. MassMutual increases and decreases repurchase agreements in response to changing market conditions and changing liability needs.

Collateral decreased $567 million to $2.4 billion as of March 31, 2019. This decrease in collateral liability was consistent with the change in net derivative asset values. In addition, securities that were held as collateral by a trustee off the balance sheet increased by $475 million to $1.2 billion as of March 31, 2019 from $710 million as of December 31, 2018. The derivative collateral liability is a function of contractual requirements. When certain threshold exposure levels and transfer amount levels are reached, MassMutual requires additional collateral or returns excess collateral held.

Derivative liabilities increased $776 million to $5.7 billion as of March 31, 2019, primarily due to an increase in interest related hedge values resulting from the decrease in the swap curve rates and decrease in foreign currency hedge values resulting from the strengthening of the British Pound relative to the U.S. Dollar, as well as changes in notional related to the repositioning of the portfolio as part of ongoing asset-liability management activity.

Separate account liabilities increased $4.6 billion to $69.1 billion as of March 31, 2019. See analysis related to separate account assets.

Surplus

Surplus increased $89 million to $15.7 billion as of March 31, 2019. The following table shows the change in surplus:

	March 31, 2019
	(In Millions)
Beginning surplus	$ 15,610
Net loss	(6)
Change in net unrealized capital gains (losses), net of tax	(108)
Change in net unrealized foreign exchange capital gains (losses), net of tax	47
Change in other net deferred income taxes	12
Change in nonadmitted assets	245
Change in AVR	(64)
Prior period adjustments	(34)
Other	(3)
Net increase	89
Ending surplus	**$ 15,699**

MassMutual's total adjusted capital, as defined by the NAIC, increased to $20.0 billion as of March 31, 2019 compared to $19.9 billion as of December 31, 2018.

The following table sets forth the calculation of total adjusted capital:

	March 31, 2019	December 31, 2018
	(In Millions)	
Surplus[(1)]	$ 15,699	$ 15,610
AVR[(2)]	3,475	3,414
One-half of the apportioned dividend liability[(2)]	859	852
Total adjusted capital [(3)]	**$ 20,033**	**$ 19,876**

[(1)] Surplus as of March 31, 2019 includes surplus notes with a carrying value of $2,268 million, comprised of the following surplus notes at face value issued and outstanding: $250 million of surplus notes maturing in 2023, $100 million of surplus notes maturing in 2024, $250 million of surplus notes maturing in 2033, $310 million of surplus notes maturing in 2039, $400 million of surplus notes maturing in 2041, $500 million of surplus notes maturing in 2065 and $475 million of surplus notes maturing in 2077.

[(2)] Consolidated for MassMutual, C.M. Life Insurance Company and MML Bay State Life Insurance Company.

[(3)] Defined by the NAIC as surplus plus consolidated AVR and one-half of the consolidated apportioned dividend liability and a deduction for applicable foreign insurance subsidiaries.

Analysis of Results of Operations – For the Years Ended December 31, 2018, 2017 and 2016

The following table sets forth the components of statutory net (loss) income:

	Years Ended December 31,				
	2018	2017	2016	% Change 18 vs. 17	% Change 17 vs. 16
	($ In Millions)				
Revenue:					
Premium income	$ 22,929	$ 17,486	$ 21,432	31 %	(18)%
Net investment income	7,774	6,542	6,334	19	3
Fees and other income	1,018	1,425	1,283	(29)	11
Total revenue	31,721	25,453	29,049	25	(12)
Benefits and expenses:					
Policyholders' benefits	23,007	20,019	18,312	15	9
Change in policyholders' reserves	4,499	740	7,387	508	(90)
Change in group annuity reserves assumed	(1,221)	(887)	(1,510)	(38)	41
General insurance expenses	2,366	2,604	2,251	(9)	16
Commissions	1,062	1,009	938	5	8
State taxes, licenses and fees	258	245	237	5	3
Total benefits and expenses	29,971	23,730	27,615	26	(14)
Net gain from operations before dividends and federal income taxes	1,750	1,723	1,434	2	20
Dividends to policyholders	1,695	1,569	1,566	8	-
Net gain from operations before federal income taxes	55	154	(132)	(64)	217
Federal income tax (benefit) expense	(168)	(320)	(326)	48	2
Net gain from operations	223	474	194	(53)	144
Net realized capital (losses) gains	(1,044)	(422)	(208)	(147)	(103)
Net (loss) income	**$ (821)**	**$ 52**	**$ (14)**	**NM%**	**471 %**

The $873 million increase to a net loss of $821 million in 2018 from a net gain of $52 million in 2017 was due to an increase in net realized capital losses of $622 million and a decrease in net gain from operations of $251 million. The major components of the decrease in net gain from operations include an increase in the change in policyholders' reserves of $3.8 billion, an increase in policyholders' benefits of $3.0 billion, a decrease in fees and other income of $407 million, a decrease in federal income tax benefit of $152 million, an increase in dividends to policyholders of $126 million and an increase in commissions of $53 million, partially offset by an increase in premium income of $5.4 billion, an increase in net investment income of $1.2 billion, a decrease in group annuity reserves assumed of $334 million and a decrease in general insurance expenses of $238 million.

The $66 million increase in net income from a net loss of $14 million in 2016 to a net gain of $52 million in 2017 was due to an increase in net gain from operations of $280 million, partially offset by an increase in net realized capital losses of $214 million. The major components of the increase in net gain from operations included a decrease in the change of policyholders' reserves of $6.6 billion, an increase in net investment income of $208 million and an increase in fees and other income of $142 million, partially offset by a decrease in premium income of $3.9 billion, an increase in policyholders' benefits of $1.7 billion, an increase in the change in group annuity reserves assumed of $623 million, an increase in general insurance expense of $353 million and an increase in commissions of $71 million.

Premium Income

Selected premium income information is presented below:

	Years Ended December 31,				
	2018	2017	2016	% Change 18 vs. 17	% Change 17 vs. 16
		($ In Millions)			
Premium income:					
Whole life	$ 6,093	$ 5,795	$ 5,346	5 %	8 %
Universal, variable and group life	897	(2,377)	1,327	(138)	(279)
Annuities and supplemental contracts	2,623	2,252	2,452	16	(8)
Disability income	510	498	489	2	2
Group annuities	12,394	11,065	11,655	12	(5)
Other	412	253	163	63	55
Total	**$ 22,929**	**$ 17,486**	**$ 21,432**	**31 %**	**(18) %**

Premium income increased $5.4 billion to $22.9 billion in 2018 primarily due to increases in universal, variable and group life of $3.3 billion, group annuities of $1.3 billion, annuities and supplemental contracts of $371 million and whole life of $298 million. The increase in universal, variable and group life is primarily due to the $4.0 billion in BOLI due to the December 31, 2017 ceding of certain inforce universal life policies. The increase in group annuities was primarily due to higher defined contribution and investment only sales, partially offset by lower sales in defined benefit and pension buyout products. The increase in annuities and supplemental contracts was primarily due to higher annuity sales. The increase in whole life was primarily due to higher sales and renewal premium.

Premium income decreased $3.9 billion to $17.5 billion in 2017 primarily due to decreases in universal, variable and group life of $3.7 billion, group annuities of $590 million, annuities and supplemental contracts of $200 million, partially offset by an increase in whole life of $449 million. The decrease in universal, variable and group life is primarily due to the $4.0 billion in BOLI due to the December 31, 2017 ceding of certain inforce universal life policies. The decrease in group annuities was primarily due to decreased sales of defined contribution products, partially offset by higher sales of defined benefit products, investment-only and pension risk transfer products. The decrease in annuities and supplemental contracts was primarily due to lower annuity sales. The increase in whole life was primarily due to higher sales and renewal premium.

Net Investment Income

The components of net investment income are set forth below:

	Years Ended December 31,				
	2018	2017	2016	% Change 18 vs. 17	% Change 17 vs. 16
	($ In Millions)				
Net investment income:					
Bonds	$ 4,062	$ 3,712	$ 3,583	9 %	4 %
Preferred stocks	35	17	24	106	(29)
Common stocks - subsidiaries and affiliates	910	436	431	109	1
Common stocks - unaffiliated	43	39	59	10	(34)
Mortgage loans	997	928	1,009	7	(8)
Policy loans	857	797	757	8	5
Real estate	110	159	174	(31)	(9)
Partnerships and LLCs	1,030	658	460	57	43
Derivatives	313	305	343	3	(11)
Cash, cash equivalents and short-term investments	71	42	33	69	27
Other	6	2	-	200	NM
Total gross investment income	8,434	7,095	6,873	19	3
Amortization of the IMR	64	113	135	(43)	(16)
Less investment expenses	(724)	(666)	(674)	9	(1)
Net investment income	**$ 7,774**	**$ 6,542**	**$ 6,334**	**19 %**	**3 %**

NM = not meaningful

Net investment income increased $1.2 billion in 2018 primarily due to increases in income from common stock of subsidiaries and affiliates of $474 million, income distributions from partnerships and LLCs of $372 million and income from bonds of $350 million.

Net investment income increased $208 million in 2017 primarily due to an increase in income distributions from partnerships and LLCs of $198 million and an increase in income from bonds of $129 million. These items were partially offset by decreases in income from mortgage loans of $81 million and derivatives of $38 million.

The net yield was 4.7% in 2018, 4.5% in 2017 and 4.6% in 2016. MassMutual calculates the yield as (a) net investment income less affiliated dividends from MMHLLC divided by (b) the monthly average of cash and invested assets plus investment income due and accrued, net of foreign exchange adjustments, unrealized gains and losses, and investment-related liabilities, less half the net investment income excluding affiliated dividends from MMHLLC.

Bond investment income increased $350 million in 2018 and $129 million in 2017, due to increased average asset balances, as well as an increase in yields in 2018. Average bond investments were $93.8 billion in 2018, $87.1 billion in 2017 and $81.7 billion in 2016. Yields were 4.4% in 2018, 4.3% in 2017 and 4.3% in 2016.

Income from common stocks of affiliates increased $474 million in 2018 and $5 million in 2017, mainly reflecting changes in the dividends received from MMHLLC. The MMHLLC dividend was $900 million in 2018, $425 million in 2017 and $430 million in 2016.

Income from unaffiliated common stocks increased $4 million in 2018 and decreased $20 million in 2017. The decrease in 2017 mainly reflects changes in the amount of dividends paid from mutual fund investments.

Mortgage loan gross investment income increased $69 million in 2018 primarily due to an increase in average assets partially offset by a reduction in loan yields. Mortgage loan gross investment income decreased $81 million in 2017 primarily due to an increase in average assets, partially offset by a reduction in loan yields. Yields were 4.4% in

2018, 4.3% in 2017 and 4.7% in 2016. Average mortgage loan investments were $23.1 billion in 2018, $21.8 billion in 2017 and $21.5 billion in 2016.

Policy loan gross investment income increased $60 million in 2018 and $40 million in 2017 as a result of increased average loan balances. Average policy loans were $13.6 billion in 2018, $12.9 billion in 2017 and $12.1 billion in 2016.

Partnership and LLCs net investment income increased $372 million in 2018 and $198 million in 2017 primarily due to fluctuations in income distributions related to earnings from various investments.

Derivative gross investment income increased $8 million in 2018 primarily due to the change in LIBOR on interest rate swaps, partially offset by additional notional related to ongoing portfolio asset/liability management during the year. Derivative gross investment income decreased $38 million in 2017 primarily due to additional notional amounts related to ongoing portfolio asset/liability management during the year, partially offset by the change in LIBOR on interest rate swaps.

Amortization of the IMR decreased $49 million in 2018 primarily due to the effect of a lower beginning reserve balance in the current year as a result of interest related gains in 2017 and by lower year over year gains amortizing into the current year as a result of a decrease in the inherent income on closed futures, partially offset by an increase in gains in bonds. Amortization of the IMR decreased $22 million in 2017 primarily due to the effect of a lower beginning reserve balance in the current year as a result of interest related losses in 2016, partially offset by higher year over year gains amortizing into the current year as a result of an increase in the inherent income on closed futures.

Investment expenses increased $59 million in 2018 and decreased $8 million in 2017. The increase in 2018 is primarily due to an increase in interest expense due to higher interest rates on repurchase agreements, as well as higher compensation costs. The decrease in 2017 mainly reflects lower investment advisory fees due in part to restructuring of certain agreements, partially offset by an increase in interest expense due to higher interest rates on repurchase agreements.

Fees and Other Income

Fees and other income decreased $407 million in 2018 primarily due to a decrease in legacy Premier Client Group ("**PCG**") maintenance revenue, decrease in investment return on MassMutual's corporate owned life insurance asset and a long term care modified coinsurance recapture, partially offset by experience refund for certain universal life policies.

Fees and other income increased $142 million in 2017 primarily due to an increase in legacy PCG maintenance revenue, investment return on MassMutual's corporate owned life insurance asset and a reclassification from premium to fees and other income for contract administration fees on registered defined contribution products partially offset by the ceding commissions of certain inforce variable life, universal life and term life policies in December 2016 in connection with a series of reinsurance agreements.

Benefits and Expenses

Policyholders' benefits, which include payments for supplementary contracts involving life contingencies, matured endowments, death, annuity, disability and surrender benefits and interest, increased $3.0 billion in 2018. The increase was primarily due to higher defined contribution and investment only group annuity product surrenders, higher annuity surrenders, COLI surrenders and the pass through of investment income on the funds held under coinsurance, partially offset by lower defined benefit product surrenders. Policyholders' benefits increased $1.7 billion in 2017, primarily due to higher defined contribution and investment only group annuity product surrenders, higher annuity surrenders and benefits, partially offset by lower defined benefit product surrenders.

The life insurance lapse rate, which is based on the amount of life insurance in force was 4.2% in 2018, 4.1% in 2017 and 4.1% in 2016.

The change in policyholders' reserves, which includes transfers to and from separate accounts, increased $3.8 billion in 2018. The increase was primarily due to the ceding of certain inforce universal life policies under a new reinsurance agreement effective December 31, 2017 and higher premium, partially offset by higher surrenders in defined benefit, investment-only and defined contribution products. The change in policyholders' reserves decreased $6.6 billion in 2017, primarily due to the ceding of certain inforce universal life policies under a new reinsurance agreement effective December 31, 2017 and higher surrenders and lower premium in defined contribution group annuity products.

The change in group annuity reserves assumed decreased $334 million in 2018 and reflects the Retirement Plan Group ("**RPG**") modified coinsurance assumption contract. This decrease in change in reserves was primarily due to higher contract surrenders and lower premium. The $623 million increase in 2017 reflects a lower level of transfers from RPG separate accounts to MassMutual contracts.

General insurance expenses decreased $238 million in 2018 primarily due to an impairment of previously capitalized software of $221 million in 2017, which did not recur in 2018. General insurance expenses increased $353 million in 2017 primarily due to an impairment of previously capitalized software, additional operating costs related to the PCG acquisition and higher service, technology and administrative fees.

Commissions, including commissions and expense allowances on reinsurance assumed, increased $53 million in 2018 primarily due to whole life renewals and growth of fixed annuities and income annuities. Commissions increased $71 million in 2017 primarily due to the growth of whole life sales.

Dividends to policyholders increased $126 million in 2018 primarily due to business growth of participating products. Dividends to policyholders increased $3 million in 2017 primarily due to business growth of participating products partially offset by a reduction in the dividend scale.

Federal income tax benefits decreased $152 million in 2018. The most significant driver is $140 million associated with the recent tax reform's impact on policyholder reserves, which became effective in 2018.

Net Realized Capital Gains (Losses)

Net realized capital gains (losses), including OTTI, were comprised of the following:

	Years Ended December 31,				
	2018	2017	2016	% Change 18 vs.17	% Change 17 vs.16
	($ In Millions)				
Net realized capital gains (losses):					
Bonds	$ (169)	$ (102)	$ (248)	(66)%	59 %
Preferred stocks	-	(6)	9	100	(167)
Common stocks - subsidiaries and affiliates	(1,242)	27	11	NM	145
Common stocks - unaffiliated	92	(9)	(60)	NM	85
Mortgage loans	(1)	(27)	(14)	96	(93)
Real estate	168	68	14	147	386
Partnerships and LLCs	(57)	(87)	(94)	34	7
Derivatives	(238)	(314)	(7)	24	NM
Other	(29)	(135)	(4)	79	NM
Net realized capital (losses) before federal and state taxes and deferral to the IMR	(1,476)	(585)	(393)	(152)	(49)
Net federal and state tax benefit	48	175	40	(73)	338
Net realized capital (losses) before deferral to the IMR	(1,428)	(410)	(353)	(248)	(16)
Net after tax (gains) losses deferred to the IMR	384	(12)	145	NM	(108)
Net realized capital (losses)	**$ (1,044)**	**$ (422)**	**$ (208)**	**(147)%**	**(103)%**

NM = not meaningful

Net realized capital losses increased $622 million in 2018 primarily due to the impairment of MMI of $1.3 billion, partially offset by increased gains from the sales of unaffiliated common stocks of $101 million and real estate of $100 million, as well as an increase in losses deferred to the IMR of $396 million.

Net realized capital losses increased $214 million in 2017 primarily due to increases in losses from derivatives of $307 million and other investments of $131 million including the loss from the tender of surplus notes, as well as an increase in gains deferred to the IMR of $157 million. These items were partially offset by lower losses from bonds of $146 million, increased gains from common stocks of $67 million and real estate of $54 million, and an increase in the federal and state tax benefit of $136 million.

Investments are written down when a decline in value is considered to be other-than-temporary. In 2018, MassMutual recognized $1.5 billion of impairment losses compared to $185 million in 2017. Of the $1.5 billion of OTTI in 2018, $1.3 billion was related to common and preferred stock, $121 million was related to bonds, and $62 million was related to partnerships and LLCs.

In 2018, $384 million of net after-tax losses were deferred into the IMR including derivative net losses of $340 million and bond net losses of $45 million. In 2017, $12 million of net after-tax gains were deferred into the IMR including derivative net gains of $48 million partially offset by bond net losses of $36 million. Gains and losses deferred to the IMR are amortized into income over the estimated remaining life of the investment sold. See “Net Investment Income”.

Bond net realized capital gains and losses on sales and OTTI, before IMR deferrals, were comprised of the following:

	Years Ended December 31,				
	2018	2017	2016	% Change 18 vs. 17	% Change 17 vs. 16
	($ In Millions)				
Gross realized capital gains on sales	$ 151	$ 114	$ 132	32 %	(14)%
Gross realized capital losses on sales	(199)	(153)	(248)	(30)	38
OTTI	(121)	(64)	(78)	(89)	18
Net realized capital (losses)	**$ (169)**	**$ (103)**	**$ (194)**	**(64)%**	**47 %**

Bond net realized capital losses increased $67 million in 2018 primarily due to an increase in impairments of $57 million. Bond net realized capital losses decreased $146 million in 2017 primarily due to the non-reoccurrence of losses on United States treasury securities in 2016 and a decrease in OTTI of $14 million.

Common stock net realized capital losses increased $1.2 billion in 2018, mainly due to the impairment of MMI. Common stock net realized capital gains increased $67 million to a gain of $18 million in 2017, from a loss of $49 million in 2016. The change in 2017 reflects a $118 million increase in gains from sales, partially offset by a $51 million increase in OTTI.

Mortgage loan net realized capital losses decreased $26 million in 2018 primarily due to decreased losses on foreign exchange of $25 million. Mortgage loan net realized capital losses increased $13 million in 2017 primarily due to increased losses on foreign exchange of $19 million, partially offset by a decrease in OTTI of $7 million.

Real estate net realized capital gains increased $100 million to $168 million in 2018 from $68 million in 2017. The current year's gains of $168 million were primarily from the sales of seven properties. Real estate net realized capital gains increased $54 million to $68 million in 2017 from $14 million in 2016. The 2017 gains of $68 million were primarily from the sales of four properties partially offset by held for sale reserves on two properties. The 2016 gain of $14 million was primarily from the sale of two properties.

Partnership and LLCs net realized capital losses decreased $30 million in 2018 primarily due to an increase in gains from sales and liquidations of $35 million and a decrease in foreign exchange losses on distributions of $4 million partially offset by an increase in OTTI of $9 million. Partnership and LLCs net realized capital losses decreased $7 million in 2017 primarily due to a decrease in OTTI of $38 million partially offset by an increase in losses from sales and liquidations of $30 million.

The following sets forth the net realized and change in unrealized capital gains and losses (which are charged directly to the Statutory Statements of Changes in Surplus) from derivatives:

	Years Ended December 31,				
	2018	2017	2016	% Change 17 vs. 16	% Change 16 vs. 15
	(In Millions)				
Net realized capital gains (losses)	$ (238)	$ (314)	$ (7)	(24)%	4,386 %
Net change in unrealized capital gains	895	(1,102)	246	(181)	(548)
Net realized and change in unrealized capital gains (losses)	**$ 657**	**$ (1,416)**	**$ 239**	**(146) %**	**(692) %**

Derivative net realized capital losses decreased $76 million to a loss of $238 million in 2018 from a loss of $314 million in 2017, primarily due to decreased losses on forwards of $322 million, decreased losses on options of $134 million, decreased losses on interest rate swaps of $119 million partially offset by decreased gains in financial futures of $428 million, decreased gains on currency swaps of $57 million, and decreased gains on credit default swaps of $11 million. These decreased losses primarily resulted from the weakening of the British Pound and Euro relative to the U.S. Dollar, changes in the equity markets, changes in the swap curve and treasury rates at the time of termination/expiration, partially offset by the increase in treasury rates and rolling of futures, along with ongoing portfolio asset/liability management.

Derivative net realized capital losses increased $307 million to a loss of $314 million in 2017 from a loss of $7 million in 2016, primarily due to increased losses on currency forwards of $445 million, interest rate swaps of $222 million, options of $41 million, and decreased gains on mortgage-backed security forwards of $5 million, partially offset by increased gains on financial futures of $329 million, currency swaps of $70 million, and credit default swaps of $7 million. These increased losses primarily resulted from the greater strengthening of the British Pound and Euro relative to the U.S. Dollar, greater strengthening of equity markets, changes in the swap curve and treasury rates at the time of termination/expiration, partially offset by the decrease in treasury rates and rolling of futures, along with ongoing portfolio asset/liability management.

Realized capital gains (losses) do not reflect the changes in the AVR and valuation reserves, which are recorded to the Statutory Statements of Changes in Surplus.

Statement of Financial Position – At December 31, 2018 Compared to December 31, 2017

The following table sets forth MassMutual's assets, liabilities and surplus for the dates presented:

	December 31, 2018	December 31, 2017	% Change
	($ In Millions)		
Assets:			
Bonds	$ 97,079	$ 90,435	7 %
Preferred stocks	744	768	(3)
Common stocks - subsidiaries and affiliates	12,327	14,424	(15)
Common stocks - unaffiliated	500	1,212	(59)
Mortgage loans	23,624	22,580	5
Policy loans	13,873	13,327	4
Real estate	488	857	(43)
Partnerships and limited liability companies	8,599	7,678	12
Derivatives	8,741	8,857	(1)
Cash, cash equivalents and short-term investments	4,318	3,580	21
Other invested assets	943	203	365
Total invested assets	171,236	163,921	4
Investment income due and accrued	3,018	2,199	37
Federal income taxes	612	544	13
Deferred income taxes	983	761	29
Other than invested assets	3,320	3,476	(4)
Total assets excluding separate accounts	179,169	170,901	5
Separate account assets	64,478	69,162	(7)
Total assets	**$ 243,647**	**$ 240,063**	**1 %**
Liabilities and Surplus:			
Policyholders' reserves	$ 121,978	$ 115,764	5 %
Liabilities for deposit-type contracts	14,370	13,014	10
Contract claims and other benefits	479	513	(7)
Policyholders' dividends	1,713	1,601	7
General expenses due or accrued	1,096	1,074	2
Asset valuation reserve	3,307	3,207	3
Repurchase agreements	4,768	4,204	13
Commercial paper	250	250	NM
Collateral	2,946	2,661	11
Derivatives	4,912	5,979	(18)
Funds held under coinsurance	4,099	4,001	2
Other liabilities	3,641	2,928	24
Total liabilities excluding separate accounts	163,559	155,196	5
Separate account liabilities	64,478	69,162	(7)
Total liabilities	**228,037**	**224,358**	2
Surplus	15,610	15,705	(1)
Total liabilities and surplus	**$ 243,647**	**$ 240,063**	**1 %**

NM = not meaningful

Assets

Total assets were $243.6 billion as of December 31, 2018, an increase of $3.6 billion, or 1%, from year-end 2017, primarily due to increases in invested assets of $7.3 billion and an increase in investment income due and accrued of $819 million, partially offset by a decrease in separate account assets of $4.7 billion.

Invested assets increased to $171.2 billion as of December 31, 2018, an increase of $7.3 billion, or 4%, from year-end 2017, primarily due to increases in bonds of $6.6 billion, mortgage loans of $1.0 billion, partnerships and limited liability companies of $921 million, other invested assets of $740 million and cash, cash equivalents and short-term investments of $738 million, partially offset by a decrease in common stocks of $2.8 billion.

Bonds increased $6.6 billion, or 7%, in 2018, including $7.2 billion of net acquisitions, partially offset by unrealized foreign currency losses of $559 million. Bonds in NAIC Categories 1 and 2 were 53% of total invested assets as of December 31, 2018 and 50% as of December 31, 2017. The percentage of total invested assets representing bond investments in NAIC Categories 3 through 6 was 4% as of December 31, 2018 and 5% as of December 31, 2017. See "Investments" for more discussion of NAIC investment categories.

For loan-backed and structured securities, if the present value of cash flows expected to be collected is less than the amortized cost basis of the security, an OTTI is recognized as a realized loss equal to the difference between the investment's amortized cost basis and the present value of cash flows expected to be collected. The expected cash flows are discounted at the security's effective interest rate. Internal inputs used in determining the amount of the OTTI on structured securities include collateral performance, prepayment speeds, default rates, and loss severity based on borrower and loan characteristics, as well as deal structure including subordination, over-collateralization and cash flow priority. In addition, if MassMutual has the intent to sell, or the inability, or lack of intent to retain the investment for a period sufficient to recover the amortized cost basis, an OTTI is recognized as a realized loss equal to the entire difference between the investment's amortized cost basis and its fair value at the balance sheet date.

ABS and MBS are evaluated for OTTI using scenarios and assumptions based on the specifics of each security including collateral type, loan type, vintage and subordination level in the structure. Cash flow estimates are based on these assumptions and inputs obtained from external industry sources along with internal analysis and actual experience. Where applicable, assumptions include prepayment speeds, default rates and loss severity, weighted average-maturity and changes in the underlying collateral values.

MassMutual has a review process for determining if CDOs are at risk for OTTI. For the senior, mezzanine and junior debt tranches, cash flows are modeled using multiple scenarios based on the current ratings and values of the underlying corporate credit risks and incorporating prepayment and default assumptions that vary according to collateral attributes of each CDO. The prepayment and default assumptions are varied within each model based upon rating (base case), historical expectations (default), rating change improvement (optimistic), rating change downgrade (pessimistic) and fair value (market). The default rates produced by these multiple scenarios are assigned an expectation weight according to current market and economic conditions and fed into a final scenario. OTTI is recorded if this final scenario results in the loss of any principal or interest payments due.

For the most subordinated junior CDO tranches, the present value of the projected cash flows in the final scenario is measured using an effective yield. If the current book value of the security is greater than the present value measured using an effective yield, an OTTI is taken in an amount sufficient to produce its effective yield. Certain CDOs cannot be modeled using all of the scenarios because of limitations on the data needed for all scenarios. The cash flows for these CDOs, including foreign currency denominated CDOs, are projected using a customized scenario management believes is reasonable for the applicable collateral pool.

RMBS are included in the U.S. government and agencies, special revenue, and industrial and miscellaneous bond categories. The Alt-A category includes option adjustable rate mortgages and the subprime category includes 'scratch and dent' or reperforming pools, high loan-to-value pools, and pools where the borrowers have very impaired credit but the average loan-to-value is low, typically 70% or below. In identifying Alt-A and subprime exposure, management used a combination of qualitative and quantitative factors, including FICO scores and loan-to-value ratios.

As of December 31, 2018, RMBS had a total carrying value of $1.3 billion and a fair value of $1.4 billion, of which approximately 20%, based on carrying value, was classified as Alt-A. Alt-A and subprime RMBS had a total carrying value of $472 million and a fair value of $553 million. As of December 31, 2017, RMBS had a total carrying value of $1.5 billion and a fair value of $1.6 billion, of which approximately 21%, based on carrying value, was classified as Alt-A. Alt-A and subprime RMBS had a total carrying value of $566 million and a fair value of $687 million.

During the year ended December 31, 2018, there were no significant credit downgrades for the securities held by MassMutual that were backed by residential mortgage pools.

Leveraged loans are loans extended to companies that already have considerable amounts of debt. MassMutual reports leveraged loans as bonds. These leveraged loans have interest rates higher than typical loans reflecting the additional risk of default from issuers with high debt-to-equity ratios.

As of December 31, 2018, total leveraged loans and leveraged loan CDOs had a carrying value of $12.4 billion and a fair value of $12.3 billion, of which approximately 82%, based on carrying value, were domestic leveraged loans and CDOs. As of December 31, 2017, total leveraged loans and leveraged loan CDOs had a carrying value of $10.7 billion and a fair value of $10.8 billion, of which approximately 84%, based on carrying value, were domestic leveraged loans and CDOs.

MassMutual holds bonds backed by pools of commercial mortgages. The mortgages in these pools have varying risk characteristics related to underlying collateral type, borrower's risk profile and ability to refinance and the return provided to the borrower from the underlying collateral. These investments had a carrying value and fair value of $2.2 billion as of December 31, 2018 and a carrying value and fair value of $1.8 billion as of December 31, 2017.

Common stocks – subsidiaries and affiliates decreased $2.1 billion, or 15%, primarily due to a net return of capital from MMI of $1.4 billion, and the subsequent reclassification of the remaining $1.0 billion carrying value to Partnerships and LLCs.

Common stocks – unaffiliated decreased $712 million, or 59%, primarily due to net dispositions of $563 million and lower valuations due to declines in equity markets.

Mortgage loans increased $1.0 billion, or 5%, in 2018 primarily due to $1.4 billion of net acquisitions, partially offset by $244 million of transfers out of mortgage loans and $125 million net loss on foreign currency revaluation.

Policy loans increased $546 million, or 4%, in 2018 primarily due to increases in policy loan values of $1.6 billion and interest capitalization of $259 million, partially offset by loan repayments of $364 million and the net settlement of policy loans in surrenders, lapses and deaths of $926 million.

Real estate decreased $369 million, or 43%, in 2018 primarily due to $342 million in net sales (including $168 million in realized gains), a $319 million increase in encumbrances, and $84 million of depreciation, partially offset by $151 million of capital improvements and $57 million in transfers. As of December 31, 2018, commercial office buildings represented 54% and hotels represented 15% of MassMutual's real estate portfolio compared to 30% and 47% for the same property types as of December 31, 2017.

Partnerships and LLCs increased $921 million, or 12%, in 2018 primarily due to additional investments of $2.1 billion, net transfers of $1.3 billion, earnings of $1.0 billion, and gains on sales of $8 million. These increases were partially offset by returns of capital of $1.5 billion, income distributions of $854 million, sale and liquidation proceeds of $583 million, unrealized operating losses of $361 million, unrealized foreign exchange valuation losses of $61 million and book value impairments of $29 million.

Cash, cash equivalents and short-term investments increased $738 million, or 21%, in 2018. Cash, cash equivalents and short-term investments increased due to cash provided from operations of $6.4 billion and net cash provided from financing and other sources of $1.3 billion, partially offset by cash applied to investing activities of $7.0 billion.

Derivative assets decreased $116 million, or 1%, in 2018. The decrease is primarily due to decreased gains of $1.1 billion in interest rate swaps and $11 million in credit default swaps due to the changes in certain swap curve rates, partially offset by increased gains of $457 million in currency swaps, $216 million in financial futures, $166 million in options, and $93 million in forwards due to the weakening of the British Pound and Euro relative to the

U.S. Dollar and the decrease in certain interest rates, as well as changes in notional related to the repositioning of the portfolio as part of ongoing asset-liability management activity.

Investment income due and accrued increased $820 million to $3.0 billion, in 2018. The change is primarily due to income accrual increases in common stocks of $652 million, bonds of $181 million and real estate and preferred stocks of $6 million, partially offset by a decrease in derivatives of $28 million.

Deferred income taxes increased $222 million, or 29%, in 2018 primarily due to a $104 million increase associated with the three-year reversals of policyholder reserves, dividends and tax basis deferred policy acquisition costs and $83 million increase due to greater leveraging of hypothetical tax planning strategies as well as an increase in the overall inventory of deferred tax items.

Separate account assets decreased $4.7 billion in 2018, primarily due to market value depreciation of $3.0 billion and net customer cash outflows of $1.6 billion and fees of $394 million, partially offset by pending security settlements of $302 million. Separate account assets and liabilities represent segregated funds administered and invested by MassMutual for the benefit of individual and group variable annuity, variable life and other insurance contract/policyholders to meet specific investment objectives. Separate account assets can only be used to satisfy separate account liabilities and are not available to satisfy the general obligations of MassMutual, except for seed money transferred from the general investments of MassMutual placed in MassMutual's separate accounts.

Liabilities

Total liabilities increased $3.7 billion, or 2%, in 2018 primarily due to increases in policyholders' reserves of $6.2 billion, liabilities for deposit-type contracts of $1.4 billion, other liabilities of $713 million, repurchase agreements of $564 million, collateral of $285 million, policyholders' dividends of $112 million, asset valuation reserve of $100 million and funds held under coinsurance of $98 million, partially offset by a decrease separate account liabilities of $4.7 billion and derivatives of $1.1 billion.

Policyholders' reserves increased $6.2 billion to $122.0 billion in 2018. The increase reflects net growth of the inforce business, premium for MassMutual's protection and annuity products, and interest on reserves, partially offset by reserves released due to benefits, and policy fees. Increases were in whole life of $3.8 billion, pension risk transfer products, defined benefit and defined contribution of $1.7 billion, group life of $731 million and universal life of $420 million, partially offset by a decrease in annuities and supplemental contracts of $464 million.

Certain variable annuity contracts include additional death or other insurance benefit features, such as GMDBs, guaranteed minimum income benefits ("**GMIBs**"), GMABs and guaranteed minimum withdrawal benefits ("**GMWBs**"). In general, these benefit guarantees require the contract or policyholder to adhere to a company-approved asset allocation strategy. Election of these benefits on certain annuity contracts is generally only available at contract issue.

The following shows the liabilities for GMDBs, GMIBs, GMABs and GMWBs (in millions):

Liability as of January 1, 2017	$ 651
Incurred guarantee benefits	(131)
Paid guarantee benefits	(8)
Liability as of December 31, 2017	512
Incurred guarantee benefits	250
Paid guarantee benefits	(6)
Liability as of December 31, 2018	$ 756

MassMutual held reserves in accordance with the stochastic scenarios as of December 31, 2018 and 2017. As of December 31, 2018 and 2017, MassMutual held additional reserves above those indicated based on the stochastic scenarios in order to maintain a prudent level of reserve adequacy, which are included in the table above.

The change in reserves for variable annuity product guarantees in 2018 and 2017 was due to changes in financial market conditions.

The following summarizes the account values, net amount at risk and weighted average attained age for variable annuity contracts with GMDBs, GMIBs, GMABs and GMWBs classified as policyholders' reserves and separate account liabilities. The net amount at risk is defined as the minimum guarantee less the account value calculated on a policy-by-policy basis, but not less than zero.

	December 31, 2018			December 31, 2017		
	Account Value	Net Amount at Risk	Weighted Average Attained Age	Account Value	Net Amount at Risk	Weighted Average Attained Age
	($ In Millions)					
GMDB................	$ 17,392	$ 132	64	$ 20,118	$ 25	64
GMIB Basic........	700	97	69	910	37	68
GMIB Plus	2,687	813	67	3,210	416	66
GMAB...............	2,573	74	60	3,233	1	59
GMWB..............	160	23	70	204	7	69

Liabilities for deposit-type contracts increased $1.4 billion in 2018 primarily due to a geography shift from with life contingencies to without life contingencies of $1.7 billion. Medium-term notes decreased $245 million primarily due to maturities of $750 million, partially offset by a $500 million deposit and interest of $167 million. Liabilities for deposit-type contracts increased $1.4 billion in 2017 primarily due to the issuance of medium-term notes of $2.0 billion, partially offset by a $500 million maturity.

AVR increased $100 million, or 3%, in 2018 due to increases in net unrealized capital gains of $1.0 billion and changes in reserve contributions of $119 million partially offset by decreases in net realized capital losses of $691 million and adjustment down to maximum of $328 million.

The liability for repurchase agreements increased $564 million, or 13%, in 2018. Repurchase agreements, where MassMutual sells securities and simultaneously agrees to repurchase the same or substantially the same security at a later date, are utilized as part of overall portfolio management to help ensure MassMutual maintains adequate assets in order to provide yield, spread and duration to support liabilities and other corporate needs. MassMutual increases and decreases repurchase agreements in response to changing market conditions and changing liability needs.

Collateral increased $285 million, or 11%, to $2.9 billion as of December 31, 2018 from $2.7 billion as of December 31, 2017. The increase in collateral liability is consistent with the increase in derivative valuations. The derivative collateral liability is a function of contractual requirements. When certain threshold exposure levels and transfer amount levels are reached, MassMutual calls in additional collateral or returns excess collateral held. The total net collateral pledged was $2.5 billion as of December 31, 2018 and $2.5 billion as of December 31, 2017. MassMutual had the right to rehypothecate or repledge securities totaling $709 million of the $2.5 billion as of December 31, 2018 and $635 million of the $2.5 billion as of December 31, 2017 of net collateral pledged by counterparties. There were no securities rehypothecated to other counterparties as of December 31, 2018 or December 31, 2017.

Derivative liabilities decreased $1.1 billion, or 18%, in 2018. The decrease is primarily due to increased gains of $667 million in interest rate swaps, $337 million in currency swaps, $76 million in currency forwards due to the changes in certain swap curve rates and the weakening of the British Pound and Euro relative to the U.S. Dollar, partially offset by decreased gains of $14 million in financial futures due to the change in certain interest rates, as well as changes in notional related to the repositioning of the portfolio as part of ongoing asset-liability management activity.

Other liabilities increased $713 million, or 24%, in 2018 primarily due to timing of cash settlements.

Commercial paper had a carrying value and face amount of $250 million as of December 31, 2018 and 2017. MassMutual issues commercial paper in the form of notes in minimum denominations of $250 thousand up to a total aggregation of $1.0 billion. These notes have maturities up to a maximum of 270 days from the date of issue and are sold at par less a discount representing an interest factor or, if interest bearing, at par. The notes are not redeemable or subject to voluntary prepayments by MassMutual.

Surplus

Surplus decreased $95 million in 2018 to $15.6 billion as of December 31, 2018. The following table shows the change in surplus:

	December 31, 2018
	(In Millions)
Beginning surplus	$ 15,705
Net loss	(821)
Change in net unrealized capital gains (losses), net of tax	1,779
Change in net unrealized foreign exchange capital gains (losses), net of tax	(594)
Change in other net deferred income taxes	291
Change in nonadmitted assets	(716)
Change in asset valuation reserve	(100)
Prior period adjustments	(47)
Change in minimum pension liability	128
Other	(15)
Net decrease	(95)
Ending surplus	**$ 15,610**

Liquidity and Capital Resources

Liquidity

MassMutual manages its liquidity position by matching its exposure to cash demands with adequate sources of cash and other liquid assets. MassMutual's principal sources of liquidity are operating cash flows and holdings of cash, cash equivalents and other readily marketable assets.

MassMutual's investment portfolio is structured to ensure a strong liquidity position in order to permit timely payment of policy and contract benefits without requiring an uneconomic sale of assets. In general, liquid assets include cash and cash equivalents, investment grade public bonds and unaffiliated public common stock, all of which generally have ready markets with large numbers of buyers. The statement value of these assets as of December 31, 2018 was approximately $40.4 billion. While the investment portfolio does contain mortgage loans, real estate, other invested assets, below investment grade public bonds, private bonds, affiliated common stock and preferred stock which are generally considered illiquid for liquidity monitoring purposes, there is some ability to raise cash from these assets if needed.

MassMutual utilizes sophisticated asset/liability analysis techniques in the management of the investments supporting its liabilities. Additionally, MassMutual tests the adequacy of the projected cash flows provided by assets to meet all of its future policyholder and other obligations. MassMutual performs these studies using stress tests regarding future credit and other asset losses, market interest rate fluctuations, claim losses and other considerations. The result provides a picture of the adequacy of the underlying assets, reserves and capital. MassMutual analyzes a variety of scenarios modeling potential demands on liquidity, taking into account the provisions of its policies and contracts in force, its cash flow position, and the volume of cash and readily marketable securities in its portfolio. MassMutual proactively manages its liquidity position on an ongoing basis to meet cash needs while minimizing adverse impacts on investment returns.

In most scenarios that MassMutual has tested, operating cash flow is more than sufficient to satisfy MassMutual's obligations. Even in the most extreme scenarios tested, obligations can be met through cash flow and the sale of some of MassMutual's liquid assets. These stress test scenarios assume varying levels of policyholder behavior and asset values. In addition, if MassMutual was in a stress situation, some uses of cash could be suspended, including new investments in illiquid instruments.

Cash, Cash Equivalents and Short-term Investments

Historically, MassMutual has consistently generated net positive cash flows from operations. Cash flows provided from operations were $6.4 billion in 2018, $8.3 billion in 2017 and $9.3 billion in 2016. MassMutual's primary cash flow sources include defined benefit and contribution premium, life insurance premium, annuity premium, investment income, principal repayments on invested assets, and net transfers from separate accounts and financial product deposits.

Net cash provided from operations decreased $1.9 billion, or 23%, to $6.4 billion in 2018. The decrease was the result of an increase in benefit payments of $3.2 billion, lower net transfers from separate accounts of $419 million and an increase in commissions and other expenses of $401 million, partially offset by an increase in premium and other income collected of $1.4 billion, an increase in net receipts from group annuity reserves assumed of $334 million, an increase in net investment income of $220 million and an increase in federal and foreign income taxes recovered of $165 million.

Net cash provided from operations decreased $1.0 billion, or 11%, to $8.3 billion in 2017. The decrease was the result of an increase in benefit payments of $1.9 billion, lower net receipts from group annuity reserves assumed of $623 million and a decrease in federal and foreign income taxes recovered of $356 million, partially offset by higher transfers from separate accounts of $1.2 billion and an increase in premium and other income collected of $509 million.

Net cash provided from operations increased $1.5 billion, or 20%, to $9.3 billion in 2016. The increase was the result of higher transfers from separate accounts of $1.5 billion, an increase in premium and other income collected of $843 million and higher net receipts from group annuity reserves assumed of $568 million, partially offset by an increase in benefit payments of $1.6 billion.

Net cash used to purchase investments decreased $1.5 billion in 2018 to $7.0 billion. Purchases of investments and the net decrease in policy loans were $33.8 billion, while sales and maturities of investments and receipts from repayments of loans were $26.8 billion. Net purchases of investments in 2018 included bonds of $7.3 billion, mortgage loans of $1.4 billion and derivatives of $294 million.

Net cash used to purchase investments decreased $655 million in 2017 to $8.5 billion. Purchases of investments and the net increase in policy loans were $34.2 billion, while sales and maturities of investments and receipts from repayments of loans were $25.7 billion. Net purchases of investments in 2017 included bonds of $5.1 billion, mortgage loans of $1.5 billion and derivatives of $544 million.

Net cash used to purchase investments increased $2.4 billion in 2016 to $9.2 billion. Purchases of investments and the net increase in policy loans were $29.7 billion, while sales and maturities of investments and receipts from repayments of loans were $20.5 billion. Net purchases of investments in 2016 included bonds of $6.7 billion, common stocks of $1.4 billion and partnerships and LLCs of $660 million.

Net cash from financing activities and other sources increased $1.3 billion in 2018, primarily due to the increase in other cash provided of $1.3 billion, an increase in the change in repurchase agreements of $1.1 billion and an increase in change in collateral of $230 million, partially offset by a decrease in net deposits on deposit-type contracts of $1.3 billion.

Net cash from financing activities and other sources decreased $451 million in 2017, primarily due to the decrease in change in collateral of $892 million and an increase in the change in repurchase agreements of $124 million, partially offset by an increase in net deposits on deposit-type contracts of $605 million.

Net cash from financing activities and other sources increased $405 million in 2016, primarily due to the purchase of COLI of $1.9 billion in 2015, partially offset by a reduction in repurchase agreements of $873 million and proceeds from a surplus note issuance of $491 million in 2015.

Institutional Investment Product Contract Terms

Assets received for funding agreements may be invested in the general account of MassMutual. As of December 31, 2018, funding agreement balances in the general account totaled $8.8 billion, consisting of $6.0 billion in note programs, $1.1 billion in FHLB Boston funding agreements, $815 million of Municipal Contracts and $919 million of various other agreements. As of December 31, 2017, funding agreement balances in the general account totaled $8.8 billion, consisting of $6.2 billion in note programs, $1.1 billion in FHLB funding agreements, $761 million of Municipal Contracts and $787 million of various other agreements.

Note programs

Funding agreements are investment contracts sold to domestic and international institutional investors. Funding agreement liabilities are equal to the account value and are established by contract deposits, increased by interest credited and decreased by contract coupon payments and maturities. Contract holders do not have the right to terminate the contract prior to the contractually stated maturity date. MassMutual may retire funding agreements prior to the contractually stated maturity date by repurchasing the agreement in the market or, in some cases, by calling the agreement. If this occurs, the difference in value is an adjustment to interest credited to liabilities for deposit-type contracts in the Statutory Statements of Operations. Credited interest rates vary by contract and can be fixed or floating. Agreements do not have put provisions or ratings-based triggers. The liability of non-U.S. dollar denominated funding agreements may increase or decrease due to changes in foreign exchange rates. Currency swaps are employed to eliminate foreign exchange risk from all funding agreements issued to back non-U.S. dollar denominated notes.

Under the note programs, MassMutual creates SPEs, which are investment vehicles or trusts, for the purpose of issuing medium-term notes to investors. Proceeds from the sale of the medium-term notes issued by these SPEs are used to purchase funding agreements from MassMutual. The payment terms of any particular series of notes are matched by the payment terms of the funding agreement securing the series. Notes were issued from MassMutual's $2.0 billion European Medium-Term Note Program with approximately $113 million outstanding as of December 31, 2018. Notes are currently issued from MassMutual's $21.0 billion Global Medium-Term Note Program.

Federal Home Loan Bank of Boston

MassMutual has funding agreements with FHLB Boston in an investment spread strategy, consistent with its other funding agreements. These funding agreements are collateralized by securities with estimated fair values of $1.1 billion as of December 31, 2018. MassMutual's borrowing capacity with FHLB Boston is subject to the lower of the limitation on the pledge of collateral for a loan set forth by law or by MassMutual's internal limit. MassMutual's unused capacity was $896 million as of December 31, 2018. As a member of FHLB Boston, MassMutual held common stock of FHLB Boston with a statement value of $74 million as of December 31, 2018 and December 31, 2017.

Municipal Contracts

Municipal Contracts include contracts that contain terms with above market crediting rates. Liabilities for these contracts includes the Municipal Contracts' account values, which are established by contract deposits, increased by interest credited (fixed or floating) and decreased by contract coupon payments, additional withdrawals, maturities and amortization of premium. Certain Municipal Contracts allow additional deposits, subject to restrictions, which are credited based on the rates in the contracts. Contracts have scheduled payment dates and amounts and interest is paid periodically. In addition, certain contracts allow additional withdrawals above and beyond the scheduled payments. These additional withdrawals have certain restrictions on the number per year, minimum dollar amount and are limited to the maximum contract balance. The majority of the Municipal Contracts allow early contract termination under certain conditions.

Certain Municipal Contracts contain make-whole provisions, which document the formula for full contract payout. Certain Municipal Contracts have ratings-based triggers that allow the trustee to declare the entire balance due and payable. Municipal Contracts may also have terms that require MassMutual to post collateral to a third party based on the contract balance in the event of a downgrade in ratings below certain levels under certain circumstances. When the collateral is other than cash, the collateral value is required to be greater than the account balance. The collateral is $158 million as of December 31, 2018 and $169 million as of December 31, 2017. MassMutual employs a rigorous asset/liability management process to help mitigate the economic impacts of various liability risks. By performing asset liability management and performing other risk management activities, MassMutual believes that these contract provisions do not create an undue level of operating risk to MassMutual.

Other deposits

Other deposits primarily consist of investment contracts assumed as part of the indemnity reinsurance agreement. These contracts are used to fund retirement plans. Contract payments are not contingent upon the life of the retirement plan participant.

As of December 31, 2018, the maturity schedule for funding agreement liabilities was as follows:

Funding Agreements

(In Millions)

2019	$	1,528
2020		1,407
2021		1,394
2022		1,123
2023		193
Thereafter		3,180
Total	**$**	**8,825**

Dividends from Subsidiaries

MassMutual does not rely on dividends from its subsidiaries to meet its operating cash flow requirements. Dividend payments from insurance subsidiaries are generally subject to certain restrictions imposed by statutory authorities. Additionally, dividend payments from other subsidiaries are limited to their retained earnings.

For C.M. Life Insurance Company and MML Bay State Life Insurance Company, substantially all of the statutory shareholder's equity of approximately $1.6 billion as of December 31, 2018 was subject to dividend restrictions. Dividend restrictions, imposed by various state regulations, limit the payment of dividends to MassMutual without the prior approval from the insurance department of the particular insurance subsidiary's state of domicile.

MassMutual's wholly owned subsidiary, MMHLLC, is the parent of subsidiaries which include retail and institutional asset management, and registered broker dealers. Dividends from MMHLLC are recorded in net investment income and are limited to MassMutual's retained earnings in MMHLLC.

Capital Resources

As of December 31, 2018, MassMutual's total adjusted capital, as defined by the NAIC, was $19.9 billion, compared to $17.4 billion as of December 31, 2017. The NAIC has an RBC model to compare total adjusted capital with a standard design in order to reflect an insurance company's risk profile. Although MassMutual believes that there is no single appropriate means of measuring RBC needs, MassMutual feels that the NAIC approach to RBC measurement is reasonable, and MassMutual manages its capital position with significant attention to maintaining adequate total adjusted capital relative to RBC. MassMutual's total adjusted capital was well in excess of all RBC standards as of December 31, 2018 and 2017. MassMutual believes that it enjoys a strong capital position in light of its risks and that it is well positioned to meet policyholder and other obligations.

Debt

MassMutual has a $1.0 billion, five-year credit facility, with a syndicate of lenders that can be used for general corporate purposes and to support commercial paper borrowings. During December 2018, the credit facility was renewed and the scheduled maturity is December 2023. The credit facility includes two one-year extension options that may be exercised with proper notification as set forth in the agreement. The credit facility has an upsize option for an additional $500 million. The terms of the credit facility additionally provide for, among other provisions, covenants pertaining to liens, fundamental changes, transactions with affiliates and adjusted statutory surplus. As of and for the years ended December 31, 2018 and 2017, MassMutual was in compliance with all covenants under the credit facility. For the years ended December 31, 2018 and 2017, there were no draws on the credit facilities. Credit facility fees were less than $1 million for the years ended December 31, 2018 and 2017.

Investments

General

As of December 31, 2018, approximately 26% of MassMutual's assets are separate account assets, which are directed by MassMutual's policyholders. Separate account assets consist principally of marketable securities reported at fair value and are not available to satisfy liabilities that arise from any of MassMutual's other businesses. The following discussion focuses on the general investments of MassMutual, which do not include MassMutual's separate account assets.

As of December 31, 2018, MassMutual had $171.2 billion of invested assets, an increase of $7.3 billion from the prior year. MassMutual manages the portfolio of invested assets to support the general liabilities of MassMutual in light of liability characteristics and yield, liquidity and diversification considerations.

The following table sets forth MassMutual's invested assets:

	December 31,			
	2018		2017	
	Carrying Value	% of Total	Carrying Value	% of Total
	($ In Millions)			
Bonds	$ 97,079	57%	$ $90,435	55 %
Preferred stocks	744	-	768	-
Common stocks - subsidiaries and affiliates	12,327	7	14,424	9
Common stocks - unaffiliated	500	-	1,212	1
Mortgage loans	23,624	14	22,580	14
Policy loans	13,873	8	13,327	8
Real estate	488	-	857	1
Partnerships and LLCs	8,599	5	7,678	5
Derivatives	8,741	5	8,857	5
Cash, cash equivalents and short-term investments	4,318	3	3,580	2
Other invested assets	943	1	203	-
Total invested assets	**$ 171,236**	**100%**	**$ 163,921**	**100 %**

The following sets forth earnings yields by asset type:

	December 31,		
	2018	2017	2016
Long-term bonds	4.4 %	4.3 %	4.3 %
Preferred & common stocks	1.1	0.8	1.6
Mortgage loans	4.4	4.3	4.7
Policy loans	6.3	6.2	6.3
Real estate	(2.9)	(1.5)	0.3
Partnerships and LLCs	13.0	8.6	6.5
Derivatives	NM	NM	NM
Total portfolio	**4.7 %**	**4.5 %**	**4.6 %**

NM = not meaningful

Bonds, Cash Equivalents and Short-Term Investments

Bonds consist primarily of government backed securities and high quality marketable corporate debt securities. MassMutual invests a significant portion of its investment funds in high quality publicly traded bonds to maintain and manage liquidity and reduce the risk of default in the portfolio.

The SVO rates investment credit risk based upon the issuer's credit profile. NAIC rating designations range from 1 to 6. The NAIC designation of 1 denotes obligations of the highest quality in which credit risk is at its lowest and the issuer's credit profile is stable, whereas the NAIC designation of 6 is assigned to obligations that are in or near default. Classes 1 and 2 are investment grade and Classes 3 through 6 are non-investment grade.

MassMutual used SVO ratings for the bond portfolio along with what it believes were the equivalent rating agency designations except for RMBS and CMBS that were rated by outside modelers. The following sets forth the NAIC class ratings for the bond portfolio including RMBS and CMBS as of December 31, 2018 and 2017. The following table consists of long-term bonds, short-term securities and cash equivalents.

Total Portfolio Credit Quality

		December 31,			
		2018		2017	
NAIC Class	Equivalent Rating Agency Designation	Carrying Value	% of Total	Carrying Value	% of Total
		($ In Millions)			
1	Aaa/Aa/A....................	$ 54,797	55%	$ 49,108	53 %
2	Baa............................	39,722	39	35,673	38
3	Ba	2,852	3	4,824	5
4	B...............................	2,005	2	2,805	3
5	Caa and lower..............	1,495	1	999	1
6	In or near default	351	-	387	-
	Total	**$ 101,222**	**100 %**	**$ 93,796**	**100 %**

The following summarizes NAIC designations for RMBS and CMBS subject to modeling as of December 31, 2018 and 2017:

	December 31,							
	2018				2017			
	RMBS		CMBS		RMBS		CMBS	
NAIC Class	Carrying Value	% of Total	Carrying Value	% of Total	Carrying Value	% of Total	Carrying Value	% of Total
	($ In Millions)							
1	$ 968	100%	$ 2,109	95%	$ 672	100%	$ 1,749	99%
2	-	-	23	1	-	-	6	-
3	-	-	-	-	-	-	3	-
4	-	-	11	1	-	-	-	-
5	-	-	48	2	-	-	-	-
6	-	-	24	1	-	-	26	1
	$ 968	**100%**	**$ 2,215**	**100%**	**$ 672**	**100%**	**$ 1,784**	**100%**

The following sets forth the SVO ratings for MassMutual's publicly traded portfolio, along with what MassMutual believes are the equivalent rating agency designations for all bonds except RMBS and CMBS, which were rated by outside modelers. The following table consists of long-term bonds, short-term securities and cash equivalents.

Publicly Traded Portfolio Credit Quality

		December 31,			
		2018		2017	
NAIC Class	**Equivalent Rating Agency Designation**	**Carrying Value**	**% of Total**	**Carrying Value**	**% of Total**
		($ In Millions)			
1	Aaa/Aa/A....................	$ 26,779	65 %	$ 24,813	64 %
2	Baa............................	13,447	32	12,380	31
3	Ba	634	2	1,278	3
4	B...............................	467	1	895	2
5	Caa and lower	108	-	152	-
6	In or near default	9	-	40	-
	Total	**$ 41,444**	**100 %**	**$ 39,558**	**100 %**

The following sets forth the SVO ratings for MassMutual's privately placed portfolio, along with what MassMutual believes are the equivalent rating agency designations for all bonds except RMBS and CMBS, which were rated by outside modelers. The following table consists of long-term bonds, short-term securities and cash equivalents.

Privately Placed Portfolio Credit Quality

		December 31,			
		2018		2017	
NAIC Class	**Equivalent Rating Agency Designation**	**Carrying Value**	**% of Total**	**Carrying Value**	**% of Total**
		($ In Millions)			
1	Aaa/Aa/A......................	$ 28,018	47%	$ 24,295	44%
2	Baa...............................	26,275	44	23,293	42
3	Ba	2,218	4	3,546	7
4	B..................................	1,538	3	1,910	4
5	Caa and lower................	1,387	2	847	2
6	In or near default	342	1	347	1
	Total........................	**$ 59,778**	**100 %**	**$ 54,238**	**100 %**

MassMutual uses its investments in the privately placed portfolio to enhance the value of the overall portfolio, increase diversification and obtain higher yields than can be earned by investing in public market securities of comparable quality. To control risk when using privately placed securities, MassMutual relies upon broader access to management information, stronger negotiated protective covenants, call protection features and a higher level of collateralization than can customarily be achieved in the public market.

The strength of the privately placed portfolio is demonstrated by the predominance of NAIC Class 1 and 2 securities.

The following sets forth the total bond portfolio, including short-term securities and cash equivalents, by industry category, as of December 31, 2018:

	Bond Portfolio by Industry					
	December 31, 2018					
	Public		Private		Total	
Industry Category	Carrying Value	% of Total	Carrying Value	% of Total	Carrying Value	% of Total
	($ In Millions)					
Government Related	$ 13,027	31 %	$ 1,361	2%	$ 14,388	14%
Financial Institutions	2,809	7	9,690	16	12,499	12
Utility	3,022	7	7,025	12	10,047	10
CDO	110	-	7,246	12	7,356	7
Capital Goods	2,666	6	3,249	5	5,915	6
Transportation	1,105	3	4,680	8	5,785	6
REITS	1,085	3	4,132	7	5,217	5
Consumer Non-Cyclical	1,449	4	3,675	6	5,124	5
Healthcare	3,025	7	1,821	3	4,846	5
Energy	2,037	5	2,636	4	4,673	5
ABS	842	2	3,570	6	4,412	5
Consumer Cyclical	1,383	3	2,791	5	4,174	4
Communications	1,849	5	1,247	2	3,096	3
Basic Industry	1,580	4	1,504	3	3,084	3
Other Industrial	378	1	2,663	4	3,041	3
CMBS	1,172	3	1,059	2	2,231	2
Technology	1,228	3	928	2	2,156	2
Insurance	1,279	3	396	1	1,675	2
CMO	1,001	2	105	-	1,106	1
MBS Pass-Through	397	1	-	-	397	-
Total	**$ 41,444**	**100 %**	**$ 59,778**	**100 %**	**$ 101,222**	**100 %**

MBS consist mainly of RMBS and collateralized mortgage obligations (both primarily government-backed or government agency-backed) as well as CMBS of generally high quality, which are supported by well-diversified collateral. MassMutual does not originate any residential mortgages but invests in residential mortgage loan pools that may contain mortgages of subprime credit quality.

With the exception of government securities, only financial institution group holdings exceed 10% of the total bond portfolio. MassMutual believes that the financial institution holdings are well diversified and include a number of issues that are effectively supported by large pools of assets that are themselves diversified by industry and issuer.

Bond Portfolio Surveillance and Underperforming Investments

Bonds are generally valued at amortized cost using the constant yield interest method with the exception of NAIC Category 6 bonds, which are in or near default, and certain RMBS and CMBS, which are rated by outside modelers, which are carried at the lower of amortized cost or fair value. NAIC ratings are applied to bonds and other securities. Categories 1 and 2 are considered investment grade, while Categories 3 through 6 are considered below investment grade. Bond transactions are recorded on a trade date basis, except for private placement bonds, which are recorded on the funding date.

For loan-backed and structured securities, such as ABS, MBS, including RMBS and CMBS, and structured securities, including CDOs, amortization or accretion is revalued quarterly based on the current estimated cash flows, using either the prospective or retrospective adjustment methodologies.

Certain fixed income securities with the highest ratings from a rating agency follow the retrospective method of accounting. Under the retrospective method, the recalculated effective yield equates the present value of the actual and anticipated cash flows, including new prepayment assumptions, to the original cost of the investment. Prepayment assumptions are based on borrower constraints and economic incentives such as the original term, age and coupon of the loan as affected by the interest rate environment. The current carrying value is then increased or decreased to the amount that would have resulted had the revised yield been applied since inception, and investment income is correspondingly decreased or increased.

All other fixed income securities, such as floating rate bonds and interest only securities, including those that have been impaired, follow the prospective method of accounting. Under the prospective method, the recalculated future effective yield equates the carrying value of the investment to the present value of the anticipated future cash flows.

The fair value of bonds is based on quoted market prices when available. If quoted market prices are not available, values provided by other third-party organizations are used. If values provided by other third-party organizations are unavailable, fair value is estimated using internal models by discounting expected future cash flows using observable current market rates applicable to yield, credit quality and maturity of the investment or using quoted market values for comparable investments. Internal inputs used in the determination of fair value include estimated prepayment speeds, default rates, discount rates and collateral values, among others. Structure characteristics and cash flow priority are also considered. Fair values resulting from internal models are those expected to be received in an orderly transaction between willing market participants.

MassMutual employs a systematic methodology to evaluate OTTI by conducting a quarterly analysis of bonds. The impairment review process provides a framework for determining OTTI in a manner consistent with market participant assumptions. MassMutual considers the following factors, where applicable depending on the type of securities, in the evaluation of whether a decline in value is other than temporary: (a) the likelihood that MassMutual will be able to collect all amounts due according to the contractual terms of the debt security; (b) the present value of the expected future cash flows of the security; (c) the characteristics, quality and value of the underlying collateral or issuer securing the position; (d) collateral structure; (e) the length of time and extent to which the fair value has been below amortized cost; (f) the financial condition and near-term prospects of the issuer; (g) adverse conditions related to the security or industry; (h) the rating of the security; and (i) MassMutual's ability and intent to hold the investment for a period of time sufficient to allow for an anticipated recovery to amortized cost.

MassMutual also considers other qualitative and quantitative factors in determining the existence of OTTI including, but not limited to, unrealized loss trend analysis and significant short-term changes in value.

When a bond is other-than-temporarily impaired, a new cost basis is established. For loan-backed and structured securities, any difference between the new amortized cost basis and any increased present value of future cash flows expected to be collected is accreted into net investment income over the expected remaining life of the bond.

The impairment review process provides a framework for deriving OTTI in a manner consistent with market participant assumptions. In these analyses, collateral type, investment structure and credit quality are critical elements in determining OTTI.

MassMutual actively reviews the bond portfolio to estimate the likelihood and amount of financial defaults or write-downs in the portfolio and to make timely decisions as to the potential sale or renegotiation of terms of specific investments.

The NAIC defines underperforming bonds as those which are not currently receiving interest and/or principal payments which are deemed to be caused by the inability of the obligor to make such payments as called for in the bond contract.

The following sets forth the carrying value of bonds in NAIC Classes 5 and 6 split between performing and underperforming status:

	December 31,	
	2018	2017
	(In Millions)	
Performing:		
Public	$ 113	$ 184
Private	1,692	1,133
Total performing	1,805	1,317
Underperforming		
Public	5	8
Private	38	61
Total underperforming	43	69
Total	**$ 1,848**	**$ 1,386**

The following is a summary of the fair values and gross unrealized losses aggregated by bond category and length of time that the securities were in a continuous unrealized loss position:

	December 31, 2018					
	Less Than 12 Months			12 Months or Longer		
	Fair Value	Unrealized Losses	Number of Issuers	Fair Value	Unrealized Losses	Number of Issuers
	($ In Millions)					
U.S. government and agencies	$ 10	$ -	7	$ 1,459	$ 21	14
All other governments	586	20	35	255	16	22
States, territories and possessions	9	-	2	88	2	5
Political subdivisions	23	-	4	115	2	7
Special revenue	362	5	52	534	18	96
Industrial and miscellaneous	29,105	865	1,748	16,852	1,071	1,145
Parent, subsidiaries and affiliates	2,146	37	25	3,582	48	8
Total	**$ 32,241**	**$ 927**	**1,873**	**$ 22,885**	**$ 1,178**	**1,297**

The December 31, 2018 unrealized losses include $30 million of losses included in the carrying value. These losses include $30 million from NAIC Class 6 bonds and were primarily included in industrial and miscellaneous or parent, subsidiaries and affiliates.

The following is a summary of the gross unrealized losses aggregated by bond category, length of time that the securities were in a continuous unrealized loss position and investment grade:

	December 31, 2018					
	Less Than 12 Months			12 Months or Longer		
	Investment Grade	Below Investment Grade	Total	Investment Grade	Below Investment Grade	Total
	($ In Millions)					
U.S. government and agencies	$ -	$ -	$ -	$ 21	$ -	$ 21
All other governments	16	4	20	14	2	16
States, territories and possessions	-	-	-	2	-	2
Political subdivisions	-	-	-	2	-	2
Special revenue	5	-	5	16	2	18
Industrial and miscellaneous	745	120	865	909	162	1,071
Parent, subsidiaries and affiliates	23	14	37	40	9	49
Total	**$ 789**	**$ 138**	**$ 927**	**$ 1,004**	**$ 175**	**$ 1,179**

Unrealized losses increased $1.7 billion from the prior year, mainly for industrial and miscellaneous bonds, due to the increase in interest rates in 2018.

As of December 31, 2018, management has not deemed these unrealized losses to be other than temporary because the investment's carrying value is expected to be realized and MassMutual has the ability and intent not to sell these investments until recovery, which may be at maturity.

Mortgage Loans

Mortgage loans represented 14% of total invested assets as of December 31, 2018. Mortgage loans consist of whole loans on commercial real estate and residential mortgage loan pools. Commercial mortgage loans were 95% of the mortgage loan portfolio as of December 31, 2018.

Commercial Mortgage Loans

MassMutual's commercial mortgage loan portfolio, which includes $70 million of mezzanine loans, consisted of fixed and variable rate loans.

As of December 31, 2018, 96% of the commercial mortgage loan portfolio consisted of bullet loans. Bullet loans are loans that do not fully amortize over their term; instead, full payment is due at the end of their term.

MassMutual had $373 million of bullet loans scheduled to mature during 2018, of which 12 loans totaling $325 million, or 87%, were paid in full, two loans totaling $28 million, or 8%, were voluntarily refinanced and one loan totaling $19 million, or 5%, extended its maturity. In addition, $679 million of bullet loans were disposed in 2018, of which seven loans totaling $314 million, or 46%, were paid in full and 14 loans totaling $260 million, or 38%, prepaid in full with yield maintenance and two loans totaling $105 million or 15% voluntarily refinanced. Bullet loans of $710 million are scheduled to mature in 2019.

As of December 31, 2018, MassMutual did not have any loans within its commercial mortgage loan portfolio with valuation allowances.

MassMutual believes that the maturities of its commercial mortgage loans are well diversified, and MassMutual carefully monitors and manages them based on its liquidity position.

The following sets forth the commercial mortgage loan portfolio by geographic distribution:

	December 31,			
	2018		2017	
	Carrying Value	% of Total	Carrying Value	% of Total
	($ In Millions)			
United States:				
West	$ 7,164	32 %	$ 6,571	32 %
Northeast	3,387	15	3,275	16
Mid-Atlantic	3,025	14	3,028	14
Midwest	2,992	13	2,929	14
Southwest	2,574	12	2,196	11
Southeast	995	4	973	5
United Kingdom	2,024	9	1,554	7
Canada	196	1	251	1
Total	**$ 22,357**	**100 %**	**$ 20,777**	**100 %**

The following sets forth the commercial mortgage loan portfolio loan-to-value ratios by property type:

	December 31, 2018				
	Less than 81%	81% to 95%	Above 95%	Total	% of Total
	($ In Millions)				
Office	$ 7,452	$ -	$ -	$ 7,452	33 %
Apartments	5,680	34	-	5,714	25
Industrial and other	3,327	28	-	3,355	15
Hotels	2,774	37	-	2,811	13
Retail	2,989	-	36	3,025	14
Total	**$ 22,222**	**$ 99**	**$ 36**	**$ 22,357**	**100 %**

	December 31, 2017				
	Less than 81%	81% to 95%	Above 95%	Total	% of Total
	($ In Millions)				
Office	$ 6,409	$ -	$ -	$ 6,409	31 %
Apartments	5,415	-	-	5,415	26
Industrial and other	3,619	-	-	3,619	18
Hotels	2,778	-	-	2,778	13
Retail	2,519	37	-	2,556	12
Total	**$ 20,740**	**$ 37**	**$ -**	**$ 20,777**	**100 %**

Residential Mortgage Loans

Residential mortgage loans are primarily seasoned pools of homogeneous residential mortgage loans, most of which are Federal Housing Administration ("**FHA**") insured or Veterans Administration ("**VA**") guaranteed. As of December 31, 2018 and 2017, MassMutual had no direct subprime exposure through the purchases of unsecuritized whole-loan pools. MassMutual had mortgages with residential mortgage-backed exposure with a carrying value of $1.3 billion as of December 31, 2018 and $1.8 billion in 2017, most of which were FHA insured or VA guaranteed.

Mortgage Loan Portfolio Surveillance and Underperforming Investments

MassMutual actively monitors, manages and directly services its commercial mortgage loan portfolio. MassMutual performs or reviews all aspects of loan origination and portfolio management, including lease analysis, property transfer analysis, economic and financial reviews, tenant analysis, and management of default and bankruptcy proceedings.

MassMutual revalues underperforming properties each year and re-inspects these properties at least every other year based on internal quality ratings. The criteria used to determine whether a current or potential problem exists includes borrower bankruptcies, major tenant bankruptcies, requests for restructuring, delinquent tax payments, late payments, loan-to-value or debt service coverage deficiencies, and overall vacancy levels.

There were no current or potential problem mortgage loans consisting of restructured mortgage loans where the modified terms are less than current market conditions as of December 31, 2018 and 2017. There were no commercial mortgage loans in the process of foreclosure or in default as of December 31, 2018. The AVR contains a mortgage loans component, which increased to $231 million as of December 31, 2018 from $215 million as of December 31, 2017. See “Investment Reserves.”

Real Estate

MassMutual’s real estate portfolio includes real estate properties MassMutual occupies and real estate MassMutual originally acquired as investments or through foreclosure or deed in lieu of foreclosure.

As of December 31, 2018, MassMutual’s real estate portfolio consisted of 16 properties with a statement value of $488 million of which $195 million was occupied by MassMutual. As of December 31, 2017, MassMutual’s real estate portfolio consisted of 25 properties with a statement value of $857 million of which $144 million was occupied by MassMutual. The portfolio uses leverage to maximize return. The portfolio had third party non-recourse debt outstanding of $931 million as of December 31, 2018 and $611 million as of December 31, 2017.

The following tables illustrate the diversity of MassMutual’s real estate portfolio by property type and geographic distribution:

Real Estate by Property Type

	December 31,			
	2018		2017	
	Carrying	% of Total	Carrying	% of Total
	($ In Millions)			
Office	$ 263	55 %	$ 261	31 %
Retail	104	21	105	12
Hotel	74	15	405	47
Apartments	21	4	59	7
Industrial & Other	26	5	27	3
Total	**$ 488**	**100 %**	**$ 857**	**100 %**

Real Estate by Geographic Distribution December 31,				
	2018		2017	
	Carrying	% of Total	Carrying	% of Total
	($ In Millions)			
Northeast	$ 212	43 %	$ 262	31 %
Southeast	116	24	374	44
Mid-Atlantic	138	28	156	18
West	22	5	55	6
Southwest	-	-	24	3
Midwest	-	-	(14)	(2)
Total	**$ 488**	**100 %**	**$ 857**	**100 %**

MassMutual reviews individual property valuations on a quarterly basis. Asset managers establish MassMutual's real estate valuations using third party valuation software which projects income on a lease-by-lease basis. Included in the valuation are budgeted expenses, leasing assumptions, and capital expenditures. MassMutual reviews these valuations for technical accuracy, methodology and the appropriateness of the assumed rates of return. Generally, external independent appraisers value a rotating selection of properties on a quarterly basis. If an external appraisal is not obtained, an internal appraisal is performed. For 2018, there were no properties where an external appraisal was not received. As of December 31, 2018, MassMutual's real estate and other invested asset AVR totaled $1.2 billion.

Partnerships and LLCs

The carrying value of partnership and LLC holdings by annual statement category were as follows:

	December 31,	
	2018	2017
	(In Millions)	
Joint venture interests:		
Common stocks - subsidiaries and affiliates	$3,108	$1,978
Common stocks - unaffiliated	1,950	2,210
Real estate	1,309	1,531
Fixed maturities/preferred stocks	957	870
Low income housing tax credits	287	330
Other	280	302
Mortgage loans	409	211
Surplus notes	299	246
Total	**$8,599**	**$7,678**

The gain and loss activity of partnerships and LLCs was as follows:

	Years Ended December 31,		
	2018	2017	2016
	(In Millions)		
Gross realized capital (losses) gains on sales	$ 8	$ (27)	$ 3
Gross realized capital losses on foreign currency	(3)	(7)	6
OTTI	(62)	(53)	(91)

Partnerships and LLCs, except for investments in partnerships that generate and realize LIHTCs, are accounted for using the equity method with the change in the equity value of the underlying investment recorded in surplus. When it appears probable that MassMutual will be unable to recover the outstanding cost of an investment, or there is evidence indicating an inability of the investee to sustain earnings to justify the carrying value of the investment, an OTTI is recognized in realized capital losses reflecting the excess of the cost over the estimated fair value of the investment. The estimated fair value is determined by assessing the value of the partnership or LLC's underlying assets, cash flow, current financial condition and other market factors. Distributions received are recognized as net investment income to the extent the distribution does not exceed previously recorded accumulated undistributed earnings. As of December 31, 2018, MassMutual did not hold any partnerships or LLCs with significant subprime or Alt-A exposure.

For determining impairments for LIHTC investments, MassMutual uses the present value of all future benefits, the majority of which are tax credits, discounted at a risk-free rate ranging from 2.5% for future benefits of two years to 2.7% for future benefits of ten or more years, and compares the result to its current carrying value. MassMutual recorded $5 million of impairments for the year ended December 31, 2018. The Tax Cuts and Jobs Act, enacted into law on December 22, 2017, reduced the statutory federal tax rate from 35% to 21%, effective January 1, 2018. Due to this law change, impairments of $2 million were recorded for the year ended December 31, 2017.

Derivatives

MassMutual uses derivative financial instruments in the normal course of business to manage risks, primarily to reduce currency, interest rate and duration imbalances determined in asset/liability analyses. MassMutual also uses a combination of derivatives and fixed income investments to create synthetic investments. These synthetic investments are created when they are economically more attractive than the actual instrument or when similar instruments are unavailable. Synthetic investments are created either to hedge and reduce MassMutual's credit and foreign currency exposure or to create an investment in a particular asset. MassMutual held synthetic investments with a notional amount of $15.5 billion as of December 31, 2018 and $13.1 billion as of December 31, 2017. These notional amounts included replicated asset transaction values of $13.6 billion as of December 31, 2018 and $11.5 billion as of December 31, 2017, as defined under statutory accounting practices as the result of pairing of a long derivative contract with cash instruments.

MassMutual's principal derivative exposures to market risk are interest rate risk, which includes inflation and credit risk. Interest rate risk pertains to the change in fair value of the derivative instruments as a result of changes in market interest rates. MassMutual is exposed to credit-related losses in the event of nonperformance by counterparties to derivative financial instruments. MassMutual regularly monitors counterparty credit ratings, derivative positions, valuations and the value of collateral posted to ensure counterparties are credit-worthy and the concentration of exposure is minimized, and monitors its derivative credit exposure as part of its overall risk management program.

MassMutual enters derivative transactions through bilateral derivative agreements with counterparties, or through over the counter cleared derivatives with a counterparty and the use of a clearinghouse. To minimize credit risk for bilateral transactions, MassMutual and its counterparties generally enter into master netting agreements based on agreed upon requirements that outline the framework for how collateral is to be posted in the amount owed under each transaction, subject to certain minimums. For over the counter cleared derivative transactions between MassMutual and a counterparty, the parties enter into a series of master netting and other agreements that govern, among other things, clearing and collateral requirements. These transactions are cleared through a clearinghouse and each derivative counterparty is only exposed to the default risk of the clearinghouse. Certain interest rate swaps and credit default swaps are considered cleared transactions. These cleared transactions require initial and daily variation margin collateral postings. These agreements allow for contracts in a positive position, in which amounts are due to MassMutual, to be offset by contracts in a negative position. This right of offset, combined with collateral obtained from counterparties, reduces MassMutual's credit exposure.

Net collateral pledged by the counterparties was $2.5 billion as of December 31, 2018 and $2.5 billion as of December 31, 2017. In the event of default, the full market value exposure at risk in a net gain position, net of offsets and collateral, was $146 million as of December 31, 2018 and $115 million as of December 31, 2017. The statutory net amount at risk, defined as net collateral pledged and statement values excluding accrued interest, was $695 million as of December 31, 2018 and $595 million as of December 31, 2017.

MassMutual also has the right to rehypothecate or repledge securities totaling $709 million of the $2.5 billion as of December 31, 2018 and $635 million of the $2.5 billion as of December 31, 2017 of net collateral pledged by counterparties. There were no securities rehypothecated to other counterparties as of December 31, 2018 or December 31, 2017.

The following summarizes the carrying values and notional amounts of MassMutual's derivative financial instruments:

	December 31, 2018			
	Assets		Liabilities	
	Carrying Value	Notional Amount	Carrying Value	Notional Amount
	(In Millions)			
Interest rate swaps………………	$ 6,629	$ 88,214	$ 4,647	$ 86,096
Options…………………………..	911	19,657	5	3
Currency swaps………………….	843	8,976	232	4,022
Interest rate caps and floors……	18	8,465	-	-
Forward contracts……………….	106	6,642	12	3,633
Credit default swaps…………….	18	1,135	2	104
Financial futures …………………	216	3,036	14	291
Total…………………………	**$ 8,741**	**$ 136,125**	**$ 4,912**	**$ 94,149**

	December 31, 2017			
	Assets		Liabilities	
	Carrying Value	Notional Amount	Carrying Value	Notional Amount
	(In Millions)			
Interest rate swaps……………….	$ 7,684	$ 77,193	$ 5,314	$ 86,754
Options…………………………..	745	10,562	7	420
Currency swaps…………………..	386	4,308	569	6,405
Forward contracts………………..	13	1,384	88	6,723
Credit default swaps……………..	29	1,503	1	64
Financial futures …………………	-	3,288	-	-
Total…………………………	**$ 8,857**	**$ 98,238**	**$ 5,979**	**$ 100,366**

Investment Reserves

MassMutual establishes and records appropriate write-downs or investment reserves in accordance with statutory practice.

MassMutual determines the fair value of bonds in accordance with principles established by the SVO using criteria that include the net worth and capital structure of the borrower, the value of the collateral, the presence of additional credit support, and MassMutual's evaluation of the borrower's ability to compete in a relevant market.

In the case of real estate and commercial mortgage loans, MassMutual makes borrower and property-specific assessments as well.

The AVR is a contingency reserve to offset potential losses of stocks, real estate investments, partnerships and LLCs, as well as credit-related declines in bonds, mortgage loans and derivatives.

As of December 31, 2018, the AVR totaled $3.3 billion, which represents a 3% increase from December 31, 2017. This increase was primarily due to current year net unrealized capital gains of $1.0 billion and a $119 million increase in reserve contribution, partially offset by current year net realized capital losses of $691 million and an adjustment down to the maximum allowable reserve calculated based on the statement values of $328 million.

The following represents the change in AVR for the years ended 2018 and 2017:

	Bonds, Preferred Stocks, Derivatives and Short-term Investments	Mortgage Loans	Common Stock	Real Estate and Other Invested Assets	Total
	(In Millions)				
Balance at December 31, 2016	$ 811	$ 93	$ 1,249	$ 1,025	$ 3,178
Change in reserve contributions [(1)]	260	34	(50)	(82)	162
Net realized capital (losses) gains [(2)]	(186)	(17)	12	(10)	(201)
Net unrealized capital gains [(3)]	(237)	124	284	476	647
Transfer among categories	19	(19)	-	-	-
Adjustment down to maximum	-	-	(224)	(355)	(579)
Net change to AVR [(4)]	(144)	122	22	29	29
Balance at December 31, 2017	667	215	1,271	1,054	3,207
Change in reserve contributions [(1)]	113	56	(125)	75	119
Net realized capital gains (losses) [(2)]	131	-	(909)	87	(691)
Net unrealized capital gains [(3)]	307	(99)	1,103	(311)	1,000
Transfer among categories	(59)	59	(269)	269	-
Adjustment down to maximum	(79)	-	(249)	-	(328)
Net change to AVR [(4)]	413	16	(449)	120	100
Balance at December 31, 2018	**$ 1,080**	**$ 231**	**$ 822**	**$ 1,174**	**$ 3,307**

[(1)] *Amounts represent contributions calculated using a statutory formula plus amounts MassMutual deems necessary. The statutory formula provides for maximums that, when exceeded, cause a negative contribution. Additionally, these amounts represent the net impact on surplus for investments gains and losses not related to changes in interest rates.*

[(2)] *These amounts offset realized capital gains (losses), net of tax, that have been recorded in net income. Amounts include realized capital gains (losses), net of tax, on sales not related to interest rate fluctuations, such as repayments of mortgage loans at a discount, mortgage loan foreclosures, and real estate permanent write-downs.*

[(3)] *These amounts offset unrealized capital gains (losses), net of deferred tax, recorded as a change in surplus. Amounts include unrealized losses due to market value reductions of common stocks, bonds and NAIC quality rating of 6, and preferred stocks with NAIC ratings of 4 through 6, net of changes in the undistributed earnings of subsidiaries.*

[(4)] *Amounts represent the reserve contributions (note 1) plus transfers and amounts already recorded (notes 2 and 3). This net change in reserves is recorded as a change in surplus.*

Quantitative and Qualitative Information about Market Risk

All non-guaranteed separate account assets and liabilities have been excluded from the following discussion since all market risks associated with those accounts are assumed by the contract holders.

Assets, such as bonds, stocks, mortgage loans on real estate and derivatives are financial instruments, which are subject to the risk of market volatility and potential market disruptions. These risks may reduce the value of MassMutual's financial instruments or impact future cash flows and earnings from those instruments. MassMutual does not hold or issue any financial instruments for the purpose of trading.

MassMutual has market risk exposure to changes in interest rates, which can cause changes in the fair value, cash flows, and earnings of certain financial instruments. To manage MassMutual's exposure to interest rate changes, MassMutual uses sophisticated quantitative asset/liability management techniques. Through asset/liability management MassMutual matches the market sensitivity of assets with the liabilities they support. If these sensitivities are closely matched, the impact of interest rate changes is effectively offset on an economic basis as the change in value of the asset is offset by a corresponding change in the value of the supported liability. In addition, MassMutual invests a significant portion of MassMutual's investment funds in high quality bonds in order to maintain and manage liquidity and reduce the risk of default in the portfolio.

Based upon the information and assumptions MassMutual used in its asset/liability analysis as of December 31, 2018, MassMutual estimates that a hypothetical immediate 10% increase in the 10-year treasury rate, approximately 27 basis points, would decrease the net fair value of its financial instruments by $2.4 billion. Whereas, a hypothetical immediate 10% decrease in the rate would increase the net fair value of MassMutual's financial instruments by $2.6 billion. A significant portion of MassMutual's liabilities, such as insurance policy and claim reserves, are not considered financial instruments and are excluded from the above analysis. Because of MassMutual's asset/liability management, a corresponding change in fair values of these liabilities, based on the present value of estimated cash flows, should significantly offset the net change in fair value of assets estimated above.

Revenues and profitability from variable products will vary from period to period, driven in part by changes in the capital and equity markets. Specifically, certain fees MassMutual charges for variable annuity product separate accounts are based on the separate account asset levels. Separate account asset levels change as the underlying investments' market values change. Based on MassMutual's experience, management believes that a 10% decrease in the equity markets would change the annualized fees by approximately $19 million.

Certain variable annuity contracts include additional death or other insurance benefit features, such as GMDBs, GMIBs, GMABs and GMWBs. In general, living benefit guarantees require the contract holder or policyholder to adhere to a company-approved asset allocation strategy. Election of these benefits on annuity contracts is generally only available at contract issue. The liability for GMDBs, GMIBs, GMABs and GMWBs was $756 million as of December 31, 2018.

MassMutual sells certain universal life and variable universal life contracts which include features such as GMDBs, or other guarantees that ensure continued death benefit coverage when the policy would otherwise lapse even if the account value is reduced to zero, as long as the policyholder makes scheduled premium payments. The value of the guarantee is only available to the beneficiary in the form of a death benefit. As of December 31, 2018, the net liability for guarantees on universal life and variable universal life type contracts, including GMDB reserves, was $3.8 billion.

Insurance and underwriting risks

MassMutual prices its products based on estimated benefit payments reflecting assumptions with respect to mortality, morbidity, longevity, persistency, interest rates and other factors. If actual policy experience emerges that is significantly and adversely different from assumptions used in product pricing, the effect could be material to the profitability of MassMutual. For participating whole life products, MassMutual's dividends to policyholders primarily reflect the difference between actual investment, mortality, expense and persistency experience and the experience embedded in the whole life premiums and guaranteed elements. MassMutual also reinsures certain life insurance and other long term care insurance policies to mitigate the impact of its underwriting risk.

Investment and interest rate risks

The fair value, cash flows and earnings of investments can be influenced by a variety of factors including changes in interest rates, credit spreads, equity markets, portfolio asset allocation and general economic conditions. MassMutual employs a rigorous asset/liability management process to help mitigate the economic impacts of various investment risks, in particular interest rate risk. By effectively matching the market sensitivity of assets with the liabilities they support, the impact of interest rate changes is addressed, on an economic basis, as the change in the value of the asset is offset by a corresponding change in the value of the supported liability. MassMutual uses derivatives, such as interest rate swaps and swaptions, as well as synthetic assets to reduce interest rate and duration imbalances determined in asset/liability analyses.

The levels of U.S. interest rates are influenced by U.S. monetary policies and by the relative attractiveness of U.S. markets to investors versus other global markets. As interest rates increase, certain debt securities may experience amortization or prepayment speeds that are slower than those assumed at purchase, impacting the expected maturity of these securities and the ability to reinvest the proceeds at the higher yields. Rising interest rates may also result in a decrease in the fair value of the investment portfolio. As interest rates decline, certain debt securities may experience accelerated amortization and prepayment speeds than what was assumed at purchase. During such periods, MassMutual is at risk of lower net investment income as it may not be able to reinvest the proceeds at comparable yields. Declining interest rates may also increase the fair value of the investment portfolio.

Interest rates also have an impact on MassMutual’s products with guaranteed minimum payouts and on interest credited to account holders. As interest rates decrease, investment spreads may contract as crediting rates approach minimum guarantees, resulting in an increased liability.

In periods of increasing interest rates, policy loans, surrenders and withdrawals may increase as policyholders seek investments with higher perceived returns. This could result in cash outflows requiring MassMutual to sell invested assets at a time when the prices of those assets are adversely affected by the increase in market interest rates, which could cause MassMutual to realize investment losses.

Currency exchange risk

MassMutual has currency risk due to its non-U.S. dollar investments and medium-term notes along with its international operations. MassMutual mitigates currency risk through the use of cross-currency swaps and forward contracts. Cross-currency swaps are used to minimize currency risk for certain non-U.S. dollar assets and liabilities through a pre-specified exchange of interest and principal. Forward contracts are used to hedge movements in exchange rates.

Credit and other market risks

MassMutual manages its investments to limit credit and other market risks by diversifying its portfolio among various security types and industry sectors as well as purchasing credit default swaps to transfer some of the risk.

Stressed conditions, volatility and disruptions in global capital markets or in particular markets or financial asset classes can have an adverse effect on MassMutual, in part because MassMutual has a large investment portfolio and assets supporting MassMutual’s insurance liabilities are sensitive to changing market factors. Global market factors, including interest rates, credit spread quality, equity prices, real estate markets, foreign currency exchange rates, consumer spending, business investment, government spending, the volatility and strength of the capital markets, deflation and inflation, all affect the business and economic environment and, ultimately, the profitability of MassMutual’s business. Disruptions in one market or asset class can also spread to other markets or asset classes. Upheavals in the financial markets can also affect MassMutual’s business through their effects on general levels of economic activity, employment and customer behavior.

Real estate markets are monitored continuously with attention on regional differences in price performance, absorption trends and supply and demand fundamentals that can impact the rate of foreclosures and delinquencies. Public sector strengths and weaknesses, job growth and macro-economic issues are factors that are closely monitored to identify any impact on MassMutual’s real estate related investments.

The CMBS, RMBS and leveraged loan sectors are sensitive to evolving conditions that can impair the cash flows realized by investors and is subject to uncertainty. Management's judgment regarding OTTI and estimated fair value depends upon the evolving investment sector and economic conditions. It can also be affected by the market liquidity, a lack of which can make it difficult to obtain accurate market prices for RMBS and other investments, including CMBS and leveraged loans. Any deterioration in economic fundamentals, especially related to the housing sector could affect management's judgment regarding OTTI.

MassMutual has investments in structured products exposed primarily to the credit risk of corporate bank loans, corporate bonds or credit default swap contracts referencing corporate credit risk. Most of these structured investments are backed by corporate loans and are commonly known as collateralized loan obligations that are classified as CDOs. The portfolios backing these investments are actively managed and diversified by industry and individual issuer concentrations. Due to the complex nature of CDOs and the reduced level of transparency to the underlying collateral pools for many market participants, the recovery in CDO valuations generally lags the overall recovery in the underlying assets. Management believes its scenario analysis approach, based primarily on actual collateral data and forward looking assumptions, does capture the credit and most other risks in each pool. However, in a rapidly changing economic environment, the credit and other risks in each collateral pool will be more volatile and actual credit performance of CDOs may differ from MassMutual's assumptions.

MassMutual continuously monitors its investments and assesses their liquidity and financial viability; however, the existence of the factors described above, as well as other market factors, could negatively impact the market value of MassMutual's investments. If MassMutual sells its investments prior to maturity or market recovery, these investments may yield a return that is less than MassMutual otherwise would have been able to realize.

Asset-based fees calculated as a percentage of the separate account assets are a source of revenue to MassMutual. Gains and losses in the investment markets may result in corresponding increases and decreases in MassMutual's separate account assets and related revenue.

Market risk arises within MassMutual's employee benefit plans to the extent that the obligations of the plans are not fully matched by assets with determinable cash flows. Pension and post-retirement obligations are subject to change due to fluctuations in the discount rates used to measure the liabilities as well as factors such as changes in inflation, salary increases and participants living longer. The risks are that such fluctuations could result in assets that are insufficient over time to cover the level of projected benefit obligations. In addition, increases in inflation and members living longer could increase the pension and post-retirement obligations. Management determines the level of this risk using reports prepared by independent actuaries and takes action, where appropriate, in terms of setting investment strategy and determining contribution levels. In the event that the pension obligations arising under MassMutual's employee benefit plans exceed the assets set aside to meet the obligations, MassMutual may be required to make additional contributions or increase its level of contributions to these plans.

Political Uncertainties

Political events, such as the ongoing volatility with respect to the EU, may trigger or exacerbate the risks described above in this section. Whether those underlying risks are driven by politics or not, MassMutual employs a rigorous asset/liability management process to reduce the impact of each underlying risk factor on MassMutual.

CAPITALIZATION OF MASSMUTUAL

As a mutual insurance company, MassMutual has no capital stock and no shareholders. MassMutual's surplus was $15.7 billion at March 31, 2019.

Surplus as of March 31, 2019 includes surplus notes with a carrying value of $2,268 million, comprised of the following surplus notes at face value issued and outstanding: $475 million of surplus notes maturing in 2077, $500 million of surplus notes maturing in 2065, $400 million of surplus notes maturing in 2041, $310 million of surplus notes maturing in 2039, $250 million of surplus notes maturing in 2033, $100 million of surplus notes maturing in 2024 and $250 million of surplus notes maturing in 2023. The NAIC Risk Based Capital Model Act requires life insurance companies to submit an annual RBC Report, which compares a company's total adjusted capital with its RBC as calculated by a formula. MassMutual's total adjusted capital at December 31, 2018 was well in excess of all RBC minimum standards.

In compliance with regulatory requirements, MassMutual maintains an AVR and an IMR. The AVR is a contingency reserve to stabilize surplus against fluctuations in the statement value of common stocks, real estate investments, partnerships and LLCs, as well as credit-related changes in the value of bonds, preferred stocks, mortgage loans, and certain derivatives to the extent that AVR is greater than zero for the appropriate asset category. All after-tax realized capital gains and losses, which result from changes in the overall level of interest rates for all types of fixed-income investments and interest-related hedging activities are deferred into the IMR and amortized into revenue. These interest-related gains and losses are amortized into net investment income using the grouped method over the remaining life of the investment sold or, in the case of derivative financial instruments, over the remaining life of the underlying asset.

DESCRIPTION OF THE NOTES

The following description of the terms and conditions of the Notes sets forth certain general provisions. It does not purport to be complete and is subject to the relevant Pricing Supplement and the detailed provisions of the Notes and the Indenture, copies of which will be on file with the Indenture Trustee and, if applicable, the Irish Paying Agent. Capitalized terms used herein have the same meanings as those used in the Indenture unless the context otherwise requires.

General

Series Indenture. Each Series of Notes will be issued under, subject to and entitled to the benefits of the Indenture and a separate Series Indenture by and between the Trust, with respect to the relevant Series Trust, and the Indenture Trustee.

Tranches of Notes. Each Series of Notes may be comprised of one or more tranches issued on different issue dates within a 90-day period. The Notes of each Series will all be subject to identical terms, except that the issue date, the issue price and the amount of the first payment of interest may be different in respect of different tranches. The Notes of each tranche will all be subject to identical terms in all respects except that a tranche may comprise Notes of different denominations.

Security. Notes issued under each Series Indenture will be secured by the Pledged Estate of the Series Trust for such Series of Notes. The Notes will solely be obligations of the relevant Series Trust and will not be guaranteed by any person, including but not limited to any Initial Purchaser, MassMutual, any other Series Trust or any of their respective affiliates.

Status of the Notes. The Notes of a Series constitute direct, unconditional, unsubordinated and secured non-recourse obligations of the relevant Series Trust and rank pari passu without any preference among themselves.

Listing. The Notes may or may not be listed on Euronext Dublin or any other exchange. Application has been made to Euronext Dublin to list Notes issued under the Program. Notes may also be (i) listed on a securities exchange that is not a regulated market or (ii) not listed on any regulated market or any other securities exchange.

Certain Definitions. The following terms are used frequently in this Offering Memorandum:

A "**Business Day**" means any day, other than a Saturday or Sunday, (a) that is neither a legal holiday nor a day on which banking institutions are authorized or required by law or regulation to close (x) in The City of New York or London or (y) for Notes denominated in a Specified Currency other than U.S. dollars, Australian dollars or euros, in the principal financial center of the country of the Specified Currency or (z) for Notes denominated in Australian dollars, in Sydney, and (b) for Notes denominated in euros, that is also a day on which the Trans-European Automated Real-time Gross Settlement Express Transfer System ("**TARGET2**") is operating.

An "**Interest Payment Date**" for any Note means a date on which, under the terms of that Note, regularly scheduled interest is payable.

"**ISDA Definitions**" means the 1991 ISDA Definitions, as amended and updated at the date of issue of the first Notes of the relevant Series (as specified in the relevant Pricing Supplement) as published by the International Swaps and Derivatives Association, Inc.

"**London Banking Day**" means any day on which dealings in deposits in the relevant index currency are transacted in the London interbank market.

The "**Record Date**" for any Interest Payment Date is the date 15 calendar days prior to that Interest Payment Date, whether or not that date is a Business Day.

"**TARGET Settlement Day**" means any day on which TARGET2 is open.

References in this Offering Memorandum to "**USD**," "**U.S. dollars**," "**U.S. $**" or "**$**" are to the lawful currency of the U.S.

Forms of Notes

Notes of a particular Series will be offered on a continuing basis and will be issued either as global Notes or as definitive Notes, and in fully registered form.

Registered Notes in Global Form. For Notes in global registered form, the relevant Series Trust will issue one or more global certificates representing the entire issue of such Notes. Except as set forth in this Offering Memorandum under "– Global Notes," an investor may not exchange global Notes or interests in global Notes for definitive Notes.

Each Rule 144A Global Note will be deposited with the Custodian as custodian for, and registered in the name of the 144A Nominee, as nominee of, DTC. Each global Note certificate representing global Notes in registered form, which are offered and sold outside the U.S. will be registered in the name of the Regulation S Nominee, as nominee for, and deposited with the Common Depositary, as common depositary for, and in respect of interests held through, Euroclear and Clearstream. A further description of each of DTC's, Euroclear's and Clearstream's procedures for global Notes is set forth in this Offering Memorandum under "– Global Notes."

Each Regulation S Temporary Global Registered Note initially representing Registered Notes of a Series offered and sold outside of the U.S. in reliance on Regulation S under the Securities Act will be registered in the name of the Regulation S Nominee, as nominee for, and deposited with the Common Depositary, as common depositary for, and in respect of interests held through, Euroclear and Clearstream for the respective accounts of the purchasers of such Notes. Beneficial interests in a Regulation S Temporary Global Registered Note will be exchanged for beneficial interests in a Regulation S Permanent Global Registered Note as described under "– Global Notes."

Owners of beneficial interests in global Registered Notes will be entitled to have Definitive Registered Notes registered in their names only if permitted by applicable law and (i) DTC notifies the Series Trust in writing that such clearing system is unwilling or unable to continue as depositary for such global Note or ceases to be a "clearing agency" registered under the Exchange Act and a qualifying successor depositary is not appointed within 90 days thereof, (ii) the Series Trust is notified that either Euroclear or Clearstream has been closed for business for a continuous period of 14 days (other than by reason of holiday, statutory or otherwise) after the original issuance of the Notes or (iii) Euroclear or Clearstream has announced an intention permanently to cease business or has in fact done so and no alternative clearance system approved by the Noteholders is available.

Definitive Registered Notes. If the Registered Notes are represented by Definitive Registered Notes, the Note will name the investor or the investor's nominee as the owner of the Note. The person named in the Note register will be considered the owner of the Note for all purposes under the Indenture. For example, if the Holders of the Notes were asked to vote on a proposed amendment to the Notes, the person named in the Note register would be asked to cast any vote regarding that Note. If the Holder of the Note has chosen to have some other entity hold the Notes, that entity would be considered the owner of the Note for the record and will be entitled to cast the vote regarding such Note. Definitive Registered Notes may not be exchanged for global Notes or interests in global Notes. *See* "– Global Notes."

("**coupons**" as used in this Offering Memorandum shall include talons where the context so requires).

Registered Notes may be transferred upon the completion and surrender of a duly executed form of transfer together with the Registered Notes at the specified office of the Registrar or the Transfer Agent. The form of transfer is obtainable at the office of the Transfer Agent.

Denominations. Notes may be denominated in any currency or currencies, subject to compliance with all applicable legal and/or regulatory and/or central bank requirements. Payments in respect of Notes may be made in and/or linked to any currency or currencies other than the currency in which such Notes are denominated, subject to compliance as aforesaid. Notes will be issued in the denominations specified in the relevant Pricing Supplement, subject to compliance with all applicable legal and/or regulatory and/or central bank requirements.

Except for Non-EU Notes, no Notes may be issued under the Program that have a minimum denomination of less than €100,000 (or the equivalent in another currency at the time of the issue) with multiple increments of €1,000 (or the equivalent in another currency at the time of the issue) thereafter. Non-EU Notes may, subject to applicable law and regulation, be issued in any denomination, including in denominations of less than €100,000. Notes, that have a maturity of less than one year from their date of issue and in respect of which the issue proceeds are to be received by the Trust in the United Kingdom will have a minimum denomination of £100,000 (or its equivalent in other currencies).

Authorized Program Amount. The authorized amount of Notes, which may in the aggregate be issued by the Series Trusts is USD 21,000,000,000. For this purpose, any Notes denominated in another currency shall be translated into U.S. dollars at the date of the relevant Terms Agreement using the spot rate of exchange for the purchase of such currency against payment of U.S. dollars being quoted by the relevant Paying Agent on such date or such other rate as the relevant Series Trust and the relevant Paying Agent may agree. The Authorized Program Amount may be increased from time to time, subject to compliance with the relevant provisions of the Purchase Agreement. As of the date of this Offering Memorandum, the Trust has issued USD 15,462,700,000 of Notes under the Program in 47 discrete Series of Notes through 47 discrete Series Trusts. As of the date of this Offering Memorandum, the Trust has USD 6,197,165,171 of Notes outstanding under the Program in 13 discrete Series of Notes through 13 separate Series Trusts (*See* "Capitalization of the Trust").

Payments

Payments, Exchanges and Transfers. Holders may present Registered Notes for payment of principal, premium, if any, register the transfer of the Notes and exchange Registered Notes at the office of the Registrar or the Transfer Agent, maintained by the relevant Series Trust for that purpose. A new Registered Note will be issued to the transferee and, in the case of a transfer of part of a Registered Note; a new Registered Note in the amount of the balance not transferred will be issued to the transferor. Each new Registered Note to be issued upon the transfer of a Registered Note will, within three Relevant Banking Days of the transfer date or, as the case may be, the note exchange date be available for collection by each relevant holder at the specified office of the Registrar or the Transfer Agent or, at the option of the holder requesting such exchange or transfer, be mailed (by uninsured post at the risk of the holder(s) entitled thereto) to such address(es) as may be specified by such holder. For these purposes, a form of transfer or request for exchange received by the Registrar, the Transfer Agent or the Principal Paying Agent after the Record Date in respect of any payment due in respect of Registered Notes shall be deemed not to be effectively received by the Registrar, the Transfer Agent or the Principal Paying Agent until the day following the due date for such payment. For the purposes of this paragraph:

(i) "**Relevant Banking Day**" means a day on which commercial banks are open for business (including dealings in foreign exchange and foreign currency deposits) in the place where the specified office of the Registrar or the Transfer Agent is located; and

(ii) the "**transfer date**" shall be the Relevant Banking Day following the day on which the relevant Registered Note shall have been surrendered for transfer.

No service charge will be made for any registration of transfer or exchange of Notes, but the relevant Series Trust, the Principal Paying Agent or the Registrar and/or the Transfer Agent may require payment of a sum sufficient to cover any tax or other governmental charge payable in connection with the registration of transfer or exchange of Notes.

Holders of global Notes may transfer and exchange global Notes only in the manner and to the extent set forth under "– Global Notes" in this Offering Memorandum. On the date of this Offering Memorandum, the agents for the payment, transfer and exchange of the Notes are the Principal Paying Agent and the Irish Paying Agent, as applicable. In the event that another Paying Agent is appointed with respect to a Series of Notes listed on Euronext Dublin, notice will be made promptly in a leading daily newspaper having general circulation in Ireland (expected to be the *Irish Times*).

A Series Trust will not be required to:

- register the transfer of or exchange Notes to be redeemed for a period of 15 calendar days preceding the mailing of the relevant notice of redemption, or
- register the transfer of or exchange any Registered Note selected for redemption in whole or in part, except the unredeemed or unpaid portion of that Registered Note being redeemed in part.

No service charge will be made for any registration of transfer or exchange of Notes, but the Series Trust may require payment of a sum sufficient to cover any tax or other governmental charge payable in connection with the registration of transfer or exchange of Notes.

Irish Paying Agent. For so long as any Definitive Registered Notes issued by any Series Trust are listed on Euronext Dublin, and to the extent required by the rules of such exchange, the relevant Series Trust will appoint an Irish Paying Agent. In such circumstances, payments on Notes may be made by the Irish Paying Agent.

Recipients of Payments. Payments of interest on Registered Notes will be made by the Paying Agent to the person in whose name the Note is registered at the close of business on the applicable Record Date. However, upon maturity, redemption or repayment of the Note, payments of interest will be made by the Paying Agent to the person to whom it pays the principal of the Note.

Registered Notes in Global Form. The Paying Agent will make payments of principal, premium, if any, and interest, if any, to the account of DTC or its nominee or Euroclear, Clearstream or the nominee of their common depositary or such other clearing system or its nominee, as holder of global Notes in registered form, by wire transfer of immediately available funds. *See* "– Global Notes" below.

Definitive Registered Notes. Except as indicated below for payments of interest at maturity, redemption or repayment, the Paying Agent will make U.S. dollar payments of interest either:

- by check mailed to the address of the person entitled to payment as shown on the Note register; or
- for a registered holder of at least USD 10,000,000 in aggregate principal amount of Definitive Registered Notes having the same Interest Payment Date, by wire transfer of immediately available funds, if the holder has given written notice to the Paying Agent not later than 15 calendar days prior to the applicable Interest Payment Date.

U.S. dollar payments of principal, premium, if any, and interest, if any, upon maturity, redemption or repayment on a Note will be made in immediately available funds against presentation and surrender of the Note.

Payment Procedures for Rule 144A Notes Denominated in a Foreign Currency. Rule 144A Notes payable in a Specified Currency other than U.S. dollars may provide that a beneficial owner of those Notes may elect to receive all or a portion of the payments of principal, premium, if any, or interest, if any, in U.S. dollars. In those cases, DTC will elect to receive all payments with respect to the beneficial owner's interest in the Notes in U.S. dollars, unless the beneficial owner takes the following steps:

- The beneficial owner must give complete instructions to the direct or indirect participant through which it holds the global Notes of its election to receive those payments in the Specified Currency other than U.S. dollars by wire transfer to an account specified by the beneficial owner with a bank located outside the U.S. In the case of a Note payable in euros, the account must be a euro account in a country for which the euro is the lawful currency.
- The participant must notify DTC of the beneficial owner's election on or prior to the third Business Day after the applicable Record Date, for payments of interest, and on or prior to the twelfth Business Day prior to the maturity date or any redemption or repayment date, for payment of principal or premium.

- DTC will notify the Paying Agent of the beneficial owner's election on or prior to the fifth Business Day after the applicable Record Date, for payments of interest, and on or prior to the tenth Business Day prior to the maturity date or any redemption or repayment date, for payment of principal or premium.

Beneficial owners should consult their participants in order to ascertain the deadline for giving instructions to participants in order to ensure that timely notice will be delivered to DTC.

Payment Procedures for Definitive Registered Notes Denominated in a Foreign Currency. For Definitive Registered Notes payable in a Specified Currency other than U.S. dollars, the Notes may provide that the holder may elect to receive all or a portion of the payments on those Notes in U.S. dollars. To do so, the holder must send a written request to the Paying Agent:

- for payments of interest, on or prior to the fifth Business Day after the applicable Record Date; or

- for payments of principal, at least ten Business Days prior to the maturity date or any redemption or repayment date.

To revoke this election for all or a portion of the payments on the Definitive Registered Notes, the holder must send written notice to the Paying Agent:

- at least five Business Days prior to the applicable Record Date, for payments of interest; or

- at least ten calendar days prior to the maturity date or any redemption or repayment date, for payments of principal.

If the holder does not elect to be paid in U.S. dollars, the Paying Agent will pay the principal, premium, if any, or interest, if any, on the Definitive Registered Notes:

- by wire transfer of immediately available funds in the Specified Currency to the holder's account at a bank located outside the U.S., and in the case of a Note payable in euros, in a country for which the euro is the lawful currency, if the Paying Agent has received the holder's written wire transfer instructions not less than 15 calendar days prior to the applicable payment date; or

- by check payable in the Specified Currency mailed to the address of the person entitled to payment that is specified in the Note register, if the holder has not provided wire instructions.

However, the Paying Agent will only pay the principal of the Definitive Registered Notes, any premium and interest, if any, due at maturity, or on any redemption or repayment date, upon presentation and surrender of the Definitive Registered Notes at the office or agency of the Paying Agent.

Determination of Exchange Rate for Payments in U.S. dollars for Notes Denominated in a Foreign Currency. The Exchange Rate Agent will convert the Specified Currency into U.S. dollars for Holders who elect to receive payments in U.S. dollars and for beneficial owners of Rule 144A Notes that do not follow the procedures described immediately above for withdrawing a previous election to receive payment in U.S. dollars. The conversion will be based on the highest bid quotation in The City of New York received by the Exchange Rate Agent at approximately 11:00 a.m., New York City time, on the second Business Day preceding the applicable payment date from three recognized foreign exchange dealers for the purchase by the quoting dealer:

- of the Specified Currency for U.S. dollars for settlement on the payment date;

- in the aggregate amount of the Specified Currency payable to those Holders or beneficial owners of Notes; and

- at which the applicable dealer commits to execute a contract.

One of the dealers providing quotations may be the Exchange Rate Agent unless the Exchange Rate Agent is an affiliate of MassMutual. If those bid quotations are not available for any reason, payments will be made in the Specified Currency. The Holders or beneficial owners of Notes will pay all currency exchange costs by deductions from the amounts payable on the Notes.

Unavailability of Foreign Currency. The relevant Specified Currency may not be available for making payments of principal of, premium, if any, or interest, if any, on any Note. This could occur due to the imposition of exchange controls, other circumstances beyond the Series Trust's control, or if the Specified Currency is no longer used by the government of the country issuing that currency or by public institutions within the international banking community for the settlement of transactions. If the Specified Currency is unavailable, obligations to Holders of the Notes may be satisfied by making those payments on the date of payment in U.S. dollars on the basis of the noon dollar buying rate in The City of New York for cable transfers of the currency or currencies in which a payment on any Note was to be made, published by the Federal Reserve Bank of New York (the "**Market Exchange Rate**"). If the Market Exchange Rate is not then available for any reason or is not published for a particular payment currency, the Market Exchange Rate will be based on the highest bid quotation in The City of New York received by the Exchange Rate Agent at approximately 11:00 a.m., New York City time, on the second Business Day preceding the applicable payment date from three recognized foreign exchange dealers for the purchase by the quoting dealer:

- of the Specified Currency for U.S. dollars for settlement on the payment date;
- in the aggregate amount of the Specified Currency payable to those Holders or beneficial owners of Notes; and
- at which the applicable dealer commits to execute a contract.

One of the dealers providing quotations may be the Exchange Rate Agent unless the Exchange Rate Agent is an affiliate of MassMutual. If those bid quotations are not available for any reason, the Exchange Rate Agent will determine the Market Exchange Rate at its sole discretion.

These provisions do not apply if a Specified Currency is unavailable because it has been replaced by the euro. If the euro has been substituted for a Specified Currency, the Series Trust may at its option, or will, if required by applicable law, without the consent of the Holders of the affected Notes, pay the principal of, premium, if any, or interest, if any, on any Note denominated in the Specified Currency in euros instead of the Specified Currency, in conformity with legally applicable measures taken pursuant to, or by virtue of, the treaty establishing the European Community, as amended by the treaty on EU. Any payment made in U.S. dollars or in euros as described above where the required payment is in an unavailable Specified Currency will not constitute an Event of Default (as described below under "Description of the Indenture").

Discount Notes. Some Notes may be considered to be issued with original issue discount ("**OID**"), which must be included in income for U.S. federal income tax purposes on a constant yield basis. *See* "Taxation – U.S. Taxation – The Notes – Interest and Original Issue Discount" below. If the principal of any Note that is considered to be issued with OID is declared to be due and payable immediately as described under "Description of the Indenture – Events of Default," the amount of principal due and payable on that Note will be limited to:

- the aggregate principal amount of the Note *multiplied* by the sum of
- its issue price, expressed as a percentage of the aggregate principal amount, *plus*
- the OID amortized from the date of issue to the date of declaration, expressed as a percentage of the aggregate principal amount.

The amortization will be calculated using the "interest method," computed in accordance with U.S. GAAP in effect on the date of declaration.

Fixed Rate Notes

Each Fixed Rate Note will mature on the date specified in the applicable Pricing Supplement.

Each Fixed Rate Note will bear interest from the date of issuance at the annual rate stated on its face until the principal is paid or made available for payment.

How Interest Is Calculated. Interest on Fixed Rate Notes will be computed on the basis of a 360-day year of 12, 30-day months.

How Interest Accrues. Interest on Fixed Rate Notes will accrue from and including the most recent Interest Payment Date to which interest has been paid or duly provided for, or, if no interest has been paid or duly provided for, from and including the issue date or any other date specified in a Pricing Supplement on which interest begins to accrue. Interest will accrue to but excluding the next Interest Payment Date, or, if earlier, the date on which the principal has been paid or duly made available for payment, except as described below under "If a Payment Date is Not a Business Day."

When Interest Is Payable. Interest will be due and payable by the relevant Series Trust on Fixed Rate Notes on the Interest Payment Dates specified in the applicable Pricing Supplement.

Amount of Interest Payable. Interest payments for Fixed Rate Notes will include accrued interest from and including the date of issue or from and including the last date in respect of which interest has been paid, as the case may be, to but excluding the relevant Interest Payment Date or date of maturity or earlier redemption or repayment, as the case may be.

If a Payment Date is Not a Business Day. If (i) any scheduled Interest Payment Date is not a Business Day, the Series Trust will pay interest on the next Business Day, but interest on that payment will not accrue during the period from and after the scheduled Interest Payment Date and (ii) the scheduled maturity date or date of redemption or repayment is not a Business Day, the Series Trust may pay interest and principal and premium, if any, on the next succeeding Business Day, but interest on that payment will not accrue during the period from and after the scheduled maturity date or date of redemption or repayment.

Amortizing Notes. If so specified in a Pricing Supplement, a Fixed Rate Note may pay a level amount in respect of both interest and principal amortized over the life of the Note. Payments of principal and interest on amortizing Notes will be made on the Interest Payment Dates specified in the applicable Pricing Supplement, and at maturity or upon any earlier redemption or repayment. Payments on amortizing Notes will be applied first to interest due and payable and then to the reduction of the unpaid principal amount. The relevant Series Trust will provide in the applicable Pricing Supplement a table setting forth repayment information for each amortizing Note.

Floating Rate Notes

Each Floating Rate Note will mature on the date specified in the applicable Pricing Supplement.

Each Floating Rate Note will bear interest at a floating rate determined by reference to the Base Rate.

Formula for Interest Rates. The interest rate on each Floating Rate Note will be calculated by reference to the specified Base Rate based on the Index Maturity, plus or minus the Spread, if any, and/or multiplied by the Spread Multiplier, if any.

For any Floating Rate Note, Index Maturity means the period of maturity of the instrument or obligation from which the Base Rate is calculated and will be specified in the applicable Pricing Supplement. The "**Spread**" is the number of basis points (one one-hundredth (.01) of a percentage point) specified in the applicable Pricing Supplement to be added to or subtracted from the Base Rate for a Floating Rate Note. The "**Spread Multiplier**" is the percentage specified in the applicable Pricing Supplement to be multiplied by the Base Rate for a Floating Rate Note.

Limitations on Interest Rate. A Floating Rate Note may also have either or both of the following: (i) a maximum limitation, or ceiling, on the rate of interest that may accrue during any interest period (the "**Maximum Interest Rate**"), or (ii) a minimum limitation, or floor, on the rate of interest that may accrue during any interest period (the "**Minimum Interest Rate**").

Any applicable Maximum Interest Rate or Minimum Interest Rate will be set forth in the relevant Pricing Supplement.

In addition, the interest rate on a Floating Rate Note may not be higher than the maximum rate permitted by New York law, as that rate may be modified by U.S. law of general application.

How Floating Interest Rates Are Reset. The interest rate in effect from the date of issue to the first Interest Reset Date for a Floating Rate Note will be the initial interest rate specified in the applicable Pricing Supplement (the "**Initial Interest Rate**"). The interest rate on each Floating Rate Note may be reset daily, weekly, monthly, quarterly, semiannually, or annually (the "**Interest Reset Period**"). The first day of each Interest Reset Period is the interest reset date ("**Interest Reset Date**"). The interest determination date for any Interest Reset Date is the day the Calculation Agent will refer to when determining the new interest rate at which a floating rate will reset (the "**Interest Determination Date**"), and is applicable as follows:

- for Federal Funds Rate Notes and Prime Rate Notes, the Interest Determination Date will be the first Business Day prior to the Interest Reset Date;

- for Commercial Paper Rate Notes and CMT Rate Notes, the Interest Determination Date will be the second Business Day prior to the Interest Reset Date;

- for EURIBOR Notes, the Interest Determination Date will be the second TARGET Settlement Day, as defined under "– General – Certain Definitions," prior to the Interest Reset Date;

- for LIBOR Notes, the Interest Determination Date will be the second London Banking Day prior to the Interest Reset Date;

- for LIBOR Notes for which the index currency is pounds sterling, the Interest Reset Date; and

- for Treasury Rate Notes, the Interest Determination Date will be the day of the week in which the Interest Reset Date falls on which Treasury bills would normally be auctioned.

Treasury bills are normally sold at auction on Monday of each week, unless that day is a legal holiday, in which case the auction is normally held on the following Tuesday, but the auction may be held on the preceding Friday. If, as the result of a legal holiday, the auction is held on the preceding Friday, that Friday will be the Interest Determination Date pertaining to the Interest Reset Date occurring in the next succeeding week. If an auction falls on a day that is an Interest Reset Date, that Interest Reset Date will be the next following Business Day.

The Interest Reset Dates will be specified in the applicable Pricing Supplement. Subject to the provisions of the relevant Pricing Supplement, if an Interest Reset Date for any Floating Rate Note falls on a day that is not a Business Day, it will be postponed to the following Business Day, except that, in the case of a EURIBOR Note or a LIBOR Note, if that Business Day is in the next calendar month, the Interest Reset Date may be the immediately preceding Business Day.

The interest rate in effect for the ten calendar days immediately prior to maturity, redemption or repayment will be the one in effect on the tenth calendar day preceding the maturity, redemption or repayment date.

In the detailed descriptions of the various Base Rates that follow, the "**Calculation Date**" pertaining to an Interest Determination Date means the earlier of (1) the tenth calendar day after that Interest Determination Date, or, if that day is not a Business Day, the next succeeding Business Day, and (2) the Business Day preceding the applicable

Interest Payment Date or maturity date or, for any principal amount to be redeemed or repaid, any redemption or repayment date.

How Interest Is Calculated and How Interest Accrues. Interest on Floating Rate Notes will accrue from and including the most recent Interest Payment Date to which interest has been paid or duly provided for, or, if no interest has been paid or duly provided for, from and including the issue date or any other date specified in a Pricing Supplement on which interest begins to accrue. Interest will accrue to but excluding the next Interest Payment Date or, if earlier, the date on which the principal has been paid or duly made available for payment, except as described below under "If a Payment Date is Not a Business Day."

The applicable Pricing Supplement will specify a Calculation Agent for any issue of Floating Rate Notes (the "**Calculation Agent**"). The Calculation Agent will provide notice of the interest rate, interest amount and interest period, calculated using the minimum denomination specified in the Pricing Supplement, which will become effective on the next Interest Reset Date to the Indenture Trustee, Principal Paying Agent, Registrar (in the case of Registered Notes), the relevant Series Trust, the Noteholders, and if the Notes are listed on a stock exchange, and the rules of such exchange so require, such exchange as soon as possible after their determination or calculation, but in no event later than the fourth London Banking Day thereafter or, earlier if in the case of notification to the stock exchange and the Noteholders, the rules of such exchange so require.

The Calculation Agent may resign at any time with respect to the Notes of a Series Trust by giving not less than 30 days prior written notice thereof to the relevant Series Trust. Pursuant to the terms of the Indenture, a successor Calculation Agent will be appointed with respect to the Notes of such Series Trust.

For a Floating Rate Note, accrued interest will be calculated by multiplying the principal amount of the Floating Rate Note by an accrued interest factor. This accrued interest factor will be computed by adding the interest factors calculated for each day in the period for which interest is being paid. The interest factor for each day is computed by *dividing* the interest rate applicable to that day, which shall be as follows:

- by 360, in the case of Commercial Paper Rate Notes, EURIBOR Notes, Federal Funds Rate Notes, LIBOR Notes, except for LIBOR Notes denominated in pounds sterling, and Prime Rate Notes;
- by 365, in the case of LIBOR Notes denominated in pounds sterling; or
- by the actual number of days in the year, in the case of Treasury Rate Notes and CMT Rate Notes.

For these calculations, the interest rate in effect on any Interest Reset Date will be the applicable rate as reset on that date. The interest rate applicable to any other day is the interest rate from the immediately preceding Interest Reset Date or, if none, the initial interest rate.

All percentages used in or resulting from any calculation of the rate of interest on a Floating Rate Note will be rounded, if necessary, to the nearest one hundred-thousandth of a percentage point (.0000001), with five one-millionths of a percentage point rounded upward, and all U.S. dollar amounts used in or resulting from these calculations on Floating Rate Notes will be rounded to the nearest cent, with one-half cent rounded upward.

When Interest Is Payable. Interest will be due and payable by the relevant Series Trust on Floating Rate Notes on the Interest Payment Dates specified in the applicable Pricing Supplement.

If a Payment Date is Not a Business Day. If any scheduled Interest Payment Date, maturity date or any earlier redemption or repayment date, for any Floating Rate Note falls on a day that is not a Business Day, it will be postponed to the following Business Day, except that, in the case of a EURIBOR Note or a LIBOR Note, if that Business Day would fall in the next calendar month, the Interest Payment Date will be the immediately preceding Business Day. Further, if the scheduled maturity date or any earlier redemption or repayment date of a Floating Rate Note falls on a day that is not a Business Day, the payment of principal, premium, if any, and interest, if any, will be made on the next succeeding Business Day, but interest on that payment will not accrue during the period from and after the maturity, redemption or repayment date.

ISDA Rate Notes

If the relevant Pricing Supplement specifies the interest rate applicable to the Notes as being ISDA Rate, each Note shall bear interest as from such date, and at such rate or in such amounts, and such interest will be payable on such dates, as would have applied (regardless of any event of default or termination event or tax event thereunder) if the relevant Series Trust had entered into an interest rate swap transaction with the Holder of such Note under the terms of an agreement to which the ISDA Definitions applied and under which:

- the Fixed Rate Payer, Fixed Amount Payer, Fixed Price Payer, Floating Rate Payer, Floating Amount Payer or, as the case may be, the Floating Price Payer is the relevant Series Trust (as specified in the relevant Pricing Supplement);
- the Effective Date is the issue date of the relevant Notes;
- the Termination Date is the maturity date of the relevant Notes;
- the Calculation Agent is the Calculation Agent as specified in the relevant Pricing Supplement;
- the Calculation Periods are the interest periods;
- the Period End Dates are the interest period end dates;
- the Payment Dates are the Interest Payment Dates;
- the Reset Dates are the interest period end dates;
- the Calculation Amount is the principal amount of the relevant Note;
- the Day Count Fraction applicable to the calculation of any amount is that specified in the relevant Pricing Supplement or, if none is so specified, as may be determined in accordance with the ISDA Definitions;
- the Applicable Business Day Convention applicable to any date is that specified in the relevant Pricing Supplement or, if none is so specified, as may be determined in accordance with the ISDA Definitions; and
- the other terms are as specified in the relevant Pricing Supplement.

Base Rates

Commercial Paper Rate Notes

Commercial Paper Rate Notes will bear interest at the interest rates (calculated with reference to the Commercial Paper Rate and the Spread and/or Spread Multiplier, if any, and subject to the Minimum Interest Rate and the Maximum Interest Rate, if any) specified in the Commercial Paper Rate Notes and in the applicable Pricing Supplement.

"**Commercial Paper Rate**" means, with respect to any Interest Determination Date relating to a Commercial Paper Rate Note (a "**Commercial Paper Interest Determination Date**"), the Money Market Yield (calculated as described below) of the rate on such date for commercial paper having the Index Maturity specified in the applicable Pricing Supplement, as such rate shall be published in H.15(519) under the heading "Commercial Paper – Nonfinancial."

The following procedures will be followed if the Commercial Paper Rate cannot be determined as described above:

- If the above rate is not published by 9:00 a.m., New York City time, on the Calculation Date, then the Commercial Paper Rate will be the Money Market Yield of the rate on such Commercial Paper Interest Determination Date for commercial paper of the Index Maturity specified in the applicable Pricing Supplement as published in H.15 Daily Update under the heading "Commercial Paper – Nonfinancial."

- If by 3:00 p.m., New York City time, on such Calculation Date such rate is not yet published in either H.15(519) or H.15 Daily Update, then the Calculation Agent will determine the Commercial Paper Rate to be the Money Market Yield of the arithmetic mean of the offered rates as of 11:00 a.m., New York City time, on such Commercial Paper Interest Determination Date of three leading dealers of commercial paper in New York City selected by the Calculation Agent for commercial paper of the Index Maturity specified in the applicable Pricing Supplement placed for an industrial issuer whose bond rating is "AA," or the equivalent, from a nationally recognized statistical rating organization.

- If the dealers selected by the Calculation Agent are not quoting as mentioned above, the Commercial Paper Rate with respect to such Commercial Paper Interest Determination Date will remain the Commercial Paper Rate then in effect on such Commercial Paper Interest Determination Date.

The "**Money Market Yield**" will be a yield calculated in accordance with the following formula:

$$\text{Money Market Yield} = \frac{\text{D x 360}}{\text{360 - (D x M)}} \text{ x 100}$$

where "D" refers to the applicable per annum rate for commercial paper quoted on a bank discount basis and expressed as a decimal and "M" refers to the actual number of days in the applicable Interest Reset Period.

EURIBOR Notes

EURIBOR Notes will bear interest at the interest rates (calculated with reference to EURIBOR and the Spread and/or Spread Multiplier, if any, and subject to the Minimum Interest Rate and the Maximum Interest Rate, if any) specified in the EURIBOR Notes and in the applicable Pricing Supplement.

"**EURIBOR**" means, with respect to any Interest Determination Date relating to a EURIBOR Note (a "**EURIBOR Interest Determination Date**"), the rate for deposits in euros as sponsored, calculated and published jointly by the European Banking Federation and ACI – The Financial Market Association, or any company established by the joint sponsors for purposes of compiling and publishing those rates, for the Index Maturity specified in the applicable Pricing Supplement as that rate appears on the Reuters (or any successor service) on page EURIBOR01 or any other page as may replace that specified page on that service, or Reuters Screen EURIBOR01 Page as of 11:00 a.m. (Brussels time).

The following procedures will be followed if the rate cannot be determined as described above:

- If the above rate does not appear as of such time, the Calculation Agent will request the principal Euro-zone office of each of four major banks in the Euro-zone interbank market, as selected by the Calculation Agent, to provide the Calculation Agent with its offered rate for deposits in euros, at approximately 11:00 a.m. (Brussels time) on the Interest Determination Date, to prime banks in the Euro-zone interbank market for the EURIBOR Index Maturity specified in the applicable Pricing Supplement commencing on the applicable Interest Reset Date, and in a principal amount not less than the equivalent of USD 1 million in euros that is representative of a single transaction in euros, in that market at that time. If at least two (2) quotations are provided, EURIBOR will be the arithmetic mean of those quotations.

- If fewer than two quotations are provided, EURIBOR will be the arithmetic mean of the rates quoted by four major banks in the Euro-zone, as selected by the Calculation Agent, at approximately 11:00 a.m. (Brussels time), on the applicable Interest Reset Date for loans in euros to leading European banks for a period of time equivalent to the Index Maturity specified in the applicable Pricing Supplement commencing on that Interest Reset Date in a principal amount not less than the equivalent of USD 1 million in euros.

- If the banks so selected by the Calculation Agent are not quoting as mentioned above, the EURIBOR Rate in effect for the applicable period will be the same as EURIBOR for the immediately preceding Interest Reset Period, or, if there was no Interest Reset Period, the rate of interest will be the Initial Interest Rate.

"**Euro-zone**" means the region comprised of member states of the EU that adopt the single currency in accordance with the treaty establishing the European Community, as amended by the treaty on the EU.

Federal Funds Rate Notes

Federal Funds Rate Notes will bear interest at the interest rates (calculated with reference to the Federal Funds Rate and the Spread and/or Spread Multiplier, if any, and subject to the Minimum Interest Rate and the Maximum Interest Rate, if any) specified in the Federal Funds Rate Notes and in the applicable Pricing Supplement.

"**Federal Funds Rate**" means, with respect to any Interest Determination Date relating to a Federal Funds Rate Note (a "**Federal Funds Interest Determination Date**"), the rate on that day for Federal Funds as published in H.15(519) under the heading "Federal Funds (Effective)" as displayed on Reuters (or any successor service) on page FEDSFUNDS1 or any other page as may replace the applicable page on that service, or Reuters Screen FEDFUNDS1 Page.

The following procedures will be followed if the Federal Funds Rate cannot be determined as described above:

- If the above rate is not displayed on FEDSFUNDS1 Page or is not published by 9:00 a.m., New York City time, on the Calculation Date, the Federal Funds Rate will be the rate on such Federal Funds Interest Determination Date as published in H.15 Daily Update under the heading "Federal Funds (Effective)."

- If such rate is not yet published in either H.15(519) or H.15 Daily Update by 3:00 p.m., New York City time, on the Calculation Date, the Calculation Agent will determine the Federal Funds Rate to be the arithmetic mean of the rates for the last transaction in overnight Federal Funds arranged by each of three leading brokers of Federal Funds transactions in New York City selected by the Calculation Agent prior to 9:00 a.m., New York City time, on such Federal Funds Interest Determination Date.

- If the brokers selected by the Calculation Agent are not quoting as mentioned above, the Federal Funds Rate with respect to such Federal Funds Interest Determination Date will remain the Federal Funds Rate then in effect on such Federal Funds Interest Determination Date.

LIBOR Notes

LIBOR Notes will bear interest at the interest rates (calculated with reference to LIBOR and the Spread and/or Spread Multiplier, if any, and subject to the Minimum Interest Rate and the Maximum Interest Rate, if any) specified in the LIBOR Notes and in the applicable Pricing Supplement.

Subject to the provisions of the applicable Pricing Supplement, LIBOR for each Interest Determination Date relating to a LIBOR Note (a "**LIBOR Interest Determination Date**") will be, as determined by the Calculation Agent as follows:

- As of the LIBOR Interest Determination Date, LIBOR will be the rate for deposits in the Index Currency (as defined below) having the Index Maturity designated in the applicable Final Terms, commencing on the second London Banking Day immediately following such LIBOR Interest Determination Date, that appears on the Designated LIBOR Page (as defined below) as of 11:00 a.m., London time, on that LIBOR Interest Determination Date. If no such rate appears, LIBOR in respect of the related LIBOR Interest Determination Date will be determined as if the parties had specified the rate described below.

- With respect to a LIBOR Interest Determination Date on which no rate appears the Calculation Agent will request the principal London offices of each of four major reference banks in the London interbank market, as selected by the Calculation Agent, to provide the Calculation Agent with its offered quotation for deposits in the Index Currency for the period of the Index Maturity designated in the applicable Pricing Supplement, commencing on the second London Banking Day immediately following such LIBOR Interest Determination Date, to prime banks in the London interbank market at approximately 11:00 a.m., London time, on such LIBOR Interest Determination Date and in a principal amount that is representative of a single transaction in such Index Currency in such market at that time. If at least two such quotations are provided, LIBOR determined on such LIBOR Interest Determination Date will be the arithmetic mean of such quotations. If fewer than two quotations are provided, LIBOR determined on such LIBOR Interest Determination Date will be the arithmetic mean of the rates quoted at approximately 11:00 a.m., in the applicable principal financial center for the country of the Index Currency on such LIBOR Interest Determination Date, by three major banks in such principal financial center selected by the Calculation Agent for loans in the Index Currency to leading European banks, having the Index Maturity designated in the applicable Pricing Supplement and in a principal amount that is representative for a single transaction in such Index Currency in such market at such time; provided, however, that if the banks so selected by the Calculation Agent are not quoting as mentioned in this sentence, LIBOR in effect for the applicable period will be the same as LIBOR for the immediately preceding Interest Reset Period (or, if there was no such Interest Reset Period, the rate of interest payable on the LIBOR Notes for which such LIBOR is being determined shall be the Initial Interest Rate).

- Notwithstanding the immediately preceding paragraph, if either the Trust or the Calculation Agent determines that LIBOR has been permanently discontinued, the Calculation Agent will use, as a substitute for LIBOR (the "**Alternative Rate**") and for each future LIBOR Interest Determination Date, the alternative reference rate selected by the central bank, reserve bank, monetary authority or any similar institution (including any committee or working group thereof) that is consistent with accepted market practice. As part of such substitution, the Calculation Agent will make such adjustments ("**Adjustments**") to the Alternative Rate or the spread thereon, as well as the business day convention, LIBOR Interest Determination Dates and related provisions and definitions, in each case that are consistent with accepted market practice for the use of such Alternative Rate for debt obligations such as the Notes in accordance with the direction of the Trust. If it is unclear as to whether any rate has replaced LIBOR consistent with accepted market practice, the Trust will appoint, in its sole discretion, a new calculation agent, who may be an affiliate of MassMutual, to replace the Calculation Agent, solely in its role as calculation agent in respect of any applicable LIBOR Notes, to determine the Alternative Rate and make any Adjustments thereon, and whose determinations will be binding on the Trust, the Indenture Trustee and the Holders of the Notes. If, however, for such LIBOR Interest Determination Date, LIBOR has been permanently discontinued, but for any reason an Alternative Rate has not been determined, LIBOR will be equal to such rate on the LIBOR Interest Determination Date when LIBOR was last available on the Designated LIBOR Page.

"**Index Currency**" means the currency (including composite currencies) specified in the applicable Pricing Supplement as the currency for which LIBOR shall be calculated. If no such currency is specified in the applicable Pricing Supplement, the Index Currency shall be U.S. dollars.

"**Designated LIBOR Page**" means if "LIBOR Reuters" is designated in the applicable Pricing Supplement, the display on the Reuters Money 3000 Service (or any successor service) for the purpose of displaying the London interbank rates of major banks for the applicable Index Currency.

Prime Rate Notes

Prime Rate Notes will bear interest at the interest rates (calculated with reference to the Prime Rate and the Spread and/or Spread Multiplier, if any, and subject to the Minimum Interest Rate and the Maximum Interest Rate, if any) specified in the Prime Rate Notes and in the applicable Pricing Supplement.

"**Prime Rate**" means, with respect to any Interest Determination Date relating to a Prime Rate Note (a "**Prime Interest Determination Date**"), the rate on such date as published in H.15(519) under the heading "Bank Prime Loan."

The following procedures will be followed if the Prime Rate cannot be determined as described above:

- If the rate is not published prior to 9:00 a.m., New York City time, on the Calculation Date, then the Prime Rate will be the rate on such Prime Interest Determination Date as published in H.15 Daily Update opposite the caption "Bank Prime Loan."

- If the rate is not published prior to 3:00 p.m., New York City time, on the Calculation Date, in either H.15(519) or the H.15 Daily Update then the Calculation Agent will determine the Prime Rate to be the arithmetic mean of the rates of interest publicly announced by each bank that appears on the Reuters Screen US PRIME 1 Page (as defined below) as such bank's prime rate or base lending rate as in effect for that Prime Interest Determination Date.

- If fewer than four such rates appear on the Reuters Screen US PRIME 1 Page for the Prime Interest Determination Date, the Calculation Agent will determine the Prime Rate to be the arithmetic mean of the prime rates quoted on the basis of the actual number of days in the year divided by 360 as of the close of business on such Prime Interest Determination Date by at least three major banks in New York City selected by the Calculation Agent.

- If the banks selected are not quoting as mentioned above, the Prime Rate will remain the Prime Rate in effect on such Prime Interest Determination Date.

"**Reuters Screen US PRIME 1 Page**" means the display designated as page "US PRIME 1" on the Reuters Money 3000 Service (or any successor service) or any such other page as may replace the US PRIME 1 Page on that service for the purpose of displaying prime rates or base lending rates of major U.S. banks.

Treasury Rate Notes

Treasury Rate Notes will bear interest at the interest rates (calculated with reference to the Treasury Rate and the Spread and/or Spread Multiplier, if any, and subject to the Minimum Interest Rate and the Maximum Interest Rate, if any) specified in the Treasury Rate Notes and the applicable Pricing Supplement.

"**Treasury Rate**" means, with respect to any Interest Determination Date relating to a Treasury Rate Note (a "**Treasury Rate Interest Determination Date**"), the rate from the auction held on the applicable Treasury Rate Interest Determination Date (the "**Auction**") of direct obligations of the U.S. ("**Treasury Bills**") having the Index Maturity specified in the applicable Pricing Supplement as that rate appears under the caption "INVESTMENT RATE" on the display on Reuters (or any successor service), on page USAUCTION 10/11 or any other page that may replace such page on that service, or Reuters Screen USAUCTION 10/11 Page; or

- if the rate described above is not published by 3:00 p.m., New York City time, on the Calculation Date, the Bond Equivalent Yield of the rate for the applicable Treasury Bills as published in the H.15 Daily Update, or other recognized electronic source used for the purpose of displaying the applicable rate, under the caption "U.S. Government Securities/Treasury Bills/Auction High"; or

- if the rate described above is not published by 3:00 p.m., New York City time, on the related Calculation Date, the Bond Equivalent Yield of the Auction rate of the applicable Treasury Bills, announced by the Treasury Department; or

- if the rate described above is not announced by the Treasury Department, or if the Auction is not held, the Bond Equivalent Yield of the rate on the applicable Treasury Rate Interest Determination Date of Treasury Bills having the Index Maturity specified in the relevant Pricing Supplement published in H.15(519) under the caption "U.S. Government Securities/Treasury Bills/ Secondary Market"; or

- if the rate described above is not so published by 3:00 p.m., New York City time, on the related Calculation Date, the rate on the applicable Treasury Rate Interest Determination Date of the applicable Treasury Bills as published in H.15 Daily Update, or other recognized electronic source used for the purpose of displaying the applicable rate, under the caption "U.S. Government Securities/ Treasury Bills/Secondary Market"; or

- if the rate described above is not so published by 3:00 p.m., New York City time, on the related Calculation Date, the rate on the applicable Treasury Rate Interest Determination Date calculated by the Calculation Agent as the Bond Equivalent Yield of the arithmetic mean of the secondary market bid rates, as of approximately 3:30 p.m., New York City time, on the applicable Treasury Rate Interest Determination Date, of three primary U.S. government securities dealers, which may include the Calculation Agent or its affiliates, selected by the Calculation Agent, for the issue of Treasury Bills with a remaining maturity closest to the Index Maturity specified in the applicable Pricing Supplement; or

- if the dealers selected by the Calculation Agent are not quoting as described above, the Treasury Rate for the immediately preceding Interest Reset Period, or, if there was no Interest Reset Period, the rate of interest payable shall be the Initial Interest Rate.

The "**Bond Equivalent Yield**" means a yield calculated in accordance with the following formula and expressed as a percentage:

$$\text{Bond Equivalent Yield} = \frac{D \times N}{360 - (D \times M)} \times 100$$

where "D" refers to the applicable per annum rate for Treasury Bills quoted on a bank discount basis, "N" refers to 365 or 366, as the case may be, and "M" refers to the actual number of days in the applicable Interest Reset Period.

CMT Rate Notes

CMT Rate Notes will bear interest at the interest rates (calculated with reference to the CMT Rate and the Spread and/or Spread Multiplier, if any, and subject to the Minimum Interest Rate and the Maximum Interest Rate, if any) specified in the CMT Rate Notes and in the applicable Pricing Supplement.

"**CMT Rate**" means, with respect to any Interest Determination Date relating to a CMT Rate Note (a "**CMT Interest Determination Date**"), the rate displayed on the Designated CMT Reuters Page (as defined below) under the caption "Treasury Constant Maturities. Federal Reserve Board Release H.15. Mondays Approximately 3:45 p.m.," under the column for the Designated CMT Maturity Index (as defined below) for:

(i) If the Designated CMT Reuters Page is the Reuters Screen FRBCMT Page, the rate on such CMT Interest Determination Date; and

(ii) If the Designated CMT Reuters Page is the Reuters Screen FEDCMT Page, the week or the month, as applicable, ended immediately preceding the week in which the related CMT Interest Determination Date occurs.

The following procedures will be used if the CMT Rate cannot be determined as described above:

- If such rate is no longer displayed on the relevant page, or if not displayed by 3:00 p.m., New York City time, on the related Calculation Date, then the CMT Rate will be such Treasury Constant Maturity rate for the Designated CMT Maturity Index as published in the relevant H.15(519).

- If that rate is no longer published, or if not published by 3:00 p.m., New York City time, on the related Calculation Date, then the CMT Rate will be such Treasury Constant Maturity rate for the Designated CMT Maturity Index (or other U.S. Treasury rate for the Designated CMT Maturity Index) for the CMT Interest Determination Date with respect to such Interest Reset Date as may then be published by either the Board of Governors of the Federal Reserve System or the Treasury Department that the Calculation Agent determines to be comparable to the rate formerly displayed on the Designated CMT Reuters Page and published in the relevant H.15(519).

- If such information is not provided by 3:00 p.m., New York City time, on the related Calculation Date, then the Calculation Agent will determine the CMT Rate to be a yield to maturity, based on the arithmetic mean of the secondary market closing offer side prices as of approximately 3:30 p.m., New York City time, on the CMT Interest Determination Date reported, according to their written records, by three leading primary U.S. government securities dealers (each, a "**Reference Dealer**") in The City of New York selected by the Calculation Agent as described in the following sentence. The Calculation Agent will select five Reference Dealers and will eliminate the highest quotation (or, in the event of equality, one of the highest) and the lowest quotation (or, in the event of equality, one of the lowest), for the most recently issued direct noncallable fixed rate obligations of the U.S. ("**Treasury Notes**"), with an original maturity of approximately the Designated CMT Maturity Index and a remaining term to maturity of not less than such Designated CMT Maturity Index minus one year.

- If the Calculation Agent cannot obtain three such Treasury Notes quotations, the Calculation Agent will determine the CMT Rate to be a yield to maturity based on the arithmetic mean of the secondary market offer side prices as of approximately 3:30 p.m., New York City time, on the CMT Interest Determination Date of three Reference Dealers in The City of New York (selected using the same method described above), for Treasury Notes with an original maturity of the number of years that is the next highest to the Designated CMT Maturity Index and a remaining term to maturity closest to the Designated CMT Maturity Index and in an amount of at least $100,000,000.

- If three or four (and not five) of such Reference Dealers are quoting as described above, then the CMT Rate will be based on the arithmetic mean of the offer prices obtained and neither the highest nor the lowest of such quotes will be eliminated.

- If fewer than three Reference Dealers selected by the Calculation Agent are quoting as described above, the CMT Rate will be the CMT Rate in effect on such CMT Interest Determination Date.

- If two Treasury Notes with an original maturity as described above have remaining terms to maturity equally close to the Designated CMT Maturity Index, the quotes for the Treasury Note with the shorter remaining term to maturity will be used.

"**Designated CMT Reuters Page**" means the display on Reuters (or any successor service) on the page designated in the applicable Pricing Supplement (or any other page as may replace such page on that service for the purpose of displaying Treasury Constant Maturities as reported in H.15(519)), for the purpose of displaying Treasury Constant Maturities as reported in H.15(519). If no such page is specified in the applicable Pricing Supplement, the Designated CMT Reuters Page shall be Reuters Screen FEDCMT Page, for the most recent week.

"**Designated CMT Maturity Index**" means the original period to maturity of the U.S. Treasury securities (either 1, 2, 3, 5, 7, 10 or 20 years) specified in an applicable Pricing Supplement with respect to which the CMT Rate will be calculated. If no maturity is specified in the applicable Pricing Supplement, the Designated CMT Maturity Index shall be two years.

Redemption at Maturity

Each Note shall be redeemed on maturity at its outstanding principal amount.

Payment of Additional Amounts

Each Series Trust will, subject to the exceptions and limitations set forth below, pay as additional interest on the Notes such additional amounts as are necessary in order that the net payment by the Series Trust or a Paying Agent of the principal of and interest on the Notes to a Holder of a Note after deduction or withholding for any present or future taxes, duties, assessments or governmental charges of the U.S. or a political subdivision or taxing authority thereof or therein, imposed by withholding with respect to the payment, will not be less than the amount provided in the Notes to be then due and payable; provided*,* however*,* that the foregoing obligation to pay additional amounts shall not apply to: (i) any tax, duty, levy, assessment or other governmental charge imposed which would have not been imposed but for (a) the existence of any present or former connection between the Holder or beneficial owner (as determined for U.S. federal income tax purposes) of the Funding Agreement or of one or more of the Notes (any such Holder or beneficial owner, hereafter, the "**Owner**") and the U.S., including without limitation, being or having been a citizen or resident thereof, or being or having been present therein, incorporated therein, engaged in a trade or business therein or having (or having had) a permanent establishment or principal office therein, or (b) such Owner being or having been treated as a controlled foreign corporation within the meaning of Section 957(a) of the Code related within the meaning of Section 864(d)(4) of the Code to MassMutual or a private foundation or other tax-exempt organization or (c) such Owner being or having been an owner, directly or indirectly, of 10% or more of the total combined voting power of the outstanding equity of MassMutual, or (d) such Owner being a bank for U.S. federal income tax purposes whose receipt of interest on the Funding Agreement or the Notes is described in Section 881(c)(3)(A) of the Code, or (e) such Owner being subject to backup withholding as of the date of becoming an Owner; (ii) any tax, duty, levy, assessment or other governmental charge, which would not have been imposed but for the presentation of the Funding Agreement or the Notes or evidence of beneficial ownership thereof (where presentation is required) for payment on a date more than 30 days after the date on which such payment becomes due and payable or the date on which payment is duly provided for, whichever occurs later; except to the extent that an Owner would have been entitled to additional amounts had the Funding Agreement or a Note been presented on the last day of such 30 day period; (iii) any tax, duty, levy, assessment or other governmental charge, which is imposed or withheld solely by reason of the failure of an Owner to comply with certification, identification or information reporting requirements concerning the nationality, residence, identity or connection with the U.S. of an Owner (including without limitation, failure to provide IRS Forms W-8BEN or W-8ECI), if compliance is required by statute, by regulation of the U.S. Treasury Department, judicial or administrative interpretation, other law or by an applicable income tax treaty to which the U.S. is a party as a condition to exemption from such tax, duty, levy, assessment or other governmental charge; (iv) any inheritance, gift, estate, personal property, sales, transfer or similar tax, duty, levy, assessment or similar governmental charge; (v) any tax, duty, levy, assessment or other governmental charge that is payable otherwise than by withholding from payments in respect of the Funding Agreement or the Notes; (vi) any tax, duty, levy, assessment or other governmental charge that would not have been imposed or withheld but for the treatment of payments in respect of the Funding Agreement or the Notes as contingent interest described in Section 871(h)(4) of the Code; (vii) any tax, duty, levy, assessment or other governmental charge that would not have been imposed or withheld but for an election (other than an election to integrate a Funding Agreement and one or more Swaps into a single "synthetic debt instrument" (within the meaning of Treasury Regulation Section 1.1276-5(b)(4)) or a single "integrated economic transaction" (within the meaning of Treasury Regulation Section 1.988-5(a)(5))) by the Owner, the effect of which is to make payment in respect of the Funding Agreement or the Notes subject to U.S. federal income tax; (viii) any tax, duty levy, assessment or governmental charge imposed by Sections 1471 through 1474 of the Code, any applicable U.S. Treasury Regulations promulgated thereunder, any intergovernmental agreement or implementing legislation or any judicial or administrative interpretation of any of the foregoing as a result of a holder, beneficial owner, intermediary or other payee not being entitled to receive payments free of any such tax, duty, levy, assessment or governmental charge imposed; or (ix) any combination of items (i), (ii), (iii), (iv), (v), (vi), (vii) or (viii). *See* "Description of Certain Terms and Conditions of the Funding Agreements – Payment of Additional Amounts; Termination of Funding Agreement."

The Notes are subject in all cases to any tax, fiscal or other law, regulation, or administrative or judicial interpretation applicable thereto. Except as specifically provided under this heading "– Payment of Additional

Amounts," the Series Trust for the relevant Series of Notes shall not be required to make any payment with respect to any tax, assessment or governmental charge imposed by any government or a political subdivision or taxing authority thereof or therein.

Tax Redemption

If MassMutual, as a result of it being required to pay additional amounts under the Funding Agreement(s) securing the relevant Notes, has elected to repay all amounts due under such Funding Agreement(s) and corresponding Swap(s), if any, and thereby terminates such Funding Agreement(s) and corresponding Swap(s), if any, then the relevant Series Trust shall redeem, as a whole, but not in part, the Notes on not less than 30 days' notice, at a redemption price equal to 100% of their principal amount, together with interest accrued but unpaid thereon to the date fixed for redemption. If any Notes to be redeemed as provided in this paragraph are listed on Euronext Dublin, notice of such tax redemption shall be made in a leading daily newspaper having general circulation in Ireland (expected to be the *Irish Times*). *See* "Description of Certain Terms and Conditions of the Funding Agreements – Payment of Additional Amounts; Termination of Funding Agreement" and "Description of Certain Terms and Conditions of the Swaps – Termination Events."

Optional Redemption and Repurchase of Notes

Optional Redemption by a Series Trust. A Series Trust may have the option to redeem Notes of such Series. The relevant Series Trust will mail a notice of redemption to each Holder of Registered Notes by first-class mail, postage prepaid, at least 30 days and not more than 60 days prior to the date fixed for redemption to the address of each Holder as that address appears upon the books maintained by the Paying Agent. Further, if any Notes to be redeemed as provided in this paragraph are listed on Euronext Dublin, notice of such redemption shall also be made in a leading daily newspaper having general circulation in Ireland (expected to be the *Irish Times*). The first publication of the notice of redemption will be made at least 30 days and not more than 60 days prior to the date fixed for redemption.

Repayment at Option of Holder. Except with respect to an event of default under the Notes, the Notes will not provide the Holder with the option to have the Series Trust repay the Note on a date or dates specified prior to its maturity date. *See* "Description of the Indenture – Events of Default."

Repurchase of Notes. The Trust may purchase some or all Notes of any Series in the open market or otherwise at any time, and from time to time, with the prior written consent of MassMutual as to both the making of such purchase and the purchase price to be paid for such Notes; *provided* that all unmatured coupons or talons appertaining thereto are purchased therewith. If MassMutual, in its sole discretion, consents to such purchase of Notes by the Trust, then the Trust and the Indenture Trustee agree to take such actions as may be necessary or desirable to effect the prepayment of such portion, or the entirety, of the current balance of the Funding Agreement Account under each applicable Funding Agreement as may be necessary to provide for the payment of the purchase price for such Notes. Upon such payment, the balance of the account created by MassMutual under each Funding Agreement (each, a "**Funding Agreement Account**") shall be reduced (i) with respect to any purchase of Fixed Rate Notes or Floating Rate Notes, by an amount equal to the aggregate principal amount of the Notes so purchased (or the portion thereof applicable to such Funding Agreement) and any accrued interest thereon as applicable and (ii) with respect to any purchase of Notes other than Fixed Rate Notes or Floating Rate Notes, by an amount to be agreed between the Trust and MassMutual to reflect such prepayment under the Funding Agreement. In the event a Series Trust entered into one or more corresponding Swaps with MassMutual in connection with such Funding Agreement, the notional amount under any of such Swaps shall be correspondingly reduced.

Replacement of Notes

At the expense of the Holder, a Series Trust will replace any Notes that become mutilated, destroyed, lost or stolen or are apparently destroyed, lost or stolen. The mutilated Notes must be delivered to the applicable trustee, the Paying Agent and the registrar (the "**Registrar**"), in the case of Registered Notes, or satisfactory evidence of the destruction, loss or theft of the Notes must be delivered to the relevant Series Trust, the Paying Agent, the Registrar (in the case of Registered Notes), and the applicable trustee. At the expense of the Holder, an indemnity and replacement fee that is satisfactory to the relevant Series Trust, the Paying Agent, the Registrar (in the case of Registered Notes), and the applicable trustee may be required before a replacement Note will be issued.

Prescription

Any money deposited with the Indenture Trustee, Registrar or any Paying Agent in trust for the payment of the principal of or interest on any Note and remaining unclaimed for two years after such principal or any such premium or interest had become due and payable shall be paid to the relevant Series Trust on a Trust Request (as defined in the Indenture); and the Holder of such Note shall thereafter, as an unsecured general creditor, look only to the relevant Series Trust for payment thereof, and all liability of the Indenture Trustee, Registrar or such Paying Agent with respect to such trust money shall thereupon cease; provided, however, that the Indenture Trustee, Registrar or such Paying Agent, before being required to make any such repayment, may at the expense of the relevant Series Trust cause to be published once, in an Authorized Newspaper (as defined in the Indenture) in each Place of Payment or to be mailed to Noteholders, or both, notice that such money remains unclaimed and that, after a date specified therein, which shall not be less than 30 days from the date of such publication or mailing nor shall it be later than two years after such principal and any interest shall have become due and payable, any unclaimed balance of such money then remaining will be repaid to the relevant Series Trust.

Global Notes

Book-Entry, Delivery and Form. The information set out below in connection with DTC, Euroclear and Clearstream (together, the "**Clearing Systems**") is subject to any change in or reinterpretation of the rules, regulations and procedures of each of the Clearing Systems currently in effect. The information in this section concerning the Clearing Systems has been obtained from sources believed to be reliable, but none of MassMutual, any Series Trust or any Initial Purchaser takes any responsibility for the accuracy of such information. Investors wishing to use the facilities of any of the Clearing Systems are advised to confirm the applicability of the rules, regulations and procedures of the relevant Clearing System. Neither MassMutual, any Series Trust, any Initial Purchaser nor any other party to the Indenture or Trust Agreement will have any responsibility or liability for any aspect of the records relating to, or payments made on account of interests in the Notes held through the facilities of any Clearing System or for maintaining, supervising or reviewing any records relating to such beneficial ownership interests.

Notes Sold under Rule 144A. The Rule 144A Global Notes will be issued in the form of a permanent global Note, in fully registered form without interest coupons, which shall be deposited with the Custodian as custodian for DTC and registered in the name of the 144A Nominee, as nominee of DTC, for credit to the respective accounts of the purchasers of Notes at DTC. The Rule 144A Global Note and any Note issued in exchange therefor will be subject to certain restrictions on transfer set forth herein and in the Trust Agreement and relevant Series Trust Agreement and will bear the legends set forth in "Purchase and Transfer Restrictions."

Notes Sold in Registered Form Under Regulation S. The Regulation S Temporary Global Registered Notes will initially be issued in the form of a single temporary global Note, in fully registered form without interest coupons, registered in the name of the Regulation S Nominee, as nominee for Euroclear and/or Clearstream, and deposited with the Common Depositary, as common depositary of Euroclear and/or Clearstream and in respect of interests held through Euroclear and Clearstream, for the respective accounts of the purchasers of such Notes. Beneficial interests in a Regulation S Temporary Global Registered Note may only be held through Euroclear or Clearstream and, except as provided herein, may not be exchanged for a beneficial interest in any other Note. Beneficial interests in a Regulation S Temporary Global Registered Note will be exchanged for beneficial interests in a Regulation S Permanent Global Registered Note in fully registered form without interest coupons together with the Regulation S Temporary Global Registered Note, (the "**Regulation S Global Notes**") upon the later of (i) the Release Date (as defined herein) and (ii) the first date subsequent to the Release Date on which the requisite certifications as to Non-U.S. beneficial ownership are provided to the Indenture Trustee. The Release Date is the date forty (40) days after the later of (i) the date the relevant Notes were first offered to persons other than Initial Purchasers and (ii) the relevant closing date for such Notes. The Regulation S Permanent Global Registered Note will be registered in the name of the Regulation S Nominee, as nominee for, and deposited with the Common Depositary of, Euroclear and Clearstream for the respective accounts of the Holders of such Notes.

A beneficial interest in a Regulation S Temporary Global Registered Note may be transferred to a person who takes delivery in the form of an interest in the corresponding Rule 144A Global Note only upon receipt by the Indenture Trustee of a written certification from the transferor in the form required by the Indenture to the effect that such transfer is being made to a person whom the transferor reasonably believes is a Qualified Institutional Buyer in a transaction meeting the requirements of Rule 144A and in accordance with any applicable securities laws of any state of the U.S. or any other jurisdiction. Beneficial interests in a Rule 144A Global Note may be transferred to a person who takes delivery in the form of an interest in the corresponding Regulation S Global Note, only upon receipt by the relevant Indenture Trustee of a written certification from the transferor in the form required by the relevant Indenture to the effect that such transfer is being made in accordance with Regulation S. Any beneficial interest in one of the global Notes that is transferred to a person who takes delivery in the form of an interest in another global Note will, upon transfer, cease to be an interest in such global Note and become an interest in such other global Note and, accordingly, will thereafter be subject to all transfer restrictions and other procedures applicable to beneficial interests in such other global Note for as long as it remains such an interest.

Interest payments due on any interest payment date with respect to a Regulation S Temporary Global Registered Note will be made only to the extent that certification as to its beneficial ownership as required by U.S. Treasury and securities regulations has been received by Euroclear or Clearstream. Payments in the amounts due in respect of a Regulation S Permanent Global Registered Note will be made through Euroclear or Clearstream or any other relevant clearing system without any requirement for certification; however see “Taxation” regarding withholding certification requirements with respect to payments of interest to Holders of the Notes. After the Release Date, Holders of interests in any Regulation S Temporary Global Registered Note shall not be entitled to receive any payment thereunder, which falls due on or after the Release Date, or be entitled to exercise any exchange right or other option after such date, unless upon due presentation of such Note for exchange in whole for a Regulation S Permanent Global Registered Note, or for delivery of definitive Registered Notes, such exchange or delivery has been improperly withheld or refused, and such circumstances are continuing as of the relevant payment date.

Subject to applicable law and the terms of the Indenture and the relevant Series Indenture, any Series Trust, the Registrar and any Paying Agent will treat the persons in whose names the global Notes are registered, initially the 144A Nominee and the Regulation S Nominee (collectively, the “**Global Note Holders**”), as owners of such global Notes for the purpose of receiving payments of principal, premium, if any, and interest on the Notes and for all other purposes whatsoever. Therefore, none of any Series Trust, the Registrar or any Paying Agent has any direct responsibility or liability for the payment of principal of or interest on the Notes to owners of beneficial interests in the global Notes. All payments made by any Series Trust to the registered Global Note Holders shall discharge the liability of the relevant Series Trust under the Notes to the extent of the sums so paid.

The Clearing Systems

The Clearing Systems have advised each Series Trust as follows:

DTC. DTC is a limited-purpose trust company organized under the laws of the State of New York, a member of the Federal Reserve System, a “clearing corporation” within the meaning of the New York Uniform Commercial Code and a “clearing agency” registered pursuant to the provisions of Section 17A of the Exchange Act. DTC was created to hold securities for DTC Participants (each, a “**DTC Participant**”) and to facilitate the clearance and settlement of transactions between DTC Participants through electronic book-entry changes in accounts of DTC Participants, thereby eliminating the need for physical movement of certificates. DTC Participants include underwriters, securities brokers and dealers (including the Initial Purchasers), banks, trust companies and clearing corporations and may in the future include certain other organizations. Indirect access to the DTC system is also available to others such as banks, brokers, dealers and trust companies that clear through or maintain a custodial relationship with a DTC Participant, either directly or indirectly (each, an “**Indirect DTC Participant**”).

Transfers of ownership or other interests in Notes in DTC may be made only through DTC Participants. Indirect DTC Participants are required to effect transfers through a DTC Participant. In addition, beneficial owners of Notes in DTC will receive all distributions of principal of and interest on the Notes through such DTC Participant.

Because DTC can only act on behalf of DTC Participants, who in turn act on behalf of Indirect DTC Participants, and, because owners of beneficial interests in the Notes holding through DTC will hold interests in the Notes through DTC Participants or Indirect DTC Participants, the ability of such owners of beneficial interests to pledge Notes to persons or entities that do not participate in DTC, or otherwise take actions with respect to such Notes, may be limited.

Ownership of interests in the Rule 144A Note will be shown on, and the transfer of that ownership will be effected only through, records maintained by DTC, the DTC Participants and the Indirect DTC Participants. The laws of some jurisdictions require that certain persons take physical delivery in definitive form of securities, which they own. Consequently, the ability to transfer beneficial interests in the Rule 144A Note is limited to such context.

Clearstream. Clearstream is incorporated under the laws of Luxembourg as a bank. Clearstream holds securities for Clearstream Participants (each, a "**Clearstream Participant**") and facilitates the clearance and settlement of securities transactions between Clearstream Participants through electronic book-entry changes in accounts of Clearstream Participants, thereby eliminating the need for physical movement of certificates. Clearstream provides to Clearstream Participants, among other things, services for safekeeping, administration, clearance and settlement of internationally traded securities and securities lending and borrowing. Clearstream interfaces with domestic markets in several countries. As a bank, Clearstream is subject to regulation by the Luxembourg Commission for the Supervision of the Financial Sector, also known as the *Commission de Surveillance du Secteur Financier*. Clearstream Participants are recognized financial institutions around the world, including underwriters, securities brokers and dealers, banks, trust companies, clearing corporations and certain other organizations and may include the Initial Purchasers. Indirect access to Clearstream is also available to others, such as banks, brokers, dealers and trust companies that clear through or maintain a custodial relationship with a Clearstream Participant either directly or indirectly.

Distributions with respect to Notes held beneficially through Clearstream will be credited to cash accounts of Clearstream Participants in accordance with its rules and procedures, to the extent received by Clearstream.

Euroclear. Euroclear was created in 1968 to hold securities for Euroclear Participants and to clear and settle transactions between Euroclear Participants through simultaneous electronic book-entry delivery against payment, thereby eliminating the need for physical movement of certificates and any risk from lack of simultaneous transfers of securities and cash. Euroclear includes various other services, including securities lending and borrowing and interfaces with domestic markets in several countries. Euroclear Participants include banks (including central banks), securities brokers, dealers, and other professional financial intermediaries and may include the Initial Purchasers. Indirect access to Euroclear is also available to other firms that clear through or maintain a custodial relationship with a Euroclear Participant, either directly or indirectly.

Euroclear, Clearstream and DTC Arrangements

So long as DTC or its nominee or Euroclear, Clearstream or the nominee of their common depositary is the registered Holder of the global Notes, DTC, Euroclear, Clearstream or such nominee, as the case may be, will be considered the sole owner or Holder of the Notes represented by such global Notes for all purposes under the Indenture, the Series Indenture with respect to that Series of Notes and the Notes. Payments of principal, interest and additional amounts, if any, in respect of the global Notes will be made to DTC, Euroclear, Clearstream or such nominee, as the case may be, as the registered Holder thereof. None of any Series Trust, any Initial Purchaser or any affiliate of any of the above or any person by whom any of the above is controlled (as such term is defined in the Securities Act) will have any responsibility or liability for any aspect of the records relating to or payments made on account of beneficial ownership interests in the global Notes or for maintaining, supervising or reviewing any records relating to such beneficial ownership interests.

Distributions of principal and interest with respect to global interests in the Notes held through Euroclear or Clearstream will be credited, to the extent received by Euroclear or Clearstream from the relevant Paying Agent, to the cash accounts of Euroclear or Clearstream customers in accordance with the relevant system's rules and procedures.

Holders of global interests in the Notes through DTC will receive, to the extent received by DTC from the relevant Paying Agent, all distributions of principal and interest with respect to global interests in the Notes from the relevant Paying Agent through DTC. Distributions in the U.S. will be subject to relevant U.S. tax laws and regulations.

Interest on the Notes (other than interest on redemption) will be paid to the Holder shown on the register on the Record Date. Trading between the Rule 144A Global Note and the Regulation S Global Note will therefore be net of accrued interest from the Record Date to the relevant Interest Payment Date.

The laws of some states of the U.S. require that certain persons take physical delivery of securities in definitive form. Consequently, the ability to transfer interests in the global Notes to such persons will be limited. Because DTC, Euroclear and Clearstream can only act on behalf of participants, who in turn act on behalf of indirect participants, the ability of a person having an interest in the global Notes to pledge such interest to persons or entities, which do not participate in the relevant clearing system, or otherwise take actions in respect of such interest, may be affected by the lack of a physical certificate in respect of such interest.

The holdings of global interests in the Notes through Euroclear, Clearstream and DTC will be reflected in the global accounts of each such institution. As necessary, the Registrar will adjust the amounts of the Notes on the register for the accounts of (i) the Regulation S Nominee and (ii) the 144A Nominee to reflect the amounts of Notes held through Euroclear and Clearstream, and DTC, respectively.

Beneficial ownership of Notes will be held through financial institutions as direct and indirect participants in Euroclear, Clearstream and DTC.

Interests in the global Notes will be in uncertificated global form.

Secondary Market Trading in Relation to Registered Global Notes

Trading between Euroclear and/or Clearstream Participants. Secondary market sales of global interests in the Notes held through Euroclear or Clearstream to purchasers of global interests in the Notes through Euroclear or Clearstream will be conducted in accordance with the normal rules and operating procedures of Euroclear and Clearstream and will be settled using the procedures applicable to conventional Euro Notes.

Trading between DTC Participants. Secondary market sales of global interests in the Notes between DTC Participants will occur in the ordinary way in accordance with DTC rules and will be settled using the procedures applicable to U.S. corporate debt obligations if payment is effected in U.S. dollars, or free of payment if payment is not effected in U.S. dollars. Where payment is not effected in U.S. dollars, separate payment arrangements outside DTC are required to be made between the DTC Participants.

Trading between DTC Seller and Euroclear/Clearstream Purchaser. When global interests in Notes are to be transferred from the account of a DTC Participant holding a beneficial interest in a Rule 144A Global Note to the account of a Euroclear or Clearstream accountholder wishing to purchase a beneficial interest in a Regulation S Global Note (subject to the certification procedures provided in the relevant Indenture), the DTC Participant will deliver instructions for delivery to the relevant Euroclear or Clearstream accountholder to DTC by 12:00 noon, New York City time, on the settlement date. Separate payment arrangements are required to be made between the DTC Participant and the relevant Euroclear or Clearstream accountholder. On the settlement date, the Custodian will instruct the Registrar to (i) decrease the amount of Notes registered in the name of the 144A Nominee and evidenced by the Rule 144A Global Note and (ii) increase the amount of Notes registered in the name of the nominee (being the Regulation S Nominee) of the common depositary for Euroclear and Clearstream and evidenced by the Regulation S Global Note. Global interests will be delivered free of payment to Euroclear or Clearstream, as the case may be, for credit to the relevant accountholder on the first business day following the settlement date but for value on the settlement date.

Trading between Euroclear/Clearstream Seller and DTC Purchaser. When global interests in the Notes are to be transferred from the account of a Euroclear or Clearstream accountholder to the account of a DTC Participant wishing to purchase a beneficial interest in the Rule 144A Global Note (subject to the certification procedures provided in the relevant Indenture), the Euroclear or Clearstream participant must send to Euroclear or Clearstream delivery free of payment instructions by 7:45 p.m., Luxembourg/Brussels time as the case may be, one business day prior to the settlement date. Euroclear or Clearstream, as the case may be, will in turn transmit appropriate instructions to the common depositary for Euroclear, Clearstream, and the Registrar to arrange delivery to the DTC Participant on the settlement date. Separate payment arrangements are required to be made between the DTC Participant and the relevant Euroclear and Clearstream accountholder, as the case may be. On the settlement date, the common depositary for Euroclear and Clearstream will (a) transmit appropriate instructions to the Custodian who will in turn deliver such global interests in the Notes free of payment to the relevant account of the DTC Participant and (b) instruct the Registrar to (i) decrease the amount of Notes registered in the name of the nominee (being the Regulation S Nominee) of the common depositary for Euroclear and Clearstream and evidenced by the Regulation S Global Note and (ii) increase the amount of Notes registered in the name of the 144A Nominee and evidenced by the Rule 144A Global Note.

Although the foregoing sets out the procedures of Euroclear, Clearstream and DTC in order to facilitate the transfers of interests in the Notes among participants of DTC, Clearstream and Euroclear, none of Euroclear, Clearstream or DTC is under any obligation to perform or continue to perform such procedures, and such procedures may be discontinued at any time. Neither any Series Trust, any Initial Purchaser, any Registrar, any Administrative Trustee, any Indenture Trustee, any Paying Agent, or any affiliate of any of the above, or any person by whom any of the above is controlled for the purposes of the Securities Act, will have any responsibility for the performance by DTC, Euroclear and Clearstream or their respective direct or indirect participants or accountholders of their respective obligations under the rules and procedures governing their operations or for the sufficiency for any purpose of the arrangements described above.

So long as the Regulation S Global Note is held on behalf of Euroclear and Clearstream or any other clearing system (an "**Alternative Clearing System**"), notices to Holders of Notes represented by a beneficial interest in the Regulation S Global Note may be given by delivery of the relevant notice to Euroclear, Clearstream or the Alternative Clearing System, as the case may be, and so long as the Rule 144A Global Note is held on behalf of DTC or an Alternative Clearing System, notices to Holders of Notes represented by a beneficial interest in the Rule 144A Global Note may be given by delivery of the relevant notice to DTC or the Alternative Clearing System, as the case may be, except that, so long as the Notes are listed on Euronext Dublin and the rules of Euronext Dublin so require, notices will also be published in a leading newspaper having general circulation in Ireland (which is expected to be the *Irish Times*) or, if such publication is not practicable, in an English language newspaper having general circulation in Europe.

Indenture Trustee

Under the Indenture and the relevant Series Indenture, and subject to the terms, conditions and limitations set forth therein, if an "Event of Default" has occurred and is continuing thereunder, the Indenture Trustee is obligated to exercise such of the rights and powers vested in it by such Indenture and such relevant Series Indenture, and use the same degree of care and skill in their exercise, as a prudent person would exercise or use under the circumstances in the conduct of its own affairs.

Except during the continuance of an Event of Default under the Indenture or a relevant Series Indenture, the Indenture Trustee need perform only those duties that are specifically set forth in the Indenture and the relevant Series Indenture and no others, and no implied covenants or obligations of the Indenture Trustee will be read into the Indenture or any such relevant Series Indenture. In addition, in the absence of bad faith on its part, the Indenture Trustee may conclusively rely, as to the truth of the statements and the correctness of the opinions expressed therein, upon certificates or opinions furnished to the Indenture Trustee and conforming to the requirements of the Indenture and the relevant Series Indenture unless a Responsible Officer (as defined in the Indenture) of the Indenture Trustee has actual knowledge that such statements or opinions are false.

The Indenture Trustee will examine such certificates and opinions to determine whether they conform to the requirements of the Indenture and the relevant Series Indenture.

No provision of the Indenture or any relevant Series Indenture will be construed to relieve the Indenture Trustee from liability for its own negligent action, its own negligent failure to act, or its own willful misconduct, except that: (a) this paragraph does not limit the effect of the immediately preceding paragraph; (b) the Indenture Trustee will not be liable for any error of judgment made in good faith by a Responsible Officer (as defined in the Indenture), unless it is proved that the Indenture Trustee was negligent in ascertaining the pertinent facts; (c) the Indenture Trustee will not be liable with respect to any action it takes or omits to take in good faith in accordance with a direction of the Holder or Holders representing at least 66 and 2/3% of the aggregate principal amount of the outstanding Notes of the relevant Series Trust relating to the time, method and place of conducting any proceeding for any remedy available to the Indenture Trustee, or exercising any trust or power conferred upon the Indenture Trustee, under such Indenture with respect to the Notes of such Series Trust; and (d) no provision of the Indenture or any relevant Series Indenture will require the Indenture Trustee to expend or risk its own funds or otherwise incur any financial liability in the performance of any of its duties thereunder, or in the exercise of any of its rights or powers, if it shall have reasonable grounds for believing that repayment of such funds or adequate indemnity against such risk or liability is not reasonably assured to it.

The Indenture Trustee may resign at any time with respect to the Notes of a Series Trust by giving not less than 90 days prior written notice thereof to the relevant Series Trust. If an instrument of acceptance by a successor Indenture Trustee shall not have been delivered to the Indenture Trustee within 30 days after the giving of such notice of resignation, the resigning Indenture Trustee may petition any court of competent jurisdiction for the appointment of a successor Indenture Trustee with respect to the Notes of such Series Trust.

The Indenture Trustee may be removed at any time by the Holder or Holders representing at least 66 and 2/3% of the aggregate principal amount of outstanding Notes of each relevant Series Trust, delivered to the Indenture Trustee and the relevant Series Trust.

If at any time the Indenture Trustee shall cease to be eligible to serve as Indenture Trustee under the requirements of any relevant Indenture or shall become incapable of acting or shall be adjudged as bankrupt or insolvent, or a receiver of the Indenture Trustee or of its property shall be appointed, or any public officer shall take charge or control of the Indenture Trustee or of its property or affairs for the purpose of rehabilitation, conservation or liquidation, then, (i) the Trust (except during the existence of an Event of Default) by a Series Trust Order (as defined in the Indenture) may remove the Indenture Trustee, or (ii) subject to certain obligations to pay costs of suit, any Noteholder who has been a bona fide Holder of a Note of the relevant Series Trust for at least six months may, on behalf of himself and all others similarly situated, petition any court of competent jurisdiction for the removal of the Indenture Trustee and the appointment of a successor Indenture Trustee under the Indenture and any relevant Series Indenture.

If the Indenture Trustee shall resign, be removed or become incapable of acting, or if a vacancy shall occur in the office of the Indenture Trustee for any cause, the Trust, by a Series Trust Order, shall promptly appoint a successor Indenture Trustee. If within one year after such resignation, removal or incapability or the occurrence of such vacancy, a successor Indenture Trustee is appointed by act of the Holder or Holders of Notes of the Series Trusts representing at least 66 and 2/3% of the aggregate principal amount of the outstanding Notes of Series Trusts delivered to the Trust and the retiring Indenture Trustee, the successor Indenture Trustee so appointed shall, forthwith upon its acceptance of such appointment, become the successor Indenture Trustee and to that extent supersede the successor Indenture Trustee appointed by the Trust. If no successor Indenture Trustee with respect to the Trust shall have been so appointed by the Holder or Holders of the Notes of the Series Trusts and shall have accepted appointment in the manner herein provided, any Holder who has been a bona fide Holder of a Note of a Series Trust for at least six months may (subject to Section 6.14 of the Indenture), on behalf of himself and all others similarly situated, petition any court of competent jurisdiction for the appointment of a successor Indenture Trustee.

Miscellaneous

Notices. All notices shall be deemed to have been given upon (i) the mailing by first class mail, postage prepaid, of such notices to each Holder of the Registered Notes of any Series Trust at their registered addresses as recorded in the register of Notes for such Series Trust and (ii) so long as the Notes of a Series Trust are listed on Euronext Dublin and it is required by the rules of Euronext Dublin, publication of such notice to each Holder of the Notes of such Series Trust in English in a leading newspaper having general circulation in Ireland (which is expected to be the *Irish Times*) or, if such publication is not practicable, in one other leading English language daily newspaper with general circulation in Europe, such newspaper being published on each business day in morning editions, whether or not it shall be published in Saturday, Sunday or holiday editions.

As long as any Notes of a Series Trust represented by a global Note are deposited in DTC, Euroclear, Clearstream or such other clearing system, notices to all Holders of the Notes of such Series Trust may, if so permitted by the rules of Euronext Dublin (or such other exchange on which the Notes of such Series Trust may then be listed), be given by delivery of the relevant notice to DTC, Euroclear or Clearstream or other relevant clearing agency for communication by it to its accountholders or by delivery of the relevant notice to the Holder or Holders of any global certificate. Any such notices will also be published in a leading daily newspaper having general circulation in Ireland (expected to be the *Irish Times*).

Neither the failure to give notice, nor any defect in any notice given, to any particular Holder of a Note will affect the sufficiency of any notice with respect to any other Holder of any Note.

Such notice may be waived in writing by the person entitled to receive such notice, either before or after the event, and such waiver shall be the equivalent of such notice. Waivers of notice by Holders of Notes of a Series Trust shall be filed with the Indenture Trustee, but such filing shall not be a condition precedent to the validity of any action taken in reliance upon such waiver.

Governing Law; Submission to Jurisdiction. The Swaps, if any, the Indenture, any relevant Series Indenture and the Notes shall be governed by, and construed in accordance with, the laws of the State of New York (without regard to its conflict of laws principles), except to the extent that the validity or perfection of a Series Trust's ownership of and security interest in the relevant Funding Agreement(s) or remedies under the Indenture or any relevant Series Indenture in respect thereof may be governed by the laws of a jurisdiction other than the State of New York. All judicial proceedings brought against the Trust, any Series Trust, Indenture Trustee, Registrar, Transfer Agent, Principal Paying Agent, Irish Paying Agent or Listing Agent or any other agent (in such capacities) arising out of or relating to the Swaps, if any, the Indenture, any relevant Series Indenture, Note or any portion of any Pledged Estate may be brought in a U.S. federal court located in New York City, the Borough of Manhattan. Under the terms of the Indenture and each relevant Series Indenture, the relevant Series Trust, the Trust, Indenture Trustee, Registrar, Transfer Agent and Principal Paying Agent will each accept for itself the nonexclusive jurisdiction of the aforesaid courts, waive any defense of *forum non conveniens* and irrevocably agree to be bound by any judgment rendered thereby in connection with the Indenture, the relevant Series Indenture or Notes or any portion of the relevant Pledged Estate.

DESCRIPTION OF THE INDENTURE

General

Each Series of Notes will be issued under, subject to and entitled to the benefits of a separate Series Indenture by and between the relevant Series Trust and the Indenture Trustee. Each Series Indenture will incorporate the Indenture, which shall provide the terms, which govern each separate Series Indenture thereunder, unless any such Series Indenture specifies otherwise. The Notes issued under a Series Indenture will constitute a single Series, together with any Notes issued in the future under such Series Indenture that are designated by the Series Trust as being part of such Series.

Pledged Estate

Pursuant to the Indenture, under each Series Indenture, each Series of Notes will be secured by a Pledged Estate, which will consist of:

(i) the relevant Funding Agreement(s) owned by the relevant Series Trust and the rights of a Series Trust in and to the corresponding Swap(s), if any;

(ii) all proceeds of the relevant Funding Agreement(s), and corresponding Swap(s), if any; and

(iii) all rights of the relevant Series Trust pertaining to the foregoing.

Covenants

Pursuant to the Indenture, the relevant Series Trust will make certain covenants regarding payment of principal and interest, maintenance of offices or agencies, money for Note payments to be held in trust, protection of the relevant Pledged Estate, delivery of an opinion and annual statement as to compliance, performance of obligations, existence, reports, financial information regarding the Notes, notices of defaults and payment of taxes and other claims. Among other covenants contained in the Indenture, each Series Trust will agree that it will not, so long as any Notes issued by it are outstanding, without the consent of the Indenture Trustee, except as permitted by the Indenture or the relevant Series Indenture:

(i) sell, transfer, exchange, assign, lease, convey or otherwise dispose of any of its assets (owned as of the date of the relevant Series Indenture or thereafter acquired), including, without limitation, any portion of the relevant Pledged Estate, except as expressly permitted by the Indenture or the relevant Series Indenture;

(ii) engage in any business or activity other than in connection with, or relating to, the execution and delivery and performance of the Trust Agreement, the relevant Series Trust Agreement, the relevant Funding Agreement(s) and corresponding Swap(s), if any, and the transactions contemplated thereby, and the issuance of the Notes issued by such Series Trust;

(iii) incur or otherwise become liable, directly or indirectly, for any Indebtedness or Contingent Obligation (each as defined in the Indenture) except for the Notes issued by such Series Trust and corresponding Swaps, if any, and the transactions contemplated thereby;

(iv) make any deduction or withholding from the principal of or interest on any Series of Notes (other than amounts that may be required to be withheld from such payments under the Code or any other applicable tax law) by reason of the payment of any taxes levied or assessed upon any portion of any relevant Pledged Estate except to the extent specified in the Indenture, the relevant Series Indenture or the applicable Pricing Supplement;

(v) (a) permit the validity or effectiveness of the Indenture, relevant Series Indenture or any security interest in or assignment for collateral purposes of the relevant Pledged Estate to be impaired, or permit a Lien (as defined in the Indenture) arising under the Indenture and/or the relevant Series

Indenture (the "**Lien of the Indenture**") to be amended, hypothecated, subordinated, terminated or discharged, or permit any Person (as defined in the Indenture) to be released from any covenants or obligations under the relevant Funding Agreement(s) and corresponding Swap(s), if any, except as may be expressly permitted by the Indenture, relevant Series Indenture or Funding Agreement(s) and corresponding Swap(s), if any, (b) create, incur or assume any Lien or other encumbrance (other than a Lien with respect to any Pledged Estate securing payment on any Series of Notes created by the Indenture and the relevant Series Indenture) on any of its properties or assets owned as of the date of the relevant Series Indenture or thereafter acquired, or any interest therein or the proceeds thereof, or (c) permit the Lien of the Indenture or the relevant Series Indenture not to constitute a valid first priority security interest in the relevant Pledged Estate;

(vi) amend, modify or fail to comply with any material provision of the Trust Agreement or the relevant Series Trust Agreement;

(vii) own any subsidiary or lend or advance any moneys to, or make any investment in, any Person, except for the investment of any funds of such Series Trust held by the Indenture Trustee or a Paying Agent as provided in the Indenture;

(viii) directly or indirectly make any distribution or other payment on, or redeem or otherwise acquire or retire for value, the relevant Beneficial Certificate (as defined in the Trust Agreement), provided that the relevant Series Trust may declare or pay a distribution on its Beneficial Interest Certificate if all amounts due to be paid on the Notes issued by such Series Trust prior to the next scheduled payment under the relevant Funding Agreement(s) and corresponding Swap(s), if any, have been paid;

(ix) exercise any rights to foreclose or realize on its security interest in or assignment for collateral purposes of any relevant Pledged Estate except at the direction of, or with the prior written approval of, the Indenture Trustee;

(x) cause or permit the sale or other transfer of, or the creation, incidence, assumption or existence of any Lien on, all or a portion of the relevant Beneficial Interest Certificate;

(xi) become required to register as an "investment company" under, or become under the "control" of an "investment company," as such terms are defined in the Investment Company Act, as amended;

(xii) enter into any transaction of merger or consolidation or liquidate or dissolve itself (or suffer any liquidation or dissolution), or acquire by purchase or otherwise all or substantially all of the business or assets of, or any stock or other evidence of beneficial ownership of, any Person;

(xiii) have any employees other than the Administrative Trustee or any other trustees necessary to conduct its business and enter into transactions contemplated under the Indenture, the Trust Agreement, the relevant Series Indenture and the relevant Series Trust Agreement;

(xiv) have an interest in any bank account other than (a) the relevant Collection Account (as defined in the Indenture), (b) the Payment Account (as defined in the Trust Agreement) and (c) those accounts expressly permitted by the Indenture Trustee; provided that any such further accounts or such Series Trust's interest therein shall be charged or otherwise secured in favor of the Indenture Trustee on terms acceptable to such Indenture Trustee;

(xv) take any action that would (i) cause it not to be treated either as an ignored entity or a grantor trust or (ii) in the case of any Series of Notes secured by the rights of a Series Trust in and to one or more Swaps, cause the Funding Agreement and corresponding Swap(s) not to be treated as a "synthetic debt instrument" (within the meaning of Treasury Regulations § 1.1275-6(b)(4), or an "integrated economic transaction" (within the meaning of Treasury Regulations § 1.988-5(a)(5)), as the case may be, in each case for U.S. federal income tax purposes;

(xvi) permit any Affiliate, employee or officer of MassMutual or any Initial Purchaser to be a trustee of the Trust or any relevant Series Trust;

(xvii) issue Notes under the Indenture and a relevant Series Indenture unless (a) such Series Trust has purchased or will simultaneously purchase a relevant Funding Agreement or Funding Agreements from MassMutual (b) MassMutual has affirmed in writing to such Series Trust that it has made or simultaneously will make changes to its books and records to reflect the granting of a security interest in, and the making of an assignment for collateral purposes of, the relevant Funding Agreement or Funding Agreements and corresponding Swap(s), if any, by such relevant Series Trust to the Indenture Trustee, and (c) such Series Trust has taken such other steps as may be necessary to cause the Indenture Trustee's security interest in or assignment for collateral purposes of the relevant Pledged Estate to be perfected for purposes of the UCC or effective against such Series Trust's creditors and subsequent purchasers of such Pledged Estate pursuant to insurance or other state law;

(xviii) commingle its assets with assets of any of its affiliates (including any Series Trust), or guarantee any obligation of any of its affiliates (including any Series Trust); or

(xix) maintain any joint account with any Person or be a party whether as co-obligor or otherwise, to any agreement to which any Person is a party, or become liable as a guarantor or otherwise with respect to any Indebtedness (as defined in the Indenture) or contractual obligation of any Person.

Events of Default

The following will be Events of Default under the Notes issued by a Series Trust:

(i) failure to pay any interest on any Note of such Series Trust within ten Business Days after such interest becomes due and payable;

(ii) failure to pay the principal of any Note of such Series Trust within five Business Days after its maturity;

(iii) any "Event of Default" (as defined in the relevant Funding Agreement) by MassMutual (subject to any cure periods);

(iv) any Swap Event of Default (as defined below) or Swap Termination Event (subject to any cure periods);

(v) default in the performance, or breach, of any one or more of the other covenants of such relevant Series Trust in the Indenture or relevant Series Indenture (other than a covenant, a default in whose performance or whose breach is elsewhere in this section specifically dealt with), and continuance of such default or breach for a period of 60 days after there shall have been given notice thereof to the relevant Series Trust by the Indenture Trustee or to the relevant Series Trust and the Indenture Trustee by the Holders of Notes representing at least 25% of the aggregate principal amount of the outstanding Notes of such Series Trust, which notice shall specify such default or breach and require it to be remedied and which notice shall state that it is a "Notice of Default"; *provided* that the Indenture Trustee may, without the consent of the Holders of the Notes of such Series Trust and without prejudice to its rights in respect of any subsequent breach, from time to time and at any time, if in its opinion the interests of the Holders of Notes of such Series Trust will not be materially prejudiced thereby, waive or authorize, on such terms as seem expedient to it, any breach by the relevant Series Trust; *provided*, *further*, that the Indenture Trustee shall not so waive or authorize any breach in contravention of any express notice given by the Holders of Notes representing at least 25% of the aggregate principal amount of the outstanding Notes of such Series Trust; *provided*, *still further*, that no such express notice shall affect any previous waiver or authorization and any such waiver or authorization shall be binding on the Holders of the Notes of such Series Trust, and if the Indenture

Trustee deems appropriate, such waiver or authorization shall be provided to the Holders of the Notes of such Series Trust as soon as practicable;

(vi) the Indenture or relevant Series Indenture for any reason shall cease to be in full force and effect (other than in accordance with its terms) or shall be declared null and void, or the Indenture Trustee shall cease to have a valid and perfected security interest subject to no prior liens or security interests in the relevant Pledged Estate and proceeds thereof except as expressly permitted by the Indenture; or any Person shall successfully claim as finally determined by a court of competent jurisdiction that any of the Liens (as defined in the Indenture) granted to the Indenture Trustee with respect to any of the relevant Pledged Estate are void or that the enforcement thereof or any other recourse by the Indenture Trustee against any of the relevant Pledged Estate is materially limited because of any preference, fraudulent transfer, conveyance or similar law;

(vii) (a) a court having jurisdiction in the premises shall enter a decree or order for relief in respect of the Trust or the relevant Series Trust in an involuntary case under any applicable bankruptcy, insolvency or other similar law now or hereafter in effect in the State of Delaware or any other applicable jurisdiction, which decree or order is not stayed; or any other similar relief shall be granted under any applicable law; or (b) an involuntary case shall be commenced against the Trust or the relevant Series Trust under any applicable bankruptcy, insolvency or other similar law of the State of Delaware or any other applicable jurisdiction; or a decree or order of a court having jurisdiction in the premises for the appointment of a receiver, liquidator, sequestrator, trustee, custodian or other officer having similar powers over Trust or the relevant Series Trust, or over all or a substantial part of its property, shall have been entered; or there shall have occurred the involuntary appointment of an interim receiver, trustee or other custodian of Trust or the relevant Series Trust for all or a substantial part of its property; or a court having jurisdiction in the premises shall enter a decree or order declaring the dissolution of Trust or the relevant Series Trust; or a warrant of attachment, execution or similar process shall have been issued against any substantial part of the property of the Trust or the Series Trust and any such event described in this clause (b) shall continue for 60 days unless dismissed, bonded or discharged; or

(viii) (a) the Trust or the relevant Series Trust shall have an order for relief entered with respect to it or shall commence a voluntary case under any applicable bankruptcy, insolvency or other similar law of the State of Delaware or any other applicable jurisdiction, or shall consent to the entry of an order for relief in an involuntary case, or to the conversion of an involuntary case to a voluntary case, under any such law, or shall consent to the appointment of or taking possession by a receiver, trustee or other custodian for all or a substantial part of its property; or the Trust or the relevant Series Trust shall make any assignment for the benefit of creditors; or (b) the Trust or the relevant Series Trust shall fail or be unable, or the Trust or the relevant Series Trust shall admit in writing its inability, to pay its debts as such debts become due; or the Administrative Trustee of the Trust or the Series Trust shall adopt any resolution or otherwise authorize any action to approve or for the purpose of effecting any of the actions referred to in this paragraph (viii).

Whenever an Event of Default specified in clause (v) or (vi) above shall have occurred and be continuing, the Indenture Trustee or Holders of more than 25% in aggregate principal amount of the outstanding Notes of such Series may, by written notice to the relevant Series Trust (and the Indenture Trustee if given by the Holders of such Notes of such Series), declare the principal of and all accrued and unpaid interest and other amounts payable on the Notes of such Series to be due and payable immediately and such amounts shall become due and payable on the date the written declaration is received by or on behalf of the relevant Series Trust. This provision, however, is subject to the condition that if, at any time after the principal of the Notes of such Series Trust shall have been so declared due and payable, and before any judgment or decree for the payment of the monies due shall have been obtained or entered, the Holder or Holders of at least 66 and 2/3% of the aggregate principal amount of the Outstanding (as defined in the Indenture) Notes of such Series by written notice to the relevant Series Trust and the Indenture Trustee may rescind and annul such declaration and its consequences, subject to certain conditions, but no such rescission and annulment shall affect any subsequent default or shall impair any right consequent thereon. If an Event of Default specified in clause (i), (ii), (iii), (iv), (vii) or (viii) above occurs, the principal of and accrued interest on the Notes of such Series will be immediately due and payable without any declaration or other act on the part of any relevant Series Trust, the Indenture Trustee or Holder of any Note. Nothing in the Notes issued by any Series Trust will prevent any Holder of the Notes from enforcing (by the institution of legal action against the relevant Series Trust or otherwise) its right to receive payment of the principal of and interest on such Notes, or any other amount payable under such Notes or the relevant Indenture, when and to the extent such payments become due, provided that any Person holding a security entitlement with respect to any Note issued by any Series Trust through an account with a securities intermediary shall be subject to the laws and contractual provisions referred to under "Description of the Notes – Global Notes" above or in the relevant Series Indenture.

Application of Money Collected Under the Indenture

Following an Event of Default under the Indenture, any Series Indenture, any respective supplements thereto or the relevant Funding Agreement(s) and corresponding Swap(s), if any, any moneys that may then be held or thereafter received by the Indenture Trustee with respect to a Series Trust shall be held in the relevant Collection Account (as defined in the Indenture) and be applied in the following order, at the date or dates fixed by the Indenture Trustee and, in case of the distribution on account of principal or interest, upon presentation of the Notes, or both, and the notation thereon of the payment if only partially paid and upon surrender thereof if fully paid:

first, to the payment of the reasonable and customary expenses and counsel fees incurred by the Indenture Trustee and any other amounts due and unpaid to the Indenture Trustee by the Trust, in an aggregate amount of no more than $500,000 for all Series of Notes Outstanding;

second, to the payment of the amounts then due and unpaid upon the Notes of the relevant Series for principal and interest and all other amounts in respect of which or for the benefit of which such amount has been collected, ratably, without preference or priority of any kind, according to the aggregate amounts due and payable on such Notes for principal and interest and all such other amounts, respectively;

third, to the payment of any other Secured Obligations (as defined in the Indenture), ratably, without preference or priority of any kind, according to the aggregate amounts due and payable on such obligations, respectively;

fourth, to the payment of amounts, including any Early Termination Payment, if any, owed to each Swap Counterparty under or with respect to a Swap that are due and payable (as defined herein); and

fifth, any remaining balance shall be paid to the relevant Series Trust, its successors or assigns or to whomever may be lawfully entitled to receive the same, or as a court of competent jurisdiction may determine.

If no Event of Default exists, the following priority of payments shall apply:

first, to the payment of the amounts then due and unpaid upon the Notes of the relevant Series for principal and interest and all other amounts in respect of which or for the benefit of which such amount has been collected, ratably, without preference or priority of any kind, according to the aggregate amounts due and payable on such Notes for principal and interest and all such other amounts, respectively;

second, to the payment of any other Secured Obligations, ratably, without preference or priority of any kind, according to the aggregate amounts due and payable on such obligations, respectively;

third, to the payment of amounts owed to each Swap Counterparty under or with respect to a Swap that are then due and payable on such date; and

fourth, any remaining balance shall be paid to the relevant Series Trust, its successors or assigns or to whomever may be lawfully entitled to receive the same, or as a court of competent jurisdiction may determine.

Except as expressly set forth in the Indenture, none of the Indenture Trustee, Paying Agents or Registrar or any successor Indenture Trustee, Paying Agents or Registrar thereto or any of their employees, officers, directors, affiliates or agents shall have any claim or rights of any nature in or to the relevant Pledged Estate, whether as a result of set-off, banker's lien or otherwise.

Certain Rights of Holders

The Holder or Holders of Notes representing at least 66 and 2/3% of the aggregate principal amount of the Notes of any Series Trust have the right under the Indenture to direct the time, method and place of conducting any proceedings for any remedy available to the Indenture Trustee or exercising any trust or power conferred on the Indenture Trustee with respect to the Notes of such Series Trust and the Pledged Estate appertaining thereto, subject to certain conditions set forth in the Indenture and the relevant Series Indenture.

No Holder of a Note shall have any right to institute any proceedings, judicial or otherwise, with respect to the Indenture, the Series Indenture or any agreement or instrument included in the relevant Pledged Estate or for the appointment of a receiver or trustee, unless:

(i) such Holder has previously given written notice to the Indenture Trustee of a continuing Event of Default;

(ii) the Holder or Holders of Notes representing not less than 25% of the aggregate principal amount of the Outstanding Notes of such Series shall have made written request to the Indenture Trustee to institute proceedings in respect of such Event of Default in its own name as the Indenture Trustee;

(iii) such Holder or Holders have offered to the Indenture Trustee indemnity or security satisfactory to it against the costs, expenses and liabilities to be incurred in compliance with such request;

(iv) the Indenture Trustee for 60 days after its receipt of such notice, request and offer of indemnity has failed to institute any such proceeding; and

(v) no direction inconsistent with such written request has been given to the Indenture Trustee during such 60 day period by the Holder or Holders of Notes representing at least 66 and 2/3% of the aggregate principal amount of the Outstanding Notes of such Series Trust;

it being understood and intended that no Holder or Holders of Notes shall have any right in any manner whatever by virtue of, or by availing of, any provision of the Indenture or relevant Series Indenture to affect, disturb or prejudice the rights of any other Holder of any Note of the relevant Series Trust or to obtain or to seek to obtain priority or preference over any other Holder of any Note of the relevant Series Trust or to enforce any right under the Indenture or relevant Series Indenture, except in the manner therein provided and for the equal and ratable benefit of all the Holders of the Notes issued by the relevant Series Trust.

Meetings

A meeting of Holders of Notes of any Series may be called at any time and from time to time pursuant to the Indenture and relevant Series Indenture to make, give or take any request, demand, authorization, direction, notice, consent, waiver or other action provided by such Indenture to be made, given or taken by the Holders of Notes of such Series Trust.

The Indenture Trustee may at any time call a meeting of Holders of Notes of the relevant Series for any purpose specified above to be held at such time and at such place in The City of New York or such other place as the Indenture Trustee will determine. Notice of every meeting of Holders of Notes, setting forth the time and the place of such meeting and in general terms the action proposed to be taken at such meeting, will be given, in the manner provided under the heading "Miscellaneous" below, not less than 21 nor more than 180 days prior to the date fixed for the meeting.

Any resolution passed or decision taken at any meeting of Holders of Notes duly held in accordance with the Indenture and relevant Series Indenture will be binding on all Holders of Notes of such Series Trust, whether or not such Holders were present or represented at the meeting.

Nonrecourse Enforcement

Notwithstanding anything to the contrary contained in the Indenture or the relevant Series Indenture or the Notes, other than as described below, none of MassMutual, its officers, directors, affiliates, employees or agents or any of the Administrative Trustee or the Depositor or the Beneficial Interest Certificate owner of any Series Trust or any of their officers, directors, affiliates, employees or agents (the "**Nonrecourse Parties**") will be personally liable for the payment of any principal, interest or any other sums at any time owing under the terms of the Notes. If any Event of Default shall occur with respect to any Notes of any Series Trust, the right of the Holder or Holders of the Notes of such Series Trust and the Indenture Trustee on behalf of such Holder or Holders in connection with a claim on such Notes will be limited solely to a proceeding against the relevant Pledged Estate. Neither such Holders nor the Indenture Trustee on behalf of such Holders will have the right to proceed against the Nonrecourse Parties or any other Series Trust to enforce the Notes (except that to the extent they exercise their rights, if any, to seize the Funding Agreement(s) and corresponding Swap(s), if any, they may enforce the Funding Agreement(s) and corresponding Swap(s), if any, against MassMutual) or for any deficiency judgment remaining after foreclosure of any property included in the Pledged Estate. However, this will not in any manner or way constitute or be deemed a release of the debt or other obligations evidenced by the Notes of any Series or otherwise affect or impair the enforceability against the relevant Series Trust of the liens, assignments, rights and security interests created by the Indenture, the relevant Series Indenture, the Pledged Estate or any other instrument or agreement evidencing, securing or relating to the indebtedness or the obligations evidenced by the Notes. The Holders of Notes are not precluded from foreclosing upon any property included in the relevant Pledged Estate or from any other rights or remedies in law or in equity against the relevant Series Trust.

Modifications and Amendments

Modifications and Amendments without Holder Consent

The relevant Series Trust may enter into an agreement or agreements supplemental to the Indenture and the relevant Series Indenture at any time, and without the consent of any Holder or any Person holding a security entitlement in respect of the Notes of the relevant Series Trust through an account with a securities intermediary, for the purpose of:

(i) conveying, transferring, assigning, mortgaging or pledging to the Indenture Trustee, as security for the Notes of such Series Trust, any property or assets in addition to the relevant Pledged Estate (provided such action does not adversely affect the Series Trust's status as either ignored or a grantor trust for U.S. federal income tax purposes);

(ii) curing any ambiguity or correcting or supplementing any provision contained in the Indenture, the relevant Series Indenture, the Notes of the relevant Series Trust, corresponding Swaps, if any, or any supplemental agreement, which may be defective or inconsistent with any other provision contained in the Indenture, such relevant Series Indenture, such Notes, the relevant Funding Agreement(s) or corresponding Swap(s), if any, or any supplemental agreement, or making such other provisions in regard to matters or questions arising under the Indenture, which shall not adversely affect the interests of any Holder of any relevant Series Trust or the interests of the Swap Counterparty, if any, in any material respect;

(iii) evidencing and providing for the acceptance of appointment under the Indenture and any relevant Series Indenture of a successor Indenture Trustee with respect to the Notes of such Series Trust;

(iv) evidencing the succession of another Person to the Trust or a Series Trust, and the assumption by any such successor of the covenants of the Trust or Series Trust, as the case may be, therein, in the Notes or Swap(s), if any;

(v) adding to or changing the covenants of the Trust or the Indenture Trustee for the benefit of the Holders of all or any Series of the Notes or coupons (and if such covenants are to be to the benefit of less than all Series of Notes or coupons, stating that such covenants are expressly being solely for the benefit of such Series) or to surrender any right or power conferred in the Indenture upon the relevant Series Trust;

(vi) adding any additional Events of Default to the Indenture;

(vii) permitting or facilitating the issuance of Notes in uncertificated form, provided any such action shall not adversely affect the interests of the Holders of Notes of any Series or any Coupons appertaining thereto in any material respect;

(viii) changing or eliminating any of the provisions of this Indenture; provided, however, that any such change or elimination shall become effective only when there is no Note Outstanding of any Series created prior to the execution of such supplemental indenture, which is entitled to the benefit of or bound by such provision; or

(ix) securing all or any Series of Notes.

Modifications and Amendments with Holder Consent

The relevant Series Trust and the Indenture Trustee may enter into an agreement or agreements supplemental to the Indenture or the relevant Series Indenture for the purpose of making any amendment or modification to the Notes of such Series Trust or the Indenture or the relevant Series Indenture or modifying in any manner the rights of any Holder of such Series Trust or the rights of the corresponding Swap Counterparty, if any, with the consent of the Holder or Holders representing at least a majority in aggregate principal amount of the Notes of such Series Trust at the time outstanding, provided that no such modification, amendment or waiver may, without the affirmative consent or affirmative vote of the Holder of each Note of such Series Trust affected thereby:

(i) change the stated maturity of the principal of or any installment of interest on any Note of the relevant Series Trust;

(ii) reduce the principal amount of or interest on any Note of the relevant Series Trust;

(iii) change any place of payment where, or the coin or currency in which the principal of or interest on, any Note of the relevant Series Trust is payable;

(iv) impair or affect the right of any Holder of the relevant Series Trust to institute suit for the enforcement of any payment on or with respect to the Notes of such Series Trust;

(v) reduce the percentage of the aggregate principal amount of the Outstanding Notes of the relevant Series Trust the consent of the Holders of which is required for any supplemental indenture, or the consent of the Holders of which is required for any waiver of compliance with provisions of the Indenture or any relevant Series Indenture or defaults thereunder and their consequences provided for in the Indenture or relevant Series Indenture;

(vi) modify any of the provisions of the Indenture or relevant Series Indenture respecting modifications and amendments, except to increase any percentage specified therein or to provide that additional provisions thereof cannot be modified or waived without the consent of the Holder of each Outstanding Note affected thereby;

(vii) modify or alter the provisions of the Indenture's definition of the term "Outstanding," which require that Notes owned by the relevant Series Trust or any affiliate thereof be disregarded for purposes of such definition;

(viii) modify or affect in any manner adverse to the interest of any Holder of Notes of the relevant Series Trust the terms and conditions of the obligations of the relevant Series Trust regarding the due and punctual payment of the principal of, interest on or any other amounts due with respect to the Notes of the relevant Series Trust; or

(ix) permit the creation of any Lien ranking prior to or on a parity with the Lien of the Indenture or relevant Series Indenture with respect to any part of the relevant Pledged Estate or terminate the Lien of the Indenture or relevant Series Indenture on any property held for the benefit and security of Holders of Notes of the relevant Series Trust or deprive any Holder of any Note of such Series Trust of the security afforded by the Lien of the Indenture or relevant Series Indenture.

DESCRIPTION OF THE BENEFICIAL INTEREST CERTIFICATE

The beneficial interest in each Series Trust will consist of one $100 Beneficial Interest Certificate. The holder of the Beneficial Interest Certificate's right to payment will be in all respects subordinated to the rights to payment of Holders of Notes of the related Series.

CERTAIN PROVISIONS OF THE TRUST AGREEMENT AND RELEVANT SERIES TRUST AGREEMENTS

Limitation on Permitted Activities. Under the Trust Agreement creating the Trust and the Series Trust Agreement creating the Series Trust, neither the Trust nor any such Series Trust may undertake any business, activity or transaction except as expressly provided for or contemplated by the Trust Agreement, the relevant Series Trust Agreements, the Indenture or the relevant Series Indenture.

Defense of Claims. Pursuant to the Trust Agreement and the relevant Series Trust Agreement, the Administrative Trustee must defend all claims and demands of all persons at any time claiming any lien on any of the assets of any Series Trust adverse to the interest of such Series Trust or any Holder of the Notes issued by such Series Trust, other than the security interest in the Pledged Estate granted in favor of the Indenture Trustee on behalf of each such Noteholder pursuant to the Indenture and the relevant Series Indenture.

Limitation on Liability of the Administrative Trustee. The Administrative Trustee will not be liable for any action or failure to act, except (i) for its own willful misconduct or gross negligence, (ii) for the inaccuracy of its own representations or warranties contained in the Trust Agreement or any relevant Series Trust Agreement, (iii) for its failure to use ordinary care to disburse funds, or (iv) for taxes (other than income taxes), fees or other charges on, based on or measured by, any fees, commissions or compensation received by such Administrative Trustee in connection with any of the transactions contemplated by the Trust Agreement or any relevant Series Trust Agreement.

Eligibility Requirements for Administrative Trustee. The Administrative Trustee must at all times be a corporation (i) authorized to exercise corporate trust powers; (ii) having a combined capital and surplus of at least $50,000,000 and subject to supervision or examination by Federal or State authorities; (iii) having (or having a parent which has) a rating of at least Baa3 by Moody's or BBB– by S&P Global Ratings and (iv) satisfying the provisions of Section 3807(a) of the Delaware Statutory Trust Act.

Amendments to the Trust Agreements and Relevant Series Trust Agreements. The Trust Agreement and a relevant Series Trust Agreement may be amended from time to time by the Administrative Trustee without the consent of Holders of the Notes issued by any relevant Series Trust, (i) to cure any ambiguity, (ii) to correct, supplement or modify any provision in such Trust Agreement and relevant Series Trust Agreement that is inconsistent with another provision therein or (iii) to modify, eliminate or add to any provisions of the Trust Agreement and relevant Series Trust Agreement to the extent necessary (A) to ensure that any Series Trust will be classified for U.S. federal income tax purposes as either a disregarded entity or a grantor trust at all times or (B) to ensure that any Series Trust will not be required to register as an investment company under the Investment Company Act; provided*,* however*,* that in the case of clause (i) and clause (ii), such action would not adversely affect in any material respect the interests of any Holder of the Notes issued by any Series Trust.

Without the consent of each affected Holder of the Notes issued by any Series Trust, the Trust Agreement and any relevant Series Trust Agreement may not be amended to (i) change the amount or timing of any payments on any Notes or otherwise adversely affect the terms of any Notes or (ii) impair the right of any Noteholder to institute suit for the enforcement of any right for principal and interest or other distribution.

DESCRIPTION OF CERTAIN TERMS AND CONDITIONS OF THE FUNDING AGREEMENTS

The description of certain of the terms and conditions of the relevant Funding Agreements set forth below and in the description of the terms and conditions of the Notes set forth above is a summary of, and is subject to, the detailed provisions of such Funding Agreements and related documents, copies of which will be on file with the Indenture Trustee and Paying Agents. Capitalized terms used herein have the same meanings as those used in the Funding Agreement unless the context otherwise requires.

General

Funding Agreements are unsecured obligations of insurance companies that, based upon Chapter 175, Section 180F of the Massachusetts General Laws Annotated, would have a statutory liquidation priority over claims of general creditors as further described below.

In connection with the issuance of each Series of Notes, the relevant Series Trust will purchase from MassMutual one or more Funding Agreements issued by MassMutual. Each Series of Notes will be secured by each applicable Funding Agreement and the rights of a Series Trust in and to the corresponding Swap(s), if any, in respect of the tranches of Notes comprising such Series of Notes.

The obligation to pay under each Funding Agreement will be solely an obligation of MassMutual. The obligations of MassMutual under each Funding Agreement are not guaranteed by any person, including but not limited to any of its holding companies, subsidiaries or affiliates.

General Account Funding Agreements

If specified in the relevant Pricing Supplement, MassMutual will issue one or more General Account Funding Agreements to the relevant Series Trust. The obligations of MassMutual under such General Account Funding Agreements will be supported solely by the general account of MassMutual.

Amounts held in the general account are pooled and invested by MassMutual in accordance with applicable insurance laws. In the aggregate, general account assets support MassMutual's obligations under all of its general account insurance contracts, and are not segregated for the exclusive benefit of any particular policy or obligation. General account assets are also available to MassMutual for the conduct of routine business activities, such as the payment of dividends and business expenses.

Guaranteed Separate Account Funding Agreements

If specified in the relevant Pricing Supplement, MassMutual will issue one or more Guaranteed Separate Account Funding Agreements to the relevant Series Trust. If a Guaranteed Separate Account Funding Agreement is issued to the relevant Series Trust, MassMutual will deposit the proceeds received for the Guaranteed Separate Account Funding Agreement in a separate account to be established and maintained by MassMutual in accordance with Massachusetts insurance laws and regulations. Any such separate account may be used to support the deposits of one or more guaranteed separate account funding agreements issued by MassMutual.

Although MassMutual will own the assets of the separate account related to a Guaranteed Separate Account Funding Agreement, the assets of the separate account will be held separately from MassMutual's other assets. MassMutual will credit to or charge against the relevant separate account the income, gain or loss, realized or unrealized, from any asset allocated to the separate account without regard to other income, gains or losses of MassMutual. Further, the portion of the assets of the separate account equal to the reserves and other contract liabilities with respect to the separate account will not be chargeable with liabilities that arise out of any other business that MassMutual may conduct. To the extent, if any, assets maintained in the relevant separate account are in excess of the reserves and other liabilities of the Guaranteed Separate Account Funding Agreement, such excess assets may be transferred to MassMutual's general account.

MassMutual's obligations under any Guaranteed Separate Account Funding Agreement will not vary as a function of the investment performance of the relevant separate account. Accordingly, neither the Series Trust nor the Holders of the Notes will participate in the investment gains or losses of the assets of the relevant separate account. MassMutual will retain the risk that the value of the assets in the relevant separate account may fall below its obligations under the relevant Guaranteed Separate Account Funding Agreement. MassMutual is obligated under Massachusetts insurance laws and regulations to maintain reserves at or above the specified minimum levels to support the liabilities of the Guaranteed Separate Account Funding Agreements.

Insolvency of MassMutual

Treatment of General Account Funding Agreements in Insolvency. General Account Funding Agreements are unsecured obligations of MassMutual that, based upon Chapter 175, Section 180F of the Massachusetts General Laws Annotated, would have a statutory liquidation priority over claims of general creditors as further described below. Under Chapter 175 Section 132I of the Massachusetts General Laws Annotated, funding agreements issued in accordance with Section 132I shall be treated as insurance contracts for purposes of determining the priority of distribution of claims from an insolvent Massachusetts domestic insurer's estate and thus be accorded a class 2 priority in the event of the insolvency of a Massachusetts domestic insurer. Massachusetts law would apply to insolvency or receivership proceedings of MassMutual should MassMutual ever become impaired or insolvent. In the opinion of Sidley and subject to the assumptions, limitations and qualifications set forth in such opinion, in the event of any judicial finding of insolvency or impairment of MassMutual and the appointment of the Massachusetts Commissioner of Insurance as receiver of MassMutual under Chapter 175, Section 180F of the Massachusetts General Laws Annotated, the relevant Series Trust, as holder of the General Account Funding Agreement, would be accorded class 2 priority and would rank *pari passu* with all other class 2 claims, and therefore ahead of any unsecured debt obligations of MassMutual, subordinate only to the expenses of administration incurred in such insolvency proceeding and workers' compensation claims as provided in Chapter 175, Section 46A of the Massachusetts General Laws Annotated. Investors should note, however, that the statutory liquidation priority accorded to Funding Agreements under Massachusetts law does not clearly apply to any additional amounts required to be paid as may be necessary in order that the net amounts receivable by a Noteholder after any withholding or deduction shall equal the respective amounts, which would have been receivable by such Noteholder in the absence of such withholding or deduction. Accordingly, in the event of MassMutual's insolvency or receivership, claims under a General Account Funding Agreement for such payments, if any, may not rank equally with policyholder or funding agreement claims, and may rank equally with MassMutual's unsecured debt obligations, which are given at least "class 7" priority under Mass. Gen. Laws c. 175, Section 180F.

Treatment of Guaranteed Separate Account Funding Agreements in Insolvency. As is the case with General Account Funding Agreements, should MassMutual ever become impaired or insolvent, claims of the Series Trust, as holder of the Guaranteed Separate Account Funding Agreement, would be subject to Massachusetts law. In the opinion of Sidley and subject to the assumptions, limitations and qualifications set forth in such opinion in the event of a liquidation of MassMutual under Massachusetts Law, the court would conclude that: (i) under Chapter 175, Section 132G of the Massachusetts General Laws Annotated, the portion of the assets of the separate account equal to the reserves and other contract liabilities with respect to such separate account, as provided under the Guaranteed Separate Account Funding Agreement, shall not be chargeable with liabilities arising out of any other business MassMutual may conduct; provided that any such Guaranteed Separate Account Agreement expressly states (1) that the separate account has been established by MassMutual in accordance with the laws of the Commonwealth of Massachusetts and (2) that all income, gains and losses (whether or not realized) of the separate account will be credited to or charged against the amounts placed in the separate account without regard to the other income, gains or losses of MassMutual, and (ii) to the extent the assets in the separate account are insufficient to discharge MassMutual's express obligations to the Series Trust under the Guaranteed Separate Account Funding Agreement, such deficiency claim of the Series Trust would be accorded class 2 priority under Chapter 175, Section 180F of the Massachusetts General Laws Annotated and would rank *pari passu* with MassMutual's policyholders, and therefore ahead of any unsecured debt obligations of MassMutual, subordinate only to the expenses of administration incurred in such insolvency proceeding and workers' compensation claims as provided in Chapter 175, Section 46A of the Massachusetts General Laws Annotated. Investors should note, however, that the statutory liquidation priority accorded to Funding Agreements under Massachusetts law does not clearly apply to any additional amounts required to be paid as may be necessary in order that the net amounts receivable by a Noteholder after any withholding or deduction shall equal the respective amounts, which would have been receivable by such Noteholder in the absence of such withholding or deduction. Accordingly, in the event of MassMutual's insolvency or receivership, claims under a Guaranteed Separate Account Funding Agreement for such payments, if any, may not rank equally with policyholder or funding agreement claims, and may rank equally with MassMutual's unsecured debt obligations, which are given at least "class 7" priority under Mass. Gen. Laws c. 175, Section 180F.

Representations of MassMutual

MassMutual will, among other things, represent in each Funding Agreement executed by it that it has the power to enter into the Funding Agreement and to consummate the transactions contemplated thereby; the Funding Agreement has been duly authorized, executed and delivered by MassMutual; the Funding Agreement constitutes a legal, valid and binding obligation of MassMutual; the Funding Agreement is enforceable in accordance with the terms thereof, subject to applicable bankruptcy, insolvency and similar laws affecting creditor's rights, and subject, as to enforceability, to general principles of equity, regardless of whether enforcement is sought in a proceeding in equity or at law; and the execution and delivery of the Funding Agreement and the performance of obligations thereunder do not and will not constitute or result in a default, breach or violation, of the terms or provisions of its certificate, articles or charter of incorporation, declaration of trust, by-laws or any agreement, instrument, mortgage, judgment, injunction or order applicable to it or any of its property.

Events of Default under Funding Agreements

Each of the following events will constitute an "**Event of Default**" under a Funding Agreement and MassMutual shall, in the case of (a), (b) and (d) below and shall, upon the request of the relevant Series Trust, in the case of (c) repay to the relevant Series Trust all amounts deposited under the relevant Funding Agreement remaining unpaid, together with interest accrued thereon but unpaid forthwith upon the occurrence of any of the following events:

(a) default in the payment of any interest on the relevant Funding Agreement when such interest becomes due and payable, and continuance of such default for a period of ten Business Days; or

(b) default in the payment of any principal amount under the relevant Funding Agreement and continuance of such default for a period of five Business Days;

(c) MassMutual (i) is dissolved (other than pursuant to a consolidation, amalgamation or merger); (ii) becomes insolvent or is unable to pay its debts or fails or admits in writing its inability generally to pay its debts as they become due; (iii) makes a general assignment, arrangement or composition with or for the benefit of its creditors; (iv) institutes or has instituted against it an administrative or legal proceeding seeking a judgment of insolvency or bankruptcy or any other relief under any supervision, rehabilitation, liquidation, bankruptcy or insolvency law or other similar law affecting creditors' rights, or a petition is presented for its winding-up or liquidation, and, in the case of any such proceeding or petition instituted or presented against it, such proceeding or petition (a) results in a judgment of insolvency or bankruptcy or the entry of an order for relief or the making of an order for its rehabilitation, winding-up or liquidation or (b) is not dismissed, discharged, stayed or restrained in each case within 30 days of the institution or presentation thereof; (v) has a resolution passed for its rehabilitation, winding-up, official management or liquidation (other than pursuant to a consolidation, amalgamation or merger); (vi) seeks or becomes subject to the appointment of an administrator, supervisor, rehabilitator, provisional liquidator, conservator, receiver, trustee, custodian or other similar official for it or for all or substantially all its assets; (vii) has a secured party take possession of all or substantially all its assets or has a distress, execution, attachment, sequestration or other legal process levied, enforced or sued on or against all or substantially all its assets and such secured party maintains possession, or any such process is not dismissed, discharged, stayed or restrained, in each case within 30 days thereafter; (viii) causes or is subject to any event with respect to it which, under the applicable laws of any jurisdiction, has an analogous effect to any of the events specified in clauses (i) to (vii) (inclusive); or (ix) takes any action in furtherance of, or indicating its consent to, approval of, or acquiescence in, any of the foregoing acts; or

(d) the occurrence of a Swap Event of Default (as defined herein).

MassMutual will forthwith notify the Administrative Trustee, the Series Trust and any rating agency rating the relevant Notes of the occurrence of the events described in clause (c) above.

Payment of Additional Amounts; Termination of Funding Agreement

If additional amounts are payable by MassMutual under the Funding Agreement, such payments will be made in accordance with the same terms and conditions as for additional amounts payable under the Notes. *See* "Description of the Notes – Payment of Additional Amounts."

If MassMutual is obligated to withhold or deduct any U.S. taxes with respect to any payment under the Funding Agreement as described above, or with respect to any payment under any related funding agreement between MassMutual and the Trust or a Series Trust, or if there is a material probability that MassMutual will become obligated to withhold or deduct any such U.S. taxes (in the opinion of independent counsel selected by MassMutual), pursuant to any change in or amendment to any U.S. tax laws (or any regulations or rulings thereunder), or any change in position of the IRS or any political subdivision or governmental authority of the U.S., regarding the application or interpretation thereof (including, but not limited to, MassMutual's receipt of a written adjustment from the IRS or other governmental authority in connection with an audit), then MassMutual may terminate the Funding Agreement by giving not less than 30 days' prior written notice to the relevant Series Trust and by paying to the relevant Series Trust on the date specified in such notice the entire balance in the Funding Agreement Account, including interest accrued to (but excluding) the date of such payment and all amounts with respect thereto required as set forth immediately above.

Prospective investors should note, however, that the statutory liquidation priority accorded to Funding Agreements under Massachusetts law does not clearly apply to any additional amounts required to be paid (if specified in the applicable Pricing Supplement) as may be necessary in order that the net amounts receivable by the Series Trust after any withholding or deduction under U.S. tax law shall equal the respective amounts, which would have been receivable by such Series Trust in the absence of such withholding or deduction. Accordingly, claims of such payments, if any, may not rank equally with either the insurance or annuity claims or Funding Agreement claims and may rank *pari passu* with the general unsecured creditors of MassMutual, which would affect the ability of the applicable Series Trust to recover any claims of additional amounts in respect of such Funding Agreement.

DESCRIPTION OF CERTAIN TERMS AND CONDITIONS OF THE SWAPS

The description of certain of the terms and conditions of the relevant Swaps set forth below and in the description of the terms and conditions of the Notes set forth above is a summary of, and is subject to, the detailed provisions of such Swaps and related documents, copies of which will be on file with the Indenture Trustee and Paying Agents. Capitalized terms used herein have the same meanings as those used in the Swaps unless the context otherwise requires.

General

Each Series of Notes may or may not involve one or more Swaps. If the relevant Series Trust purchases a Funding Agreement denominated in the same currency or accruing interest on the same basis as the related Series of Notes, there will be no Swap. However, in the event the Funding Agreement is denominated in a different currency and/or accrues interest on a different basis (such as a fixed as opposed to a floating rate) from the related Series of Notes, then the relevant Series Trust will enter into a Swap with either Swap Counterparty. In the event the Swap Counterparty is MassMutual on behalf of a related separate account, the obligations of the separate account in connection with the Swap shall be irrevocably and unconditionally guaranteed by the general account of MassMutual.

Each Series of Notes will be secured by each applicable Funding Agreement issued by MassMutual in respect of the tranches of Notes comprising such Series of Notes and the rights of the related Series Trust in and to the corresponding Swap(s), if any.

Representations of the Swap Counterparty

The Swap Counterparty will, among other things, represent in each Swap executed by it that it has the power to enter into the Swap and to consummate the transactions contemplated thereby; the Swap has been duly authorized, executed and delivered by the Swap Counterparty; the Swap constitutes a legal, valid and binding obligation of the Swap Counterparty; the Swap is enforceable in accordance with the terms thereof, subject to applicable bankruptcy, insolvency and similar laws affecting creditor's rights, and subject, as to enforceability, to general principles of equity, regardless of whether enforcement is sought in a proceeding in equity or at law; the execution and delivery of the Swap and the performance of obligations thereunder do not and will not constitute or result in a default, breach or violation of the terms or provisions of its certificate, articles or charter of incorporation, declaration of trust, by-laws or any agreement, instrument, mortgage, judgment, injunction or order applicable to it or any of its property, and that in the event the Swap Counterparty is MassMutual on behalf of a related separate account, the obligations of the Swap Counterparty under the Swap are irrevocably and unconditionally guaranteed by the general account of MassMutual.

Payments under the Swaps

Each Swap will provide that the relevant Series Trust will exchange with the Swap Counterparty the payments, which the relevant Series Trust receives from MassMutual under the corresponding Funding Agreement for payments in the same currency and/or on the same interest basis as the relevant Series of Notes, as further specified in the Swap. For example, if a Series of Notes were denominated in Euros and interest accrued at a fixed rate, MassMutual could issue a Funding Agreement denominated in U.S. dollars and bearing interest at a floating rate and simultaneously enter into corresponding Swap(s) with the relevant Series Trust under which the relevant Series Trust would make payments in U.S. Dollars at the floating rate as provided in the relevant Funding Agreement to the applicable Swap Counterparty in exchange for the receipt from the applicable Swap Counterparty of payments in Euros at a fixed rate. The timing and amounts of such payment paid by the relevant Series Trust and the applicable Swap Counterparty to each other under the corresponding Swap(s) will be specified in such Swap(s). The net payments due to the Series Trust pursuant to the Funding Agreement and the corresponding Swap(s) are designed to provide the relevant Series Trust with the desired currency in the amounts and within the appropriate time periods to make the payments due under the relevant Series of Notes. Further, if the Funding Agreement is denominated in a different currency from the related Series of Notes, the corresponding Swap(s) will provide for the Swap Counterparty to exchange an amount equal to the net proceeds of the issuance of the relevant Series of Notes for an amount equal to and in the same currency as the proceeds paid to the Series Trust under the relevant Funding Agreement on the effective date of the Swap, and for the Series Trust to pay to the applicable Swap Counterparty an amount equal to the balance of Funding Agreement Account under the relevant Funding Agreement for an amount equal to and in the same currency as the amount due under the Notes of the relevant Series upon termination of the related Funding Agreement. For example, if a Series of Notes were denominated in Euros and the related Funding Agreement were denominated in U.S. Dollars, the Swap Counterparty would initially exchange the net proceeds in Euros from the sale of the relevant Series of Notes for a U.S. Dollar amount equal to the net deposit of the related Funding Agreement. Upon termination of the Funding Agreement, the relevant Series Trust would exchange a U.S. Dollar amount equal to the Funding Agreement redemption amount for a euro amount equal to the Note redemption amount of the related Series of Notes.

Events of Default under Swaps

Unless otherwise specified in the relevant Swap, each of the following events will constitute an event of default under a Swap (each, a "**Swap Event of Default**"):

(a) failure by the Swap Counterparty or the relevant Series Trust to make any payment under the Swap, and continuance of such default for a period of ten Business Days;

(b) MassMutual (i) is dissolved (other than pursuant to a consolidation, amalgamation or merger); (ii) becomes insolvent or is unable to pay its debts or fails or admits in writing its inability generally to pay its debts as they become due; (iii) makes a general assignment, arrangement or composition with or for the benefit of its creditors; (iv) institutes or has instituted against it an administrative or legal proceeding seeking a judgment of insolvency or bankruptcy or any other relief under any supervision, rehabilitation, liquidation, bankruptcy or insolvency law or other similar law affecting creditors' rights, or a petition is presented for its winding-up or liquidation, and, in the case of any such proceeding or petition instituted or presented against it, such proceeding or petition (a) results in a judgment of insolvency or bankruptcy or the entry of an order for relief or the making of an order for its rehabilitation, winding-up or liquidation or (b) is not dismissed, discharged, stayed or restrained in each case within thirty (30) days of the institution or presentation thereof; (v) has a resolution passed for its rehabilitation, winding-up, official management or liquidation (other than pursuant to a consolidation, amalgamation or merger); (vi) seeks or becomes subject to the appointment of an administrator, supervisor, rehabilitator, provisional liquidator, conservator, receiver, trustee, custodian or other similar official for it or for all or substantially all its assets; (vii) has a secured party take possession of all or substantially all its assets or has a distress, execution, attachment, sequestration or other legal process levied, enforced or sued on or against all or substantially all its assets and such secured party maintains possession, or any such process is not dismissed, discharged, stayed or restrained, in each case within 30 days thereafter; (viii) causes or is subject to any event with respect to it which, under the applicable laws of any jurisdiction, has an analogous effect to any of the events specified in clauses (i) to (vii) (inclusive); or (ix) takes any action in furtherance of, or indicating its consent to, approval of, or acquiescence in, any of the foregoing acts; or

(c) the occurrence of an "Event of Default" as defined in the relevant Funding Agreement.

For so long as the Series Trust is in default under (a) under the related Swap, the Swap Counterparty will not be obligated to make any Swap payments.

Termination Events

Unless otherwise specified in the applicable Swap, the occurrence of any of the following with respect to a Swap Counterparty or the Series Trust, constitutes a termination event under the Swap with respect to such party (each, a "**Swap Termination Event**"):

(a) In the case of either the Series Trust or the Swap Counterparty (which will be the "Affected Party"), as a result of certain legislative, regulatory or judicial action, it becomes unlawful for such party to comply with any material provision of the Swap, including any payment obligation;

(b) In the case of the Series Trust (which will be the "Affected Party"), the Series Trust becomes subject to registration as an investment company under the Investment Company Act, as amended;

(c) In the case of the Series Trust (which will be the "Affected Party"), the Series Trust ceases to be taxable as a grantor trust and becomes treated as an association taxable as a corporation for U.S. federal income tax purposes;

(d) In the case of the Series Trust (which will be the "Affected Party"), the Series Trust Agreement is amended or supplemented without the prior written consent of the Swap Counterparty, provided that the Trustee may create one or more additional Series without the consent of the Swap Counterparty; or

(e) The occurrence of such other events as are specified in the applicable Swap.

Early Termination Date

If a Swap Event of Default or a Swap Termination Event occurs in which a Swap Counterparty is the "Defaulting Party" or the only "Affected Party" and an Early Termination Payment (as defined below) is due to the Series Trust from the Swap Counterparty, the Indenture Trustee, on behalf of the Holders of the related Series of Notes, will designate as the Early Termination Date the earliest date following the Indenture Trustee's receipt of actual knowledge of such Swap Event of Default or Swap Termination Event on which the Swap can practicably be terminated.

Payments upon Early Termination

Unless otherwise specified in the applicable Swap, the amount payable upon a Swap Termination Event (the "**Early Termination Payment**") will be determined based upon the calculation of "Market Quotation" pursuant to the procedures contained in the ISDA Master Agreement. The "Market Quotation" is an amount determined by averaging quotations obtained from Reference Market-makers for economically equivalent replacement swap transactions. "Reference Market-makers" is defined in the ISDA Master Agreement as meaning four leading dealers in the relevant market selected from among dealers of the highest credit standing.

If an early termination results from either a Swap Event of Default or a Swap Termination Event where there is only one Affected Party, the Early Termination Payment will be equal to (i) the sum of the Market Quotation (as determined by the non-Defaulting Party or non-Affected Party, as applicable) and any unpaid amounts owing to the non-Defaulting Party or non-Affected Party, as applicable, less (ii) any unpaid amounts owing to the Defaulting Party or the Affected Party, as applicable. If the resulting Early Termination Payment amount is a positive number, the Defaulting Party or Affected Party, as applicable, will pay the Early Termination Payment to the other party. If the resulting Early Termination Payment amount is a negative number, the non-Defaulting Party or non-Affected Party, as applicable, will pay the absolute value of the amount to the Defaulting Party or Affected Party, as applicable.

If an early termination results from a Swap Termination Event where there are two Affected Parties, each party will determine a Market Quotation, and the Early Termination Payment will be equal to (i) the sum of (A) one-half of the difference between the Market Quotation of the party with the higher Market Quotation ("X") and the Market Quotation of the party with the lower Market Quotation ("Y") and (B) any unpaid amounts owing to X; less (ii) any unpaid amounts owing to Y. If the resulting Early Termination Payment amount is a positive number, Y will pay it to X; if negative, X will pay the absolute value to Y.

Amendments to the Swaps

The Swap(s) may be amended from time to time by the Administrative Trustee without the consent of Holders of the Notes issued by any relevant Series Trust, (i) to cure any ambiguity, (ii) to correct, supplement or modify any provision in such Swap(s) that is inconsistent with another provision therein or (iii) to modify, eliminate or add to any provisions of the Swap(s) to the extent necessary (A) to ensure that any Series Trust will be classified for U.S. federal income tax purposes as either a disregarded entity or a grantor trust at all times or (B) to ensure that any Series Trust will not be required to register as an investment company under the Investment Company Act; provided, however, that in the case of clause (i) and clause (ii), such action would not adversely affect in any material respect the interests of any Holder of the Notes issued by any Series Trust.

Without the consent of each affected Holder of the Notes issued by any Series Trust, the Swap(s) may not be amended to (i) change the amount or timing of any payments on any Notes or otherwise adversely affect the terms of any Notes or (ii) impair the right of any Noteholder to institute suit for the enforcement of any right for principal and interest or other distribution.

Treatment of Swaps in Insolvency

In the event a Series Trust enters into one or more Swap(s) in connection with a Funding Agreement and the related Series of Notes, the rights of such Series Trust in and to such Swap(s) will constitute part of the Pledged Estate securing the Series Trust's obligations under its applicable Series of Notes.

Swap(s) entered into in connection with General Account Funding Agreement(s). In the event of MassMutual's impairment or insolvency, the claims of a Series Trust as a counterparty to the corresponding Swap(s) entered into in connection with the issuance of one or more General Account Funding Agreements would be subject to Massachusetts law. Claims of a Series Trust under such Swap(s) would be first satisfied out of the assets of the general account of MassMutual. MassMutual believes that, pursuant to Chapter 175 Section 180F of the Massachusetts General Laws Annotated, such claims would be accorded class 7 priority and rank *pari passu* with the claims of MassMutual's general unsecured creditors.

Swap(s) entered into in connection with Guaranteed Separate Account Funding Agreement(s). In the event of MassMutual's impairment or insolvency, the claims of a Series Trust as a counterparty to the corresponding Swap(s) entered into in connection with the issuance of one or more Guaranteed Separate Account Funding Agreements would be subject to Massachusetts law. MassMutual believes that, pursuant to Chapter 175 Section 132G of the Massachusetts General Laws Annotated, claims of a Series Trust under such Swap(s) would be first satisfied out of the assets allocated to the related separate account of MassMutual. Furthermore, to the extent such assets are insufficient (after giving effect to any other liabilities of such separate account, including, without limitation, under Guaranteed Separate Account Funding Agreements), claims of a Series Trust under such Swap would be then satisfied out of the assets of MassMutual's general account. MassMutual believes that such claims would be accorded class 7 priority and rank *pari passu* with the claims of MassMutual's general unsecured creditors under Chapter 175 Section 180F of the Massachusetts General Laws Annotated.

TAXATION

The information provided below does not purport to be a complete summary of the tax law and practice currently applicable. Prospective investors should consult with their own professional advisors.

United States Federal Income Taxation

The following is a summary of certain U.S. federal income tax consequences of the purchase, ownership and disposition of the Notes. It is included herein for general information only and does not address every aspect of the income or other tax laws that may be relevant to investors in the Notes in light of their personal investment circumstances or that may be relevant to certain types of investors subject to special treatment under U.S. income tax laws (for example, financial institutions, partnerships, tax-exempt organizations, insurance companies, persons subject to the alternative minimum tax, persons that are broker-dealers, retirement plans (including IRAs and tax-deferred accounts), certain former U.S. citizens or long-term residents, certain U.S. citizens or long-term residents who expatriate from the U.S. or U.S. Holders (as defined below) that have a functional currency other than the U.S. dollar or that hold their Notes through non-U.S. brokers or other non-U.S. intermediaries). Except as noted below, the discussion in this section is limited to initial purchasers of the Notes who hold Notes as capital assets within the meaning of Section 1221 of the Code and not as part of a straddle, hedging or conversion transaction, or as part of a "synthetic security" or other integrated financial transaction. Furthermore, the discussion below is based upon provisions of the Code, the legislative history thereof, U.S. Treasury regulations thereunder (the "**Treasury Regulations**") and administrative rulings and judicial decisions thereunder as of the date hereof. Such authorities may be repealed, revoked or modified (including changes in effective dates, and possibly with retroactive effect) so as to result in U.S. federal income tax consequences different from those discussed below. The discussion set forth below does not address the tax treatment of Floating Rate Notes providing for contingent principal or Floating Rate Notes that provide for interest at other than a Base Rate described herein or Notes having an original maturity date greater than 30 years from the date of issue. The treatment of any such Notes will be addressed in the applicable Pricing Supplement.

As used herein, a "**U.S. Holder**" is a beneficial owner of a Note that is for U.S. federal income tax purposes (i) a citizen or resident of the U.S.; (ii) a corporation created or organized in or under the laws of the U.S. or any state thereof (including the District of Columbia); (iii) an estate, the income of which is subject to U.S. federal income taxation regardless of its source; or (iv) a trust if it (a) is subject to the primary supervision of a court within the U.S. and one or more U.S. persons have the authority to control all substantial decisions of the trust or (b) has a valid election in effect under applicable Treasury Regulations to be treated as a U.S. person (any of the foregoing, for purposes of this "Taxation" section, a "**U.S. Person**"). A "**Non-U.S. Holder**" is any beneficial owner of a Note other than a U.S. Holder or an entity or arrangement treated as a partnership for U.S. federal tax purposes. For the purposes of this Offering Memorandum, U.S. Holders and Non-U.S. Holders shall be referred to collectively as "**Holders.**"

If an entity or arrangement treated as a partnership for U.S. federal income tax purposes holds Notes, the tax treatment of a partner will generally depend upon the status of the partner and the activities of the partnership. If you are a partnership holding Notes, or a partner of a partnership holding Notes, it is very important that you consult your own tax advisor. The following summary does not address the U.S. federal income tax treatment of partnerships or their partners.

Pursuant to recently enacted legislation, an accrual method taxpayer that reports revenues on an applicable financial statement generally must recognize income for U.S. federal income tax purposes no later than the taxable year in which such income is taken into account as revenue in an applicable financial statement of the taxpayer. To the extent this rule is inconsistent with the rules described below, this rule supersedes such rules. Thus, this rule could potentially require such a taxpayer to recognize income for U.S. federal income tax purposes with respect to the Notes prior to the time such income would be recognized pursuant to the rules described below. Potential investors in the Notes should consult their tax advisors regarding the potential applicability of these rules to their investment in the Notes.

Except as otherwise noted herein, the discussion below does not address the U.S. federal income tax consequences of the purchase, ownership and disposition of any Notes that will initially be retained by MassMutual and the Trustee or conveyed to any member of MassMutual and the Trustee's expanded group, as defined in the final regulations under Section 385 of the Code.

Prospective investors should consult their tax advisors concerning the U.S. federal income tax consequences of the purchase, ownership and disposition of Notes in light of their particular situations as well as any consequences arising under the laws of any other taxing jurisdiction.

Classification of the Trust and the Series Trust

Upon the issuance of each Series of Notes, Sidley, special U.S. federal income tax counsel to the Trust, will render its opinion that, under current law and assuming full compliance with the terms of the Trust Agreement for the Trust, each Series Trust Agreement, the Indenture and each Series Indenture (and certain other documents), and based on certain facts and assumptions contained in such opinion, neither the Trust nor any Series Trust will be classified as an association (or publicly traded partnership) taxable as a corporation for U.S. federal income tax purposes**.** Accordingly, neither the Trust nor any Series Trust will be treated as a taxable entity for U.S. federal income tax purposes.

Series Trust Disregarded. In the event that a Series Trust enters into a Funding Agreement but does not enter into any Swaps, MassMutual and the Trustee intend to take the position, for U.S. federal income tax purposes, that such Series Trust will be ignored and that the Notes will be treated as representing indebtedness of MassMutual (the "**Intended Tax Characterization**"), in which case each Holder of a Note (or any beneficial interest therein) issued by such Series Trust, by acceptance of such Note (or such beneficial interest), agrees to treat such Note consistently with the Intended Tax Characterization.

Notwithstanding the Intended Tax Characterization, it is possible that a Series Trust could be viewed as a separate entity for U.S. federal income tax purposes. If a Series Trust is viewed as a separate entity rather than ignored, each Holder generally will be subject to the rules applicable to holders of interests in grantor trusts described below under the heading "– *Series Trust Treated as Grantor Trust.*"

Series Trust Treated as Grantor Trust. In the event that a Series Trust enters into a Funding Agreement and one or more Swaps, MassMutual and the Trustee intend to take the position, for U.S. federal income tax purposes, that such Series Trust will be treated as a grantor trust (the "**Alternative Trust Characterization**"), in which case each Holder of a Note (or any beneficial interest therein) issued by such Series Trust, by acceptance of such Note (or such beneficial interest), agrees to treat such Note consistently with the Alternative Trust Characterization.

Under the U.S. federal income tax rules applicable to grantor trusts, each Holder of a Note (or any beneficial interest therein) issued by such a Series Trust generally will be treated as having purchased an undivided interest in the assets of the Series Trust and as having entered into any Swaps entered into by the Series Trust, in all cases to the extent of such Holder's proportionate interest in the relevant Series Trust. Similarly, the sale of a Note by a Holder will be considered a sale of the Holder's interest in the assets of the Series Trust and a termination of the Swaps with respect to that Holder. In addition, a U.S. Holder will be required to include in income, consistent with its method of accounting, its *pro rata* share of any amounts paid to the relevant Series Trust to satisfy expenses and may be entitled to deduct, consistent with its method of accounting, its *pro rata* share of any such expenses as provided in Section 162 of the Code. If the U.S. Holder is an individual, trust or estate, or to the extent the U.S. Holder's income is reportable on the income tax return of an individual, trust or estate, the deduction for such person's share of such expenses will generally not be allowed if such expenses constitute "miscellaneous itemized deductions." In addition, an individual's itemized deductions may be subject to other limitations as well. Accordingly, U.S. Holders who are individuals, or whose income is reported in whole or in part on the income tax return of a U.S. citizen or resident, should consult their tax advisors with respect to such deductions.

Interests in Synthetic Notes

Where certain conditions are met, a taxpayer may elect to "integrate" a debt instrument with other financial instruments into a single "synthetic debt instrument" (within the meaning of Treasury Regulation § 1.1275-6(b) (4)) or a single "integrated economic transaction" (within the meaning of Treasury Regulation § 1.988-5(a)(5)), as the case may be, in each case for U.S. federal income tax purposes. To integrate, the taxpayer must hold a "qualifying debt instrument" as part of the positions being integrated. Subject to certain exceptions, a qualifying debt instrument can be any type of debt instrument. In addition, a taxpayer must also hold a hedge described in Treasury Regulation § 1.1275-6 (a "**§ 1.1275-6 Hedge**") or Treasury Regulation § 1.988-5 (a "**§ 1.988-5 Hedge**").

An election to integrate is made by fulfilling certain identification requirements. In general, the identification rules require the owner of the qualifying debt instrument and § 1.1275-6 Hedge or § 1.988-5 Hedge, as the case may be, to enter and retain as part of its books and records the following information: (i) the date the qualifying debt instrument was issued and acquired and the date the related § 1.1275-6 Hedge or § 1.988-5 Hedge, as the case may be, was entered into; (ii) a description of the qualifying debt instrument and the § 1.1275-6 Hedge or the § 1.988-5 Hedge, as the case may be; (iii) a summary of the cash flows and accruals on the synthetic debt instrument or the integrated economic transaction, as the case may be; and (iv) in the case of an integrated economic transaction, certain other information.

To the extent a Series Trust simultaneously enters into a Funding Agreement and one or more Swaps, the relevant Series Trust Agreement will provide that the Trustee will fulfill the identification and other requirements necessary to make an integration election on behalf of the Series Trust and on behalf of each Holder with respect to such Holder's undivided interest in the property held by the Series Trust. However, it is not entirely clear whether the relevant Treasury Regulations permit the trustee of a grantor trust to make such an election. Therefore, a Holder of a Note (or any beneficial interest therein) also may wish to consider making an integration election with respect to such Holder's undivided interest in the property held by the Series Trust. In the event that an integration election is made by a Series Trust, the relevant Series Trust Agreement will require the Trustee to provide any information necessary for a Holder to satisfy the identification requirements with respect to its undivided interest in the property held by the Series Trust. Each Holder is expected to consult its own tax advisor regarding how to comply with the identification requirements.

If a proper integration election has been made, a Holder's undivided interest in the resulting synthetic debt instrument or integrated economic transaction, as the case may be (a "**Synthetic Note**"), will be subject to rules different than those that would apply on a separate basis to such Holder's undivided interest in the Funding Agreement and the Swap(s). Generally, the interest in the Synthetic Note will be subject to the same rules that would apply to conventional Notes with cash flows similar to those attributable to the interest in the Synthetic Note. For a discussion of those rules, see below under "The Notes." There are some exceptions to this treatment, and Holders are expected to consult their own tax advisors in that regard. Among those exceptions, in the case of a Synthetic Note consisting of a Holder's undivided interest in a Funding Agreement and an interest rate Swap, all stated interest will be treated as OID (rather than "qualified stated interest," as discussed below), which a Holder must include in income as it accrues. See the discussion of OID below under "The Notes − Interest and Original Issue Discount." In addition, special rules apply to Non-U.S. Holders that hold Synthetic Notes. Non-U.S. Holders are expected to consult their own tax advisors regarding the application of these rules.

References to the "Notes" in the remainder of this summary refer to Notes that are not treated as interests in Synthetic Notes.

The Notes

Interest and Original Issue Discount. U.S. Holders will include payments of "qualified stated interest" (defined generally as stated interest that is unconditionally payable at fixed periodic intervals of one year or less at a single fixed rate or, in the case of a "variable rate debt instrument" (as described below), at a rate or combination of rates meeting certain specified criteria (as described below)), received in respect of the Notes in accordance with their method of accounting, as ordinary interest income. In general, if the issue price of the Notes, determined by the aggregate first price at which a substantial amount of the Notes of the related tranche are sold to Holders, is less than the "stated redemption price at maturity" (defined as the sum of all payments to be received on the Notes other than payments of qualified stated interest) of the Notes by an amount that is equal to or greater than a specified *de minimis* amount (generally, 1/4 of 1% multiplied by the number of complete years to maturity), a U.S. Holder will be considered to have purchased its Notes with OID. If a U.S. Holder acquires Notes with OID, then regardless of such Holder's method of accounting, the Holder will be required to accrue its pro rata share of OID on the Notes on a constant yield basis and include such accruals in gross income, whether or not such U.S. Holder has received any cash payment from the relevant Series Trust with respect to the Notes.

The amount of OID allocable to any accrual period is an amount equal to the excess, if any, of (i) the Note's "adjusted issue price" (as defined below) at the beginning of the accrual period multiplied by its yield to maturity, determined on the basis of compounding at the close of each accrual period and properly adjusted for the length of the accrual period, over (ii) the aggregate of all qualified stated interest allocable to the accrual period. OID allocable to the final accrual period is the difference between the amount payable at maturity, other than a payment of qualified stated interest, and the adjusted issue price at the beginning of the final accrual period. Special rules will apply for calculating OID for an initial short accrual period. The "adjusted issue price" of a Note at the beginning of any accrual period is equal to its issue price increased by the accrued OID for each prior accrual period, determined without regard to market discount or amortized bond premium (as described below), and reduced by any payments made on the Note (other than qualified stated interest) on or before the first day of the accrual period. Under these rules, you will have to include in income increasingly greater amounts of OID in successive accrual periods.

If the amount of OID with respect to a Note is *de minimis*, the amount of OID is treated as zero and a U.S. Holder will be required to treat any stated principal payment on a Note as capital gain to the extent of the product of the total amount of *de minimis* OID and a fraction, the numerator of which is the amount of the principal payment made and the denominator of which is the stated principal amount of the note.

The taxation of OID with respect to a Floating Rate Note is dependent upon whether the Note is a "variable rate debt instrument" ("**VRDI**"). An instrument is a VRDI if four conditions are met. First, the issue price of the instrument must not exceed the total noncontingent principal payments by more than an amount equal to the lesser of (i) .015 multiplied by the product of the total noncontingent principal payments and the number of complete years to maturity from the issue date (or, in certain cases, its weighted average maturity) and (ii) 15% of the total noncontingent principal payments. Second, except as provided in the preceding sentence, the instrument must not provide for any principal payments that are contingent. Third, the instrument must provide for stated interest (compounded or paid at least annually) at (a) one or more "qualified floating rates," (b) a single fixed rate and one or more qualified floating rates, (c) a single "objective rate" or (d) a single fixed rate and a single objective rate that is a "qualified inverse floating rate" (in each case, as defined below). Fourth, the instrument must provide that a qualified floating rate or objective rate in effect at any time during the term of the instrument is set at the value of the rate on any day that is no earlier than three months prior to the first day on which that value is in effect and no later than one year following that first day.

Subject to certain exceptions, a variable rate of interest is a "qualified floating rate" if variations in the value of the rate can reasonably be expected to measure contemporaneous fluctuations in the cost of newly borrowed funds in the currency in which the instrument is denominated. This includes a variable rate equal to (i) the product of an otherwise qualified floating rate and a Spread Multiplier that is greater than .65 but not more than 1.35 or (ii) an otherwise qualified floating rate (or the product described in clause (i)) plus or minus a Spread. If the variable rate equals the product of an otherwise qualified floating rate and a single Spread Multiplier greater than 1.35 or less than or equal to .65, however, such rate generally is an objective rate. A variable rate is not considered a qualified floating rate if the variable rate is subject to a cap, floor, governor or similar restriction that is not fixed throughout the term of the instrument and is reasonably expected as of the issue date to cause the yield on the instrument to be significantly more or less than the expected yield determined without the restriction.

Subject to certain exceptions, an "objective rate" is a rate (other than a qualified floating rate) that is determined using a single fixed-formula and that is based on objective financial or economic information that is neither within the control of the issuer (or a related party) nor unique to the circumstances of the issuer (or a related party). A rate is not an objective rate if it is reasonably expected that the average value of the rate during the first half of the instrument's term will be either significantly less than or significantly greater than the average value of the rate during the final half of the instrument's term. The IRS may designate rates other than those specified above that will be treated as objective rates. As of the date of this Offering Memorandum, no such other rates have been designated. An objective rate is a "qualified inverse floating rate" if (a) the rate is equal to a fixed rate minus a qualified floating rate and (b) the variations in the rate can be reasonably be expected to reflect inversely contemporaneous variations in the qualified floating rate (disregarding any caps, floors, governors or similar restrictions that would not, as described above, cause a rate to fail to be a qualified floating rate).

An instrument will have a single qualified floating rate or an objective rate if interest on the instrument is stated at a fixed rate for an initial period of one year or less, followed by a variable rate that is either a qualified floating rate or an objective rate for a subsequent period, and either (i) the value of the variable rate on the issue date is intended to approximate the fixed rate, or (ii) the fixed rate and the qualified floating rate or objective rate have values on the issue date of the debt security that do not differ by more than 0.25 percentage points.

In the case of a VRDI that provides for qualified stated interest, the amount of qualified stated interest and OID, if any, includible in income during a taxable year is determined by assuming that the variable rate is a fixed rate equal to (i) in the case of a qualified floating rate or a qualified inverse floating rate, the value, as of the issue date, of the qualified floating rate or qualified inverse floating rate, and (ii) in the case of an objective rate (other than a qualified inverse floating rate), the rate that reflects the yield that is reasonably expected for the instrument. Qualified stated interest allocable to an accrual period is increased (or decreased) if the interest actually paid during an accrual period exceeds (or is less than) the interest assumed to be paid during the accrual period.

If a VRDI does not provide for qualified stated interest as described above and does not provide for a fixed rate, the amount of interest and OID accruals are determined by constructing an equivalent fixed rate debt instrument, as follows:

First, a fixed rate substitute for each variable rate provided by the VRDI is determined. The fixed rate substitute for each qualified floating rate provided by the VRDI is the value of that qualified floating rate on the issue date. If the VRDI provides for two or more qualified floating rates with different intervals between interest adjustment dates (*e.g.*, the 30-day Commercial Paper Rate and quarterly LIBOR), the fixed rate substitutes are based on intervals that are equal in length (*e.g.*, the 90-day Commercial Paper Rate and quarterly LIBOR, or the 30-day Commercial Paper Rate and monthly LIBOR). The fixed rate substitute for an objective rate that is a qualified inverse floating rate is the value of the qualified inverse floating rate on the issue date. The fixed rate substitute for an objective rate (other than a qualified inverse floating rate) is a fixed rate that reflects the yield that is reasonably expected for the VRDI.

Second, a hypothetical equivalent fixed rate debt instrument is constructed that has terms identical to those provided under the VRDI, except that the equivalent fixed rate debt instrument provides for the fixed rate substitutes determined in the first step, in lieu of the qualified floating rates or objective rate provided by the VRDI.

Third, the amount of qualified stated interest and OID for the equivalent fixed rate debt instrument are determined. These amounts are taken into account as if the U.S. Holder held the equivalent fixed rate debt instrument.

Fourth, appropriate adjustments are made for the actual values of the variable rates. In this step, qualified stated interest or OID allocable to an accrual period is increased (or decreased) if the interest actually accrued or paid during the accrual period exceeds (or is less than) the interest assumed to be accrued or paid during the accrual period under the equivalent fixed rate debt instrument.

If a VRDI provides for stated interest either at one or more qualified floating rates or at a qualified inverse floating rate, and in addition provides for stated interest at a single fixed rate, the amount of interest and OID accruals are determined as in the preceding four paragraphs with the modification that the VRDI is treated, for purposes of the first three steps of the determination, as if it provided for a qualified floating rate (or qualified inverse floating rate) rather than the fixed rate. The qualified floating rate (or qualified inverse floating rate) replacing the fixed rate must be such that the fair market value of the VRDI as of the issue date would be approximately the same as the fair market value of an otherwise identical debt instrument that provides for the qualified floating rate (or qualified inverse floating rate) rather than the fixed rate.

Short-Term Notes. In the case of a Note with a maturity of one year or less from its issue date (a "**Short-Term Note**"), no interest is treated as qualified stated interest, and therefore all interest is included in the stated redemption price at maturity and generally treated as OID. U.S. Holders that report income for U.S. federal income tax purposes on an accrual method and certain other U.S. Holders are required to include OID in income on a straight-line basis, unless an election is made to accrue the OID according to a constant yield method based on daily compounding.

Any other U.S. Holder is not required to accrue OID on a Short-Term Note for U.S. federal income tax purposes, unless it elects to do so, with the consequence that the reporting of the income is deferred until it is received. In the case of a U.S. Holder that is not required, and does not elect, to include OID in income currently, any gain realized on the sale, exchange or retirement of a Short-Term Note is ordinary income to the extent of the OID accrued on a straight-line basis (or, if elected, according to a constant yield method based on daily compounding) through the date of sale, exchange or retirement. In addition, U.S. Holders that are not required, and do not elect, to include OID in income currently are required to defer deductions for any interest paid on indebtedness incurred or continued to purchase or carry such Short-Term Note to the extent of accrued OID and accrued interest that are payable but that have not been included in gross income. A U.S. Holder of a Short-Term Note may elect to apply the foregoing rules (except for the rule characterizing gain on sale, exchange or retirement as ordinary) with respect to "acquisition discount" rather than OID. Acquisition discount is the excess of the stated redemption price at maturity of the Short-Term Note over the U.S. Holder's basis in the Short-Term Note. This election applies to all obligations acquired by the U.S. Holder on or after the first day of the first taxable year to which such election applies, unless revoked with the consent of the IRS. A U.S. Holder's tax basis in a Short-Term Note is increased by the amount included in such U.S. Holder's income on such a Note.

Market Discount and Premium. If a U.S. Holder purchases a Note (other than a Note issued with OID) for an amount that is less than its issue price, or if a subsequent purchaser purchases a Note for an amount that is less than its stated redemption price at maturity (or, in the case of a Note issued with OID, its adjusted issue price as of the purchase date), the amount of the difference will be treated as "market discount" for U.S. federal income tax purposes, unless this difference is less than a specified de minimis amount.

Under the market discount rules of the Code, (i) any partial principal payment on the Note, (ii) in the case of a Note issued with OID, any payment on the Note that does not constitute qualified stated interest or (iii) any gain realized on the sale, exchange, retirement or other disposition of the Note must be recognized by U.S. Holders as ordinary income to the extent of the lesser of (i) the amount of the payment or realized gain or (ii) the market discount that has not previously been included in income and is treated as having accrued on the Note at the time of payment or disposition.

If the Note is disposed of in a nontaxable transaction, other than a non-recognition transaction described in Section 1276(c) of the Code, the amount of gain realized on the disposition for purposes of the market discount rules will be determined as if the U.S. Holder had sold the Note at its then fair market value. Generally, market discount will be considered to accrue ratably during the period from the date of acquisition to the maturity date of the Note. However, a U.S. Holder may elect to include market discount in income currently as it accrues, on either a ratable or a constant interest rate basis, in which case the rules described in the preceding two sentences will not apply. Generally, this currently included market discount is treated as ordinary interest. The election will apply to all debt instruments acquired by the U.S. Holder on or after the first day of the first taxable year to which that election applies and may be revoked only with the consent of the IRS.

A U.S. Holder who purchases a Note issued with OID for an amount that is greater than its adjusted issue price as of the purchase date, but less than or equal to the sum of all amounts payable on the Note after the purchase date, other than payments of qualified stated interest, will be considered to have purchased the Note at an "acquisition premium" within the meaning of the Code. Under the acquisition premium rules, the amount of OID which, the U.S. Holder must include in its gross income with respect to the Note for any taxable year, or for the part of a taxable year in which the U.S. Holder holds the Note, will be reduced (but not below zero) by the portion of the acquisition premium properly allocable to the period.

A U.S. Holder who purchases a Note issued with OID for an amount that is greater than the sum of all amounts payable on the Note after the purchase date, other than qualified stated interest, will be considered to have purchased that note at a "premium" within the meaning of the OID regulations. In that case, the U.S. Holder is not required to include any OID in gross income.

If a U.S. Holder purchases a Note (at initial issuance or otherwise) for an amount that is greater than the amount payable at maturity, that U.S. Holder will be considered to have purchased the Note with "amortizable bond premium" equal in amount to that excess, and may elect, in accordance with applicable Code provisions, to amortize this premium, using a constant yield method over the remaining term of the Note and to offset interest otherwise required to be included in income in respect of the Note during any taxable year by the amortized amount of that excess for the taxable year. Any election to amortize bond premium applies to all debt instruments acquired by the U.S. Holder on or after the first day of the first taxable year to which the election applies and may be revoked only with the consent of the IRS.

Election to Treat All Interest as OID. U.S. Holders may elect to include in gross income all interest that accrues with respect to a Note, including any stated interest, OID, *de minimis* OID, market discount, *de minimis* market discount and unstated interest (as adjusted by any amortizable bond premium), by using the constant yield method described above. Such an election with respect to a Note with amortizable bond premium results in a deemed election to amortize bond premium for all taxable debt instruments owned and later acquired by the U.S. Holder with amortizable bond premium and may be revoked only with the permission of the IRS. A U.S. Holder's tax basis in a Note is increased by each accrual of the amounts treated as OID under the constant yield election described in this paragraph.

Early Redemption of Notes Issued with OID. As described above under the headings "Description of the Notes—Optional Redemption and Repurchase of Notes," Notes issued with OID may be redeemable prior to maturity at the option of the Series Trust. Notes issued with OID that contain this option may be subject to rules that differ from the general rules discussed above. U.S. Holders intending to purchase notes issued with OID that have this feature should carefully examine the applicable Pricing Supplement and should consult with their own tax advisors with respect to either or both of these features since the tax consequences with respect to OID will depend, in part, on the particular terms and the particular features of the purchased note.

Sale, Exchange and Retirement of Notes. In general, a U.S. Holder will have a tax basis in a Note equal to the cost of the Note to such Holder, increased by any amount includible in income by such Holder as OID and reduced (but not below zero) by its amortized premium and any payments other than payments of qualified stated interest on the Note. Upon a sale, exchange or retirement of a Note, a U.S. Holder will generally recognize gain or loss equal to the difference between the amount realized on the sale, exchange or retirement (less any accrued but unpaid qualified stated interest, which would be taxable as such) and the Holder's adjusted tax basis in such Note. Such gain or loss will be long-term capital gain or loss if the U.S. Holder held the Note for more than one year at the time of disposition, and otherwise will be short-term capital gain or loss. Net long-term capital gains of U.S. Holders that are not corporations are eligible for preferential rates of taxation. Short-term capital gains are taxed at rates applicable to ordinary income. The ability of U.S. Holders to offset capital losses against ordinary income is limited.

The Notes may trade at a price that does not accurately reflect the value of accrued but unpaid interest. A U.S. Holder who disposes of Notes between record dates for payments of interest thereon will be required to include accrued but unpaid interest on the Notes through the date of disposition in income as ordinary income. To the extent the selling price is less than the U.S. Holder's adjusted tax basis (which will include all accrued but unpaid OID) a U.S. Holder will recognize a capital loss.

Extendible Notes. MassMutual and each Series Trust intend to take the position that an election to extend the maturity of all or any portion of the principal amount of Notes, which allows the holder to extend the maturity date of such Notes ("**Extendible Notes**") should not be a taxable event for U.S. federal income tax purposes. In addition, MassMutual and each Series Trust intend to take the position that any Extendible Notes issued by such Series Trust should not constitute contingent payment debt instruments that would be subject to certain Treasury Regulations governing contingent payment obligations (the "**Contingent Payment Regulations**").

Under the treatment described above, it is expected that Extendible Notes should be treated as having been issued with *de minimis* OID. Therefore, Extendible Notes should not be treated as having been issued with OID for U.S. federal income tax purposes.

Prospective investors should note that, in particular because of the absence of authority directly addressing the unique features of Extendible Notes, no assurance can be given that the IRS will accept, or that the courts will uphold, the characterization and the tax treatment of Extendible Notes described above. If the IRS were successful in asserting that an election to extend the maturity of all or any portion of the principal amount of Extendible Notes is a taxable event for U.S. federal income tax purposes, then a U.S. Holder would be required to recognize any gain inherent in the Extendible Notes at such time upon the exercise of such election. Also, if the IRS were successful in asserting that Extendible Notes were subject to the Contingent Payment Regulations, the timing and character of income thereon would be affected. Among other things, U.S. Holders may be required to accrue OID, subject to adjustments, at a "comparable yield" on the issue price. Furthermore, any gain recognized with respect to such Extendible Notes would generally be treated as ordinary income.

Prospective investors should consult their tax advisor regarding the U.S. federal income tax consequences of an investment in, and extending the maturity of, Extendible Notes.

Foreign Currency Considerations. The following summary relates to Notes denominated in a currency other than U.S. dollars ("**Foreign Currency Notes**").

A cash method U.S. Holder that receives a payment of qualified stated interest with respect to a Foreign Currency Note will be required to include in income the U.S. dollar value of the foreign currency payment (determined by the spot rate on the date such payment is received) regardless of whether the payment is in fact converted to U.S. dollars at that time, and such U.S. dollar value will be the U.S. Holder's tax basis in the foreign currency.

A U.S. Holder that uses the accrual method of accounting (and, in the case of Notes having OID, a cash method U.S. Holder) will be required to include in income the U.S. dollar value of the amount of interest income that has accrued with respect to a Note during an accrual period (increased by any accrued OID and market discount and reduced by the amortization of any amortizable bond premium) under the rules described above. The U.S. dollar value of such accrued income will be determined by translating such income at the average rate of exchange for the accrual period or, with respect to an accrual period that spans two taxable years, at the average rate for the partial period within the taxable year. A U.S. Holder may elect to translate interest income into U.S. dollars at the spot rate on the last day of the interest accrual period (or in the case of a partial accrual period, the spot rate on the last day of the taxable year), or, alternatively, if the date of receipt of payment is within five business days of the last day of the interest accrual period, the spot rate on the date of receipt. A U.S. Holder that makes such an election must apply it consistently to all debt instruments from year to year, including all debt instruments subsequently acquired and cannot change the election without the consent of the IRS.

A U.S. Holder using the accrual method of accounting (and, in the case of Notes having OID, a cash method U.S. Holder) will also recognize exchange gain or loss, subject to tax at ordinary rates, with respect to accrued interest income (or OID) on the date such income is actually received or the Foreign Currency Note is disposed of. The amount of exchange gain or loss recognized on the payment date (or disposition date) will equal the difference between the U.S. dollar value of the foreign currency payment received (determined at the spot rate on the date such payment is received or the Foreign Currency Note is disposed of) in respect of the interest (or OID) accruing during such accrual period (or, where a holder receives U.S. dollars, the amount of such payment in respect of such accrual period) and the U.S. dollar value of interest income (or OID) that has accrued during such period (as determined above). Notwithstanding the foregoing, in the case of payments attributable to accrued interest (or OID) received on the sale, exchange or retirement of a Foreign Currency Note, exchange gain or loss will be recognized only to the extent of the total gain or loss, as the case may be, realized by a U.S. Holder on such sale, exchange or retirement.

In general, except as described in the immediately preceding paragraph and below, gain or loss realized on the sale, exchange or retirement of a Foreign Currency Note will be capital gain or loss.

A U.S. Holder's tax basis in a Foreign Currency Note, and the amount of any subsequent adjustment to such Holder's tax basis, will be the U.S. dollar value of the foreign currency amount paid for such Note, or the U.S. dollar value of the foreign currency amount of the adjustment, determined on the date of such purchase or adjustment. In the case of an adjustment resulting from an accrual of OID, such adjustment will be made at the rate at which such OID is translated into U.S. dollars under the rules described above. A U.S. Holder who purchases a Foreign Currency Note with previously owned foreign currency will recognize ordinary income or loss in an amount equal to the difference, if any, between such U.S. Holder's tax basis in the foreign currency and the U.S. dollar fair market value of the Foreign Currency Note on the date of purchase. For purposes of determining the amount of any gain or loss recognized by a U.S. Holder on the sale, exchange or retirement of a Foreign Currency Note, the amount realized upon the sale, exchange or retirement will be the U.S.-dollar value of the foreign currency received, determined on the date of the sale, exchange or retirement.

Gain or loss realized with respect to the principal amount represented by a Foreign Currency Note upon the sale, exchange or retirement of the Note that is attributable to fluctuations in currency exchange rates (*i.e.*, exchange gain or loss) will be ordinary income or loss, which will not be treated as interest income or expense. This exchange gain or loss will equal the difference between (i) the U.S. dollar value of the foreign currency principal amount (*i.e.*, the U.S. Holder's purchase price in units of foreign currency) represented by such Note, determined on the date such Note is disposed of, and (ii) the U.S. dollar value of the foreign currency principal amount represented by such Note, determined on the date such U.S. Holder acquired such Note. Such exchange gain or loss (along with any exchange gain or loss attributable to accrued interest income (or OID) paid at the time of such sale, exchange or retirement) will be recognized only to the extent of the total gain or loss, as the case may be, realized by a U.S. Holder on the sale, exchange or retirement of the Note (with such total gain or loss determined after accrual of any OID under the rules discussed above). Any gain or loss realized by a U.S. Holder in excess of such exchange gain or loss will be capital gain or loss, except to the extent of any accrued market discount not previously included in the U.S. Holder's income or, in the case of a Short-Term Note, any accrued OID.

A U.S. Holder will have a tax basis in any foreign currency received on the sale, exchange or retirement of a Note equal to the U.S. dollar value of such foreign currency, determined at the time of such sale, exchange or retirement. Any gain or loss realized by a U.S. Holder on the sale or other disposition of foreign currency, including its exchange for U.S. dollars or its use to purchase foreign currency notes, will be ordinary income or loss.

Any loss realized on the sale, exchange or retirement of a Foreign Currency Note with amortizable bond premium by a U.S. Holder that has not elected to amortize such bond premium will be a capital loss to the extent of the bond premium. If the election to amortize bond premium is made, amortizable bond premium taken into account on a current basis will reduce interest income in units of the relevant foreign currency. Exchange gain or loss is realized on the amortized bond premium with respect to any period by treating the bond premium amortized during such period as a return of principal.

Pursuant to relevant Treasury Regulations (the "**Disclosure Regulations**"), any taxpayer that has participated in a "reportable transaction" and who is required to file a U.S. federal income tax return must generally attach a disclosure statement disclosing such taxpayer's participation in the reportable transaction to the taxpayer's tax return for each taxable year for which the taxpayer participates in the reportable transaction. The Disclosure Regulations provide that, in addition to certain other transactions, a "loss transaction" constitutes a "reportable transaction." A "loss transaction" is any transaction resulting in the taxpayer claiming a loss under Section 165 of the Code in an amount equal to or in excess of certain threshold amounts. The Disclosure Regulations specifically provide that a loss resulting from a "Section 988 transaction" will constitute a Section 165 loss. In general, a Foreign Currency Note will be subject to the rules governing foreign currency exchange gain or loss. Therefore, any loss realized with respect to a Foreign Currency Note will constitute a Section 988 transaction. Based upon the foregoing, in the absence of future administrative pronouncements to the contrary, a U.S. Holder of a Foreign Currency Note that recognizes an exchange loss with respect to the Foreign Currency Notes in an amount that exceeds the loss threshold amount applicable to such U.S. Holder may be required to file a disclosure statement (*i.e.*, IRS Form 8886 or other applicable form) as an attachment to the U.S. Holder's tax return for the first taxable year in which the threshold amount is reached and to any subsequent tax return that reflects any amount of such Section 165 loss realized with respect to the Foreign Currency Note.

Net Investment Income Tax

Certain U.S. Holders that are individuals, estates or trusts will be subject to a 3.8% tax on all or a portion of their "net investment income" or "undistributed net investment income" (as applicable), which may include all or a portion of their interest income (including OID) and net gains from the disposition of Notes. If you are a U.S. Holder that is an individual, estate or trust, you are urged to consult your tax advisors regarding the applicability of the net investment income tax to your income and gains in respect of your investment in the Notes.

United States Federal Income Taxation of Non-U.S. Holders

Provided the Notes are sold and delivered, and payments are made, in accordance with the terms of the Notes and the Funding Agreement and subject to the discussion of effectively connected income, certain dividend equivalent payments, backup withholding, and withholding under FATCA (as defined below), below, payments of principal and interest (including OID) with respect to the Notes, by or on behalf of the relevant Series Trust or any of its paying agents to a Non-U.S. Holder, will not be subject to U.S. federal withholding tax if, in the case of interest (including OID): (i) the Non-U.S. Holder does not actually or constructively own 10% or more of the total combined voting power of the outstanding equity of MassMutual entitled to vote within the meaning of Section 871(h)(3) of the Code and regulations thereunder; (ii) the Non-U.S. Holder is not a controlled foreign corporation that is related within the meaning of Section 864(d)(4) of the Code to MassMutual; (iii) the Non-U.S. Holder is not a bank for U.S. federal income tax purposes whose receipt of interest on the Note is described in Section 881(c)(3)(A) of the Code; (iv) the interest is not contingent interest as described in Section 871(h)(4) of the Code (relating primarily to interest based on or determined by reference to income, profits, cash flow and other comparable attributes of MassMutual or a person related to MassMutual) and (v) the statement requirement set forth in Section 871(h) or Section 881(c) of the Code has been fulfilled with respect to the Non-U.S. Holder, as discussed in the following paragraph.

The statement requirement set forth in Sections 871(h) or 881(c) of the Code is satisfied if either (i) the beneficial owner of the Note certifies, under penalties of perjury, to the last U.S. payor (or Non-U.S. payor who is an authorized foreign agent of the U.S. payor, a "qualified intermediary," a U.S. branch of a foreign bank or foreign insurance company or a "withholding foreign partnership") in the chain of payment (the "Withholding Agent") that such owner is a Non-U.S. Holder and provides such owner's name and address and any other information required pursuant to applicable regulations, or (ii) a securities clearing organization, bank or another financial institution that holds customers' securities in the ordinary course of its trade or business (a "Financial Institution") that holds the Note certifies to the Withholding Agent, under penalties of perjury, that the certificate has been received from the beneficial owner by it or by a Financial Institution between it and the beneficial owner and furnishes the Withholding Agent with a copy thereof. Generally, the beneficial owner's certified statement is made on an applicable IRS Form W-8, which is effective for the remainder of the year of signature plus three full calendar years unless a change in circumstances makes any information on the form incorrect. The beneficial owner must inform the Withholding Agent (or Financial Institution) within 30 days of such change by furnishing a new Form W-8 (and the financial institution must obtain a new certificate and promptly so inform the Withholding Agent). A Non-U.S. Holder that is not an individual or corporation (or an entity treated as a corporation for U.S. federal income tax purposes) holding Notes on its own behalf may have substantially increased reporting requirements. In particular, in the case of Notes held by a foreign partnership (or foreign trust), the partners (or beneficiaries), rather than the partnership (or trust), are required to provide the certification discussed above, and the partnership (or trust) is required to provide certain additional information. Non-U.S. Holders should consult their tax advisors with respect to the requirement to periodically update their IRS Forms W-8.

A Non-U.S. Holder that is not exempt from U.S. federal withholding tax under the foregoing rules should consult its own tax advisor as to the availability of an exemption from, or reduction of, such tax under an applicable income tax treaty, if any.

If a Non-U.S. Holder is engaged in a trade or business in the U.S. and if interest on the Note is effectively connected with the conduct of that trade or business (and, if required by an applicable income tax treaty, such interest is attributable to a permanent establishment of the Non-U.S. Holder in the U.S.), the Non-U.S. Holder, although exempt from the withholding tax discussed in the preceding paragraphs, will generally be subject to regular U.S. federal income tax on interest (including OID) in the same manner as if it were a U.S. Holder. In lieu of the certificate described above, the Non-U.S. Holder will be required to provide to the withholding agent an appropriate form (generally IRS Form W-8ECI), executed under penalties of perjury, in order to claim an exemption from withholding tax. In addition, if the Non-U.S. Holder is a foreign corporation, it may be subject to a branch profits tax equal to 30% (or a lower rate provided by an applicable income tax treaty) of its effectively connected earnings and profits for the taxable year, subject to certain adjustments.

Subject to the discussion of backup withholding and FATCA below, a Non-U.S. Holder will not be subject to U.S. federal withholding tax on any gain realized on the sale, exchange or other disposition of a Note and will not be subject to U.S. federal income tax on such gain unless (i) such gain is (or is treated as) effectively connected with a U.S. trade or business of the Non-U.S. Holder (and, if required by an applicable income tax treaty applies, such income is attributable to a permanent establishment of the Non-U.S. Holder in the U.S.), in which case, if the Non-U.S. Holder is a foreign corporation, it may also be subject to a branch profits tax equal to 30% (or a lower rate provided by an applicable treaty) of its effectively connected earnings and profits for the taxable year, subject to certain adjustments, or (ii) in the case of an individual, unless an applicable income tax treaty provides otherwise, such holder is present in the U.S. for 183 days or more during the taxable year of the sale, exchange or other disposition and certain other requirements are met.

Withholding of U.S. federal income tax with respect to accrued OID may apply to payments on a redemption (or certain other sales or dispositions) of a Note by a Non-U.S. Holder that does not provide appropriate certification to the withholding agent.

Information Reporting and Backup Withholding

U.S. Holders

Under U.S. federal income tax law, information reporting requirements generally apply to payments of principal, interest (including OID) and premium made to, and to the proceeds of the sale of a Note paid to, certain non-corporate U.S. Holders. In addition, a backup withholding tax may apply if the non-corporate U.S. Holder fails to furnish a correct TIN (which, for an individual, would be his or her Social Security Number) and required certifications (usually on IRS Form W-9) or certification of foreign or other exempt status or if the withholding agent is notified by the IRS that the U.S. Holder failed to report in full dividend and interest income. Exempt recipients that are not subject to backup withholding and do not provide an IRS Form W-9 may nonetheless be treated as a foreign payee subject to withholding under FATCA, and withheld upon at the 30% rate discussed below under "—FATCA Withholding."

Any amounts withheld under backup withholding rules will be allowed as a refund or credit against such U.S. Holder's U.S. federal income tax liability provided the required information is furnished to the IRS in a timely manner.

Non-U.S. Holders

Information reporting will generally apply to payments of interest (including OID) and the amount of tax, if any, withheld with respect to such payments to Non-U.S. Holders. Copies of the information returns reporting such interest payments (generally, IRS Form 1042-S) and any withholding may also be made available to the tax authorities in the country in which the Non-U.S. Holder resides under the provisions of an applicable income tax treaty. Information on payments to Non-U.S. Holders may also be automatically provided by the government of the U.S. to non-U.S. tax authorities pursuant to various intergovernmental agreements concluded by the U.S. with other jurisdictions in relation to the implementation of FATCA (see below).

In addition, except as otherwise set forth in this discussion (and provided that the payor does not have actual knowledge or reason to know that the beneficial owner is a U.S. person), backup withholding and information reporting will not apply to the amount payable (whether in respect of principal, interest, OID, premium or otherwise) in respect of a Note paid or collected by a foreign intermediary or a U.S. branch that is not treated as a U.S. person on behalf of the beneficial owner of such Note, or to the payment outside the U.S. of the proceeds of a sale (including a redemption) of a Note effected outside the U.S. by a broker (as defined in applicable U.S. Treasury Regulations); *provided*, *however*, that no office of the same broker within the U.S. negotiated the sale or received instructions with respect to the sale from the payee. If, however, such party is a U.S. person, a controlled foreign corporation, a foreign person that derives 50% or more of its gross income for certain periods from the conduct of a U.S. trade or business or a foreign partnership, in which one or more persons, in the aggregate, own more than 50% of the income or capital interests in the partnership or which is engaged in a trade or business in the U.S., then such payments will not be subject to backup withholding, but will be subject to information reporting unless such custodian, nominee, agent or broker has documentary evidence in its records that the beneficial owner is not a U.S. person and certain other conditions are met, or the beneficial person otherwise establishes an exemption.

Payments on a Note to the beneficial owner thereof by a U.S. office of a custodian, nominee or agent, or the payment by the U.S. office of a broker of the proceeds of sale (including a redemption) of a Note, will be subject to both backup withholding and information reporting unless the beneficial owner certifies as to its non-U.S. status under penalties of perjury, and the payor does not have actual knowledge or reason to know that the beneficial owner is a U.S. person, or the beneficial owner otherwise establishes an exemption.

For purposes of the two preceding paragraphs, the term "U.S. person" shall have the meaning ascribed to it in Section 7701(a)(30) of the Code.

Any amounts withheld under the backup withholding rules will be allowed as a refund or a credit against the beneficial owner's U.S. federal income tax liability provided the required information is furnished to the IRS in a timely manner.

FATCA Withholding

A portion of the Hiring Incentives to Restore Employment Act (the "**HIRE Act**"), commonly referred to as the Foreign Account Tax Compliance Act ("**FATCA**"), generally imposes a withholding tax of 30% on interest income from Notes paid to certain foreign entities unless various information reporting, withholding and other requirements are satisfied. This would generally apply in the case of debt obligations held by or through intermediaries who do not agree to satisfy such information reporting, withholding and other requirements. Current provisions of the Code and Treasury Regulations that govern FATCA treat gross proceeds from the sale or other disposition of debt obligations that can produce U.S.-source interest (such as the Notes) as subject to FATCA withholding after December 31, 2018. However, under recently proposed Treasury Regulations (the preamble to which specifies that taxpayers are permitted to rely on them pending finalization), such gross proceeds are not subject to FATCA withholding.

Withholding on Dividend Equivalent Payments

Treasury Regulations issued under Section 871(m) of the Code treat certain payments to Non-U.S. Holders made pursuant to Notes that are classified as "specified equity-linked instruments" as "dividend equivalent" payments that are subject to a 30% withholding tax (or a lower rate provided by an applicable income tax treaty). These regulations generally provide that withholding may be required if payments are contingent upon or determined by reference to U.S.-source dividends (or substantially similar payments as described in the regulations). MassMutual may require Non-U.S. Holders to make certifications prior to maturity of the Notes that are specified equity linked instruments in order to avoid or minimize withholding obligations, and withhold accordingly (subject to a Non-U.S. Holder's potential right to claim a refund from the Internal Revenue Service) if such certifications were not received or were not satisfactory. If withholding is required, no Additional Amounts will be paid with respect to amounts so withheld. The rules governing dividend equivalent payments are continuing to evolve and Non-U.S. Holders should consult their tax advisors concerning the potential application of these regulations to payments received on the Notes and should read any specific disclosure regarding the treatment of dividend equivalent payments in the applicable disclosure accompanying an issue of Notes.

THE U.S. FEDERAL INCOME TAX DISCUSSION SET FORTH ABOVE IS INCLUDED FOR GENERAL INFORMATION ONLY AND MAY NOT BE APPLICABLE DEPENDING UPON A HOLDER'S PARTICULAR SITUATION. PROSPECTIVE INVESTORS ARE ADVISED TO CONSULT THEIR TAX ADVISORS REGARDING THE FEDERAL, STATE, LOCAL AND FOREIGN TAX CONSEQUENCES OF THE PURCHASE, OWNERSHIP AND DISPOSITION OF THE NOTES, AND THE POSSIBLE EFFECTS OF CHANGES IN UNITED STATES OR OTHER TAX LAWS.

EMPLOYEE BENEFIT PLAN CONSIDERATIONS

Each fiduciary of a pension, profit sharing or other employee benefit plan subject to ERISA (an "**ERISA Plan**"), should consider the fiduciary standards of ERISA in the context of the ERISA Plan's particular circumstances before authorizing an investment in the Notes. Accordingly, among other factors, the fiduciary should consider whether the investment would satisfy the prudence and diversification requirements of ERISA, would be consistent with the documents and instruments governing the ERISA Plan and would give rise to a nonexempt prohibited transaction under Section 406 of ERISA or Section 4975 of the Code.

Section 406 of ERISA and Section 4975 of the Code prohibit ERISA Plans, as well as other employee benefit plans not subject to ERISA but subject to the Code such as IRAs and Keogh plans (together with ERISA Plans, "**Plans**"), from engaging in certain transactions involving "plan assets" (within the meaning of ERISA) with persons who are "parties in interest" under ERISA or "disqualified persons" under Section 4975 of the Code with respect to such Plans (a "**Party in Interest**"). Parties in Interest that participate in a prohibited transaction may be subject to a penalty imposed under ERISA and/or an excise tax imposed pursuant to Section 4975 of the Code, unless a statutory or administrative exemption is available. These prohibited transactions generally are set forth in Section 406 of ERISA and Section 4975 of the Code.

Subject to the considerations described below, the Notes are eligible for purchase by Plans, any entity (a "**Plan Asset Entity**") whose underlying assets include "plan assets" by reason of investments in such entity by any Plans and any person investing "plan assets" of any Plan or Plan Asset Entity.

Because the acquisition or holding of a Note may be deemed to be an indirect extension of credit between an investor and MassMutual, and MassMutual may be a Party in Interest to a number of Plans, the acquisition or holding of a Note could constitute a prohibited transaction. In addition, such Parties in Interest could include, without limitation, the Initial Purchasers and the Administrative Trustee. Accordingly, any fiduciary or other Plan investor considering whether to purchase or hold the Notes should consult with its counsel regarding the availability of exemptive relief under DOL Prohibited Transaction Class Exemption ("**PTCE**") 96-23 (relating to transactions determined by "in-house asset managers"), 95-60 (relating to transactions involving insurance company general accounts), 91-38 (relating to transactions involving bank collective investment funds), 90-1 (relating to transactions involving insurance company pooled separate accounts), 84-14 (relating to transactions determined by independent "qualified professional asset managers") or the statutory exemption provided by Section 408(b)(17) of ERISA and Section 4975(d)(20) of the Code (relating to transactions for "adequate consideration" with certain parties in interest that are not fiduciaries). A purchaser or Holder of the Notes should be aware, however, that even if the conditions specified in one or more of the above-referenced exemptions are met, the scope of the exemptive relief provided by the exemption might not cover all acts, which might be construed as prohibited transactions.

Each purchaser or Holder of the Notes or any interest therein will be deemed to have represented by its purchase and holding thereof that either (i) it is not a Plan or acting on behalf of a Plan or acquiring the Notes with the assets of a Plan or (ii) the acquisition and holding of the Notes is exempt pursuant to one or more of the foregoing prohibited transaction exemptions.

Moreover, without regard to whether one of the above exemptions applies to a Plan's acquisition or holding of a Note, the Notes may not be purchased or held by any Plan, or any person investing Plan Assets of any Plan, if MassMutual, Morgan Stanley, any U.S. or European Dealer, any Initial Purchaser, the Custodian, the Depositor, the Calculation Agent, the Administrative Trustee, the Irish Paying Agent, the Listing Agent, the Indenture Trustee, Citibank N.A., or any of their respective affiliates (the "**Transaction Parties**") (a) has investment or administrative discretion with respect to the assets of the Plan used to effect such purchase; (b) has authority or responsibility to give, or gives, investment advice with respect to such assets for a fee; or (c) unless PTCE 95-60, 91-38 or 90-1 applies, is an employer maintaining or contributing to such Plan.

The DOL has promulgated a regulation, 29 C.F.R. § 2510.3-101, as modified by Section 3(42) of ERISA (the "**Plan Asset Regulation**"), describing what constitutes the assets of a Plan with respect to the Plan's investment in an entity for purposes of the fiduciary responsibility provisions of Title I of ERISA and Section 4975 of the Code. Under the Plan Asset Regulation, if a Plan invests in an "equity interest" of an entity that is neither a "publicly offered security" nor a security issued by an investment company registered under the Investment Company Act, the Plan's assets are deemed to include both the equity interest itself and an undivided interest in each of the entity's underlying assets, unless it is established that the entity is an "operating company" or that equity participation by "benefit plan investors" is not "significant." The Plan Asset Regulation provides, however, that where the value of a Plan's equity interest in an entity relates solely to identified property of the entity, such property shall be treated as the sole property of a separate entity.

The Plan Asset Regulation defines an "equity interest" as an interest other than an instrument that is treated as indebtedness under applicable local law and which has no substantial equity features. There is little pertinent authority on the issue of what constitutes an equity interest for purposes of the Plan Asset Regulation. While it is unclear whether the Notes would be treated as debt or equity for purposes of the Plan Asset Regulation, because the Holders of a Series of Notes will have recourse to only the relevant Pledged Estate that secures such Series of Notes, the Notes could be treated as equity interests, in which case, the related Funding Agreement or, if applicable, the corresponding Swaps, could be treated as assets of any Plan holding a Note.

Even if the Notes were treated as equity interests for purposes of the Plan Asset Regulation, because (a) the relevant Series Trust expects that the Funding Agreements or, if applicable, the corresponding Swaps, will be treated as debt, rather than equity, for federal tax purposes and (b) the Funding Agreements or, if applicable, the corresponding Swaps, should not be deemed to have any "substantial equity features," none of the assets underlying the Funding Agreements or Swaps should be treated as Plan Assets for purposes of the Plan Asset Regulation. Those conclusions are based, in part, upon the traditional debt features of the Funding Agreements or, if applicable, the corresponding Swaps, including the reasonable expectation of purchasers of the Notes that the payments due under the Funding Agreements or Swaps will be paid when due, as well as the absence of conversion rights, warrants and other typical equity features.

Moreover, since the Administrative Trustee has no discretionary authority with respect to the Funding Agreements or Swaps even if the Funding Agreements or, if applicable, the corresponding Swaps, are treated as assets of a Plan holding a Note, the Administrative Trustee should not be treated as having acted in a fiduciary capacity with respect to the Funding Agreements or Swaps. In addition, the treatment of the Funding Agreements or Swaps as Plan assets should not give rise to a violation of the prohibited transaction rules of ERISA or Section 4975 of the Code, provided that the prohibited transaction exemption relied upon by the purchaser of the Notes to acquire and hold the Notes also applies to the purchaser's indirect holding of an interest in the Funding Agreement or, if applicable, the corresponding Swaps.

Certain employee benefit plans may be governmental plans, church plans or foreign plans. Governmental plans, church plans and foreign plans are generally not subject to ERISA, nor do the above-described prohibited transaction provisions apply. However, any governmental, church, or foreign plan must consider applicable state, local or non-U.S. laws, if any, and the restrictions and duties of common law, if any, imposed upon such plan.

Any purchaser of the Notes or any interest therein, including in the secondary market, will be deemed to have represented that, among other things either (a) it is not (i) a Plan, subject to Section 4975 of the Code and/or ERISA, (ii) a governmental plan, a church plan or foreign plan subject to any federal, state, local, or non-U.S. law substantially similar to the provisions of Section 406 of ERISA or Section 4975 of the Code or (iii) an entity the assets of which are treated as including assets of such plans and it is not purchasing the Notes on behalf of or with assets of any such plan or entity or (b) its purchase and holding of the Notes, and the indirect holding of the Pledged Estate, is not in violation of ERISA or Section 4975 of the Code or, in the case of a governmental plan, church plan or foreign plan the laws applicable to any such plan, and that such representations shall be deemed to be made each day from the date of purchase through and including the date of disposition of the Notes. *See* "Purchase and Transfer Restrictions" herein.

In addition, each purchaser of a Note which is, or is using assets of, a Plan, will be deemed to have represented and warranted that (a) none of the Transaction Parties will be making an investment recommendation or providing investment advice on which any Plan or Plan Asset Entity (a "**Benefit Plan Investor**")or the fiduciary or other person with investment responsibilities over the assets of such Benefit Plan Investor considering an investment in a Note (the "**Plan Fiduciary**") will rely in connection with the decision to acquire such Note, and none of the Transaction Parties is acting as a fiduciary (within the meaning of Section 3(21) of ERISA or Section 4975(e)(3) of the Code) to the

Benefit Plan Investor in connection with the Benefit Plan Investor's acquisition of the Note (unless an applicable prohibited transaction exemption is available to cover the purchase or holding of such Note or the transaction is not otherwise prohibited), and (b) the Plan Fiduciary is exercising its own independent judgment in evaluating the investment in the Note. Each Plan Fiduciary considering an investment in the Notes must carefully consider the above factors before making an investment.

Notwithstanding the above, with regard to a particular Series Trust, the sale of Notes to Plans, or a person utilizing the assets of Plans, might not be allowed, or might only be allowed subject to certain additional conditions, in which case the Pricing Supplement to this Offering Memorandum will disclose the prohibition or such additional conditions.

THE EMPLOYEE BENEFIT PLAN CONSIDERATIONS SET FORTH ABOVE ARE INTENDED AS A SUMMARY ONLY AND MAY NOT BE APPLICABLE DEPENDING UPON A PLAN'S SPECIFIC FACTS AND CIRCUMSTANCES. PLAN FIDUCIARIES SHOULD CONSULT THEIR OWN ADVISORS WITH RESPECT TO THE ADVISABILITY OF AN INVESTMENT IN THE NOTES, AND POTENTIALLY ADVERSE CONSEQUENCES OF SUCH INVESTMENT, INCLUDING WITHOUT LIMITATION, THE POSSIBLE EFFECTS OF CHANGES IN APPLICABLE LAWS. THE SALE OF ANY NOTES TO A PLAN IS IN NO RESPECT A REPRESENTATION BY ANY TRANSACTION PARTY THAT SUCH INVESTMENT MEETS ALL RELEVANT LEGAL REQUIREMENTS WITH RESPECT TO INVESTMENTS BY ANY PARTICULAR PLAN OR THAT SUCH AN INVESTMENT IS APPROPRIATE FOR ANY PARTICULAR PLAN.

PLAN OF DISTRIBUTION

General

Each Series of Notes will be purchased from the relevant Series Trust pursuant to the terms and conditions of the Purchase Agreement and the Series Trust Consent Letter to the Purchase Agreement to be executed by and between the Trust, with respect to the Series Trust, and the Initial Purchasers. The Initial Purchasers will be named in the Pricing Supplement relating to such Series of Notes. Morgan Stanley & Co. LLC and Morgan Stanley & Co. International plc may be among the Initial Purchasers. The Purchase Agreement makes provision for the resignation or termination of appointment of existing Initial Purchasers and for the appointment of additional or other Initial Purchasers either generally in respect of the Program or in relation to a particular tranche of Notes.

Each Series Trust may sell the Notes of any Series to an Initial Purchaser as principal for its own account at discounts to be agreed upon at the time of sale. That Initial Purchaser may resell the Notes to investors and other purchasers at a fixed offering price or at prevailing market prices, or prices related thereto at the time of resale or otherwise, as that Initial Purchaser determines and as will be specified in the applicable Pricing Supplement. An Initial Purchaser may offer the Notes it has purchased as principal to other dealers. That Initial Purchaser may sell the Notes to any dealer at a discount and the discount allowed to any dealer will not be in excess of the discount that Initial Purchaser will receive from each Series Trust. After the initial offering of Notes that an Initial Purchaser is to resell on a fixed offering price basis, the Initial Purchaser may change the offering price, concession and discount. To the extent the Initial Purchasers buy the Notes of any Series as principal, one or more of such Initial Purchasers may be entitled in certain circumstances to be released and discharged from their obligations under the Purchase Agreement prior to the closing of such Series of Notes.

MassMutual will agree to indemnify the several Initial Purchasers against certain liabilities, including liabilities under the Securities Act, or to contribute payments made in respect of those liabilities. MassMutual will also agree to reimburse the Initial Purchasers for specified expenses.

In connection with any offering of the Notes, the Initial Purchasers may engage in transactions that stabilize the market price of the Notes. Such transactions consist of bids or purchases to peg, fix or maintain the price of the Notes. If the Initial Purchasers create a short position in the Notes in connection with the offering (*e.g.*, if they sell more Notes than are listed on the cover page of the applicable Pricing Supplement), the Initial Purchasers may reduce that short position by purchasing Notes in the open market. Purchases of a security to stabilize the price or to reduce a short position may cause the price of the security to be higher than it might be in the absence of those purchases.

Neither the Trust nor any of the Initial Purchasers makes any representation or prediction as to the direction or magnitude of any effect that the transactions described above may have on the price of the Notes. In addition, neither the Trust nor any of the Initial Purchasers makes any representation that the Initial Purchasers will engage in these transactions or that these transactions, once commenced, will not be discontinued without notice.

The Notes may be listed on Euronext Dublin or any other exchange, or the Notes may not be listed on any exchange. None of the Initial Purchasers is under any obligation to make a market in the Notes and, to the extent that such market making is commenced by any Initial Purchasers, it may be discontinued at any time. Given the restrictions on and risks related to transfer, there is no assurance that a secondary market will develop or, if it does develop, that it will provide Noteholders with liquidity or that it will be sustained. Prospective investors should proceed on the assumption that they may have to bear the economic risk of an investment in the Notes until the maturity date of such Notes. In the ordinary course of their respective businesses, the Initial Purchasers and their affiliates may have in the past performed and may perform, from time to time in the future, certain investment banking, commercial banking and financial advisory services for MassMutual and/or its affiliates.

With respect to offers and sales outside the U.S., each Initial Purchaser will comply (to the best of its knowledge) with all applicable laws and regulations in each country or jurisdiction in or from which it purchases, offers, sells or delivers Notes or has in its possession or distributes such offering material, in all cases at their own expense.

With respect to any Series of Notes as to which Citigroup Global Markets Inc. or Citigroup Global Markets Limited will serve as an Initial Purchaser, an eligible and unaffiliated entity will be appointed to serve as Indenture Trustee instead of Citibank, N.A.

The initial purchasers may engage in transactions with, or perform services for the Trust or MassMutual in the ordinary course of business. Some of the initial purchasers or their affiliates have, directly or indirectly, performed investment and/or commercial banking or financial advisory services for the Trust, MassMutual or its affiliates, for which they have received customary fees and commissions, and they may provide these services to the Trust, MassMutual and its affiliates in the future, for which they may receive customary fees and commissions.

In addition, in the ordinary course of their various business activities, the Initial Purchasers and certain of their affiliates may make or hold a broad array of investments and actively trade debt and equity securities (or related derivative securities) and financial instruments (including bank loans) for their own account and for the accounts of their customers, and such investments and securities activities may involve securities and/or instruments of the Trust, MassMutual or its affiliates. If the Initial Purchasers or their affiliates have a lending relationship with the Trust, MassMutual or its affiliates, certain of those Initial Purchasers or their affiliates may hedge, their credit exposure to MassMutual consistent with their customary risk management policies. Typically, the Initial Purchasers and their affiliates would hedge such exposure by entering into transactions that consist of either the purchase of credit default swaps or the creation of short positions in the Trust, MassMutual or its affiliate's securities, including potentially the Notes. Any such credit default swaps or short positions could adversely affect future trading prices of the Notes. The Initial Purchasers and certain of their affiliates may also communicate independent investment recommendations, market color or trading ideas and/or publish or express independent research views in respect of such securities or instruments and may at any time hold, or recommend to clients that they acquire, long and/or short positions in such securities and instruments.

United States of America

The Initial Purchasers will offer the Notes for resale in transactions not requiring registration under the Securities Act or applicable state securities laws, including sales pursuant to Rule 144A under the Securities Act. The Initial Purchasers have agreed to not offer or sell the Notes except (a) to persons they reasonably believe to be Qualified Institutional Buyers or (b) pursuant to offers and sales to non-U.S. Persons that occur outside the U.S. within the meaning of Regulation S. Notes sold pursuant to Regulation S may not be offered or resold in the U.S. or to U.S. Persons (as defined in Regulation S) until the Release Date, and thereafter such Notes may only be resold in the U.S. to Qualified Institutional Buyers or institutional investors that are "accredited investors" within the meaning of rule 501(a) under the Securities Act or to non-U.S. Persons, in each case pursuant to an exemption from the registration requirements of the Securities Act. The Notes will initially be offered at the price indicated in the relevant Pricing Supplement. After the initial offering of the Notes, the offering price and other selling terms of the Notes may from time to time be varied by the Initial Purchasers.

United Kingdom

Each Initial Purchaser has represented and agreed, and each further Initial Purchaser appointed under the Program will be required to represent and agree, that:

(a) in relation to any Notes which have a maturity of less than one year, (i) it is a person whose ordinary activities involve it in acquiring, holding, managing or disposing of investments (as principal or as agent) for the purposes of its business and (ii) it has not offered or sold and will not offer or sell any Notes other than to persons whose ordinary activities involve them in acquiring, holding, managing or disposing of investments (as principal or as agent) for the purposes of their businesses or who it is reasonable to expect will acquire, hold, manage or dispose of investments (as principal or as agent) for the purposes of their businesses where the issue of the Notes would otherwise constitute a contravention of Section 19 of the Financial Services and Markets Act 2000 ("**FSMA**") by the Trust or any Series Trust;

(b) it has only communicated or caused to be communicated and will only communicate or cause to be communicated an invitation or inducement to engage in investment activity (within the meaning of Section 21 of the FSMA) received by it in connection with the issue or sale of any Notes in circumstances in which Section 21(1) of the FSMA does not apply to the Trust or any Series Trust; and

(c) it has complied and will comply with all applicable provisions of the FSMA with respect to anything done by it in relation to any Notes in, from or otherwise involving the United Kingdom.

Japan

Each Initial Purchaser understands that the Notes have not been and will not be registered under the Financial Instruments and Exchange Act of Japan (Act No. 25 of 1948, as amended) and, accordingly, such Initial Purchaser has represented and agreed, and each further Initial Purchaser appointed under the Program will be required to represent and agree, that it will not offer or sell any Notes, which are denominated in yen or any other currency, directly or indirectly, in Japan, or for the benefit of any Japanese Person or to others for re-offering or resale, directly or indirectly, in Japan or to any Japanese Person except in compliance with all applicable laws, regulations and ministerial guidelines promulgated by relevant Japanese governmental or regulatory authorities in effect at the relevant time. For the purposes of this paragraph, "**Japanese Person**" shall mean any person resident in Japan, as defined under Item 5, Paragraph 1, Article 6 of the Foreign Exchange and Foreign Trade Act (Act No. 228 of 1949 as amended).

Prohibition of Sales to EEA Retail Investors

Each Initial Purchaser has represented and agreed, and each further Initial Purchaser appointed under the Program will be required to represent and agree, that, in respect of any offer of Notes, it has not offered, sold or otherwise made available and will not offer, sell or otherwise make available any Notes which are the subject of the offering contemplated by this Offering Memorandum as contemplated by the relevant Pricing Supplement to any retail investor in the EEA. For purposes of this provision, the expression "retail investor" means a person who is one (or more) of the following:

(a) a retail client as defined in point (11) of Article 4(1) of MiFID II; or

(b) a customer within the meaning of the Insurance Distribution Directive, where that customer would not qualify as a professional client as defined in point (10) of Article 4(1) of MiFID II.

The Republic of France

Each of the Initial Purchasers and the Trust has represented and agreed, or will represent or agree that:

(a) Offer to the public in France:
it has only made and will only make an offer of Notes to the public (*appel public à l'épargne*) in France in the period beginning (i) when a prospectus in relation to those Notes has been approved by the *Autorité des marchés financiers* ("**AMF**"), on the date of such publication, or (ii) when a prospectus has been approved by the competent authority of another member State of the EEA, which has implemented the Prospectus Directive on the date of notification of such approval to the AMF, and ending at the latest on the date, which is 12 months after the date of approval of this Offering Memorandum, all in accordance with articles L.412-1 and L.621-8 of the French *Code monétaire et financier and the Règlement général* of the AMF; or

(b) Private placement in France:
in connection with the initial distribution of the Notes, it has not offered or sold and will not offer or sell, directly or indirectly, Notes to the public in France, and has not distributed or caused to be distributed and will not distribute or cause to be distributed to the public in France, this Offering Memorandum, the relevant Pricing Supplement or any other offering material relating to the Notes, and that such offers, sales and distributions have been and will be made in France only to (i) providers of investment services relating to portfolio management for the account of third parties, (ii) qualified investors (*investisseurs qualifiés*) and/or (iii) a restricted group of investors (*cercle restraint d'investisseurs*), all as defined in, and in accordance with, articles L.411-1, L.411-2, D.411-1, D.411-2 and D. 411-3 of the French *Code monétaire et financier*.

The Netherlands

Each Initial Purchaser has represented and agreed that it has not, directly or indirectly, offered or sold and will not, directly or indirectly, offer or sell in The Netherlands any Notes other than (a) Notes with a minimum denomination of €100,000 (or its foreign currency equivalent), which Notes are fully paid up at their issuance, (b) to persons who trade or invest in securities in the conduct of a profession or business (which include banks, stockbrokers, insurance companies, pension funds, other institutional investors and finance companies and treasury departments of large enterprises) or (c) in circumstances where one of the exceptions to or exemptions from the prohibitions contained in article 3 of the Securities Transactions Supervision Act 1995 ("**Wet toezicht effectenverkeer 1995**") is applicable and the conditions attached to such exemption or exception are complied with.

Switzerland

Each Initial Purchaser has represented and agreed, and each further Initial Purchaser appointed under the Program will be required to represent and agree, that the Notes may not and will not be publicly offered, distributed or re-distributed in the Swiss Confederation ("**Switzerland**"), and neither this Offering Memorandum nor any other solicitation for investments in the Notes may be communicated, or distributed in Switzerland in any way that could constitute a public offering within the meaning of Articles 11 56 or 652a of the Swiss Code of Obligations or of Article 2 paragraph 4 and Article 3 of the Federal Act on Collective Investment Schemes of 23 June 2006. This Offering Memorandum may not be copied, reproduced, distributed or passed on to others without the prior written consent of the relevant Initial Purchaser. This Offering Memorandum is not a prospectus within the meaning of Articles 11, 56 and 652a of the Swiss Code of Obligations and may not comply with the information standards required thereunder. The Trust or any Series Trust will not apply for a listing of the Notes on any Swiss stock exchange or other Swiss regulated market, and this Offering Memorandum may not comply with the information required under the relevant listing rules. The Notes have not and will not be registered with the Swiss Federal Banking Commission and have not and will not be authorized under the Federal Act on Collective Investment Schemes of 23 June 2006. The protection afforded to investors in collective investment schemes certificated by the Federal Act on Collective Investment Schemes of 23 June 2006 does not extend to acquirers of the Notes.

Ireland

Each Initial Purchaser has agreed and each further Initial Purchaser appointed under the Program will be required to agree that:

(a) it will not underwrite the issue of, or place the Notes, otherwise than in conformity with the provisions of the European Communities (Markets in Financial Instruments) Regulations 2007 (Nos. 1 to 3) (as amended) including, without limitation, Regulations 7 and 152 thereof or any codes of conduct issued in connection therewith, and the provisions of the Investor Compensation Act 1998;

(b) it will not underwrite the issue of, or place, the Notes, otherwise than in conformity with the provisions of the Irish Central Bank Acts 1942 to 2011 (as amended) and any codes of conduct rules made under Section 117(1) of the Central Bank Act 1989;

(c) it will not underwrite the issue of, place or otherwise act in Ireland in respect of the Notes, otherwise than in conformity with the provisions of the Market Abuse (Directive 2003/6/EC) Irish Regulations 2005 (as amended) and any rules issued by the Central Bank) pursuant thereto;

(d) it will not underwrite the issue of, or place the Notes, otherwise than in conformity with the provisions of the Prospectus (Directive 2003/71/EC) Regulations 2005 (as amended) and any rules issued under Section 51 of the Irish Investment Funds, Companies and Miscellaneous Provisions Act 2005 by the Central Bank; and

(e) no Notes will be offered or sold with a maturity of less than 12 months except in full compliance with Notice BSD C 01/02 issued by the Central Bank.

The Federal Republic of Germany

Each Initial Purchaser has agreed that it shall not offer or sell the Notes in the Federal Republic of Germany other than in compliance with the German Securities Prospectus Act (*Wertpapierprospektgesetz*), the German Securities Sales Prospectus Act (*Wertpapier-Verkaufsprospektgesetz*) and the German Investment Act

(*Investmentgesetz*), respectively, and any other laws and regulations applicable in the Federal Republic of Germany governing the issue, the offering and the sale of securities.

The Notes may neither be nor intended to be distributed by way of public offering, public advertisement or in a similar manner within the meaning of section 2 no. 4 and section 3 (1) of the German Securities Prospectus Act (*Wertpapierprospektgesetz*), section 8f (1) of the German Securities Sales Prospectus Act (*Wertpapier-Verkaufsprospektgesetz*) and sections 1 and 2 (11) of the German Investment Act (*Investmentgesetz*), nor shall the distribution of this Offering Memorandum or any other document relating to the Notes constitute such public offer.

The distribution of the Notes has not been notified, and the Notes are not registered or authorized for public distribution, in the Federal Republic of Germany under the German Securities Prospectus Act (*Wertpapierprospektgesetz*) or the German Investment Act (*Investmentgesetz*). Accordingly, this Offering Memorandum has not been filed or deposited with the German Federal Financial Supervisory Authority (*Bundesanstalt fuer Finanzdienstleistungsaufsicht - BaFin*).

Republic of Italy

The offering of the Notes has not been registered pursuant to Italian securities legislation and, accordingly, each of the Initial Purchasers has represented, warranted and agreed, and each of the additional Initial Purchasers appointed under the Program will represent, warrant and agree, that it has not offered or sold, and will not offer or sell, any Notes in the Republic of Italy in a solicitation to the public, and that sales of the Notes in the Republic of Italy shall be effected in accordance with all Italian securities, tax, exchange control and other applicable laws and regulations.

Each Initial Purchaser has also represented, warranted and agreed, and each of the additional Initial Purchaser appointed under the Program will represent, warrant and agree, that it has not offered, sold or delivered and will not offer, sell or deliver any Notes or distribute or make available copies of this Offering Memorandum or any other material relating to the Notes in the Republic of Italy except: (a) to "Professional Investors" as defined in Article 31.2 of CONSOB Regulation No. 11522 of 1 July 1998, as amended ("**Regulation No. 11522**"), pursuant to articles 30(2) and 100 of Legislative Decree No. 58 of 24 February 1998, as amended (the "**Consolidated Financial Law**"), or (b) in any other circumstances where an express exemption from compliance with the solicitation restrictions applies, as provided under the Consolidated Financial Law or Regulation 11971 of 14 May 1999, as amended.

Any such offer, sale or delivery of Notes or distribution of copies of this Offering Memorandum or any other material relating to the Notes in the Republic of Italy must be:

(a) made by investment firms, banks or financial intermediaries permitted to conduct such activities in the Republic of Italy in accordance with the Legislative Decree No. 385 of 1 September 1992, as amended, the Consolidated Financial Law, Regulation No. 11522 and any other applicable laws and regulations;
(b) in compliance with any other applicable notification requirement or limitation, which may be imposed by CONSOB or the Bank of Italy.

Cayman Islands

Each Initial Purchaser has represented and agreed that no invitation will be made to the public in the Cayman Islands to purchase any Notes, whether directly or indirectly, unless the Notes are listed on the Cayman Islands Stock Exchange. No offering materials relating to the Notes have been, and none may be, distributed in the Cayman Islands in contravention of the laws of the Cayman Islands or any governmental entity therein.

Canada

The Notes are not being offered and may not be sold to any purchaser in a province or territory of Canada other than the provinces of Alberta, British Columbia, Nova Scotia, New Brunswick, Ontario, Prince Edward Island and Quebec.

The Notes may be sold only to purchasers purchasing, or deemed to be purchasing, as principal that are accredited investors, as defined in National Instrument 45-106 *Prospectus Exemptions* or subsection 73.3(1) of the *Securities Act* (Ontario), and are permitted clients, as defined in National Instrument 31-103 *Registration Requirements, Exemptions and Ongoing Registrant Obligations*. Any resale of the Notes must be made in accordance with an exemption from, or in a transaction not subject to, the prospectus requirements of applicable securities laws.

Securities legislation in certain provinces or territories of Canada may provide a purchaser with remedies for rescission or damages if this Offering Memorandum (including any amendment hereto) contains a misrepresentation, provided that the remedies for rescission or damages are exercised by the purchaser within the time limit prescribed by the securities legislation of the purchaser's province or territory. The purchaser should refer to any applicable provisions of the securities legislation of the purchaser's province or territory for particulars of these rights or consult with a legal advisor.

Pursuant to section 3A.3 of National Instrument 33-105 *Underwriting Conflicts* ("**NI 33-105**"), the Initial Purchasers are not required to comply with the disclosure requirements of NI 33-105 regarding underwriter conflicts of interest in connection with this offering.

Singapore

Each Initital Purchaser has represented, warranted and agreed that the Notes may not be offered or sold, or be made the subject of an invitation for subscription or purchase, whether directly or indirectly, to persons in Singapore other than (i) to an institutional investor under Section 274 of the SFA, (ii) to a relevant person, or any person pursuant to Section 275(1A), and in accordance with the conditions, specified in Section 275 of the SFA or (iii) otherwise pursuant to, and in accordance with the conditions of, any other applicable provisions of the SFA. Such Initial Purchaser further agrees that where the notes are subscribed or purchased under Section 275 of the SFA by a relevant person which is: (a) a corporation (which is not an accredited investor) the sole business of which is to hold investments and the entire share capital of which is owned by one or more individuals, each of whom is an accredited investor; or (b) a trust (where the trustee is not an accredited investor) whose sole purpose is to hold investments and each beneficiary is an accredited investor, shares, debentures and units of shares and debentures of that corporation or the beneficiaries' rights and interest in that trust shall not be transferable for 6 months after that corporation or that trust has acquired the notes under Section 275 except:

(i) to an institutional investor under Section 274 of the SFA or to a relevant person, or any person pursuant to Section 275(1A), and in accordance with the conditions, specified in Section 275 of the SFA;

(ii) where no consideration is given for the transfer; or

(iii) by operation of law.

Solely for the purposes of its obligations pursuant to Sections 309B(1)(a) and 309B(1)(c) of the SFA, the Trust has determined, and hereby notifies all relevant persons (as defined in Section 309A of the SFA) that all Notes to be issued under the Program are "prescribed capital markets products" (as defined in the Securities and Futures (Capital Markets Products) Regulations 2018) and Excluded Investment Products (as defined in MAS Notice SFA 04-N12: Notice on the Sale of Investment Products and MAS Notice FAA-N16: Notice on Recommendations on Investment Products).

Hong Kong

Each Initial Purchaser has represented, warranted and agreed, and each further Initial Purchaser appointed under the Program will be required to represent, warrant and agree, that:

(i) This Offering Memorandum has not been reviewed or approved by the Securities and Futures Commission or the Companies Registry of Hong Kong and, accordingly, the Notes may not be offered or sold by means of any document other than (a) in circumstances which do not constitute an offer to the public within the meaning of the Companies Ordinance (Cap.32, Laws of Hong Kong) or the Securities and Futures Ordinance (Cap. 571), (b) in other circumstances which do not result in the document being a "prospectus" within the meaning of the Companies Ordinance (Cap.32, Laws of Hong Kong) or (c) to "professional investors" within the meaning of the Securities and Futures Ordinance (Cap.571, Laws of Hong Kong) and any rules made thereunder.

(ii) No advertisement, invitation or document relating to the Notes may be issued or may be in the possession of any person for the purpose of issue (in each case whether in Hong Kong or elsewhere), which is directed at, or the contents of which are likely to be accessed or read by, the public in Hong Kong (except if permitted to do so under the laws of Hong Kong) other than with respect to Notes which are or are intended to be disposed of only to persons outside Hong Kong or only to "professional investors" within the meaning of the Securities and Futures Ordinance (Cap. 571, Laws of Hong Kong) and any rules made thereunder.

PURCHASE AND TRANSFER RESTRICTIONS

Other than with respect to the listing of certain Notes on the relevant stock exchange as may be specified in the relevant Pricing Supplement, no action has been or will be taken in any country or jurisdiction by the Series Trust or the Initial Purchasers that would permit a public offering of Notes, or possession or distribution of any offering material in relation thereto, in any country or jurisdiction where action for that purpose is required. Persons into whose hands this Offering Memorandum or any Pricing Supplement comes are required by the Series Trust and the Initial Purchasers to comply with all applicable laws and regulations, including anti-money laundering rules, applicable to the issuance and sale of securities in each country or jurisdiction in or from which they purchase, offer, sell or deliver Notes or have in their possession or distribute such offering material, in all cases at their own expense.

The Purchase Agreement provides that the Initial Purchasers shall not be bound by any of the restrictions relating to any specific jurisdiction (set out above) to the extent that such restrictions shall, as a result of change(s) in, or change(s) in official interpretation of, after the date hereof, applicable laws and regulations, no longer be applicable but without prejudice to the obligations of the Initial Purchasers described in "Plan of Distribution – General."

Each purchaser of a beneficial interest in the Notes will be deemed to have represented, warranted and agreed that it understands that:

- The Notes have not been and will not be registered under the Securities Act or any state or foreign securities laws and may not be offered, sold, pledged or otherwise transferred except in accordance with applicable securities laws and the following provisions.

- Neither the Trust nor the Series Trust has been or will be registered as an investment company under the Investment Company Act, as amended.

- The Notes may not be transferred to, acquired or held by, or acquired with the "plan assets" of, any Plan or other Plan Asset Entity (each as defined under "Employee Benefit Plan Considerations"), any governmental plan, church plan, foreign plan or any entity the assets of which are treated as including the assets of a governmental plan, a church plan or foreign plan unless the purchase, holding and disposition of the Notes, and the indirect holding of the relevant Pledged Estate, by or on behalf of such plan or account is (a) in the case of a Plan or Plan Asset Entity, exempt from the prohibited transaction provisions of Section 406 of ERISA and Section 4975 of the Code under PTCE 96-23, PTCE 95-60, PTCE 91-38, PTCE 90-1, PTCE 84-14, Section 408(b)(17) of ERISA or Section 4975(d)(20) of the Code, or another applicable exemption, or (b) in the case of a governmental plan, church plan, foreign plan or entity including the assets of such a plan, is not in violation of the laws applicable to any such governmental plan, church plan or foreign plan. This representation shall be deemed made on each day from the date on which the purchaser acquires the Notes through and including the date on which the purchaser disposes of the Notes.

- Unless the Series Trust determines otherwise in accordance with applicable law, certificates representing the Notes will bear a legend reflecting these representations and agreements.

For 40 days following the distribution of the Notes, certificates representing Notes sold pursuant to Regulation S will have legends regarding agreements of purchasers to the following effect:

- If, prior to 40 days after the distribution of the Notes is complete, the purchaser decides to offer, sell, pledge or otherwise transfer such Notes, such Notes may be offered, sold, pledged or otherwise transferred only (a)(i) in an offshore transaction in accordance with Rule 903 or Rule 904 of Regulation S or (ii) in compliance with Rule 144A under the Securities Act to an institutional buyer that the seller reasonably believes is a Qualified Institutional Buyer within the meaning of Rule 144A purchasing for its own account or for the account of a Qualified Institutional Buyer, whom the seller has informed that the resale or transfer is being made in reliance on Rule 144A, and (b) in accordance with all applicable securities laws of the states of the U.S.

In addition, each purchaser of a beneficial interest in Notes sold pursuant to Rule 144A will be deemed to have represented, warranted and agreed that:

- If it should sell or transfer the Notes it will only do so in compliance with the Securities Act and other applicable laws and only (i) in compliance with Rule 144A to an institutional investor that the seller reasonably believes is a Qualified Institutional Buyer within the meaning of Rule 144A purchasing for its own account or for the account of a Qualified Institutional Buyer, whom the seller has informed, in each case, that the resale or transfer is being made in reliance on Rule 144A, (ii) in an off-shore transaction in accordance with Rule 903 or 904 of Regulation S under the Securities Act or (iii) pursuant to any other exemption from the registration requirements of the Securities Act, subject to the receipt by the Series Trust or the Indenture Trustee of an opinion of counsel or such other evidence, which they may reasonably require that such resale or transfer is in compliance with the Securities Act.

- It is a Qualified Institutional Buyer within the meaning of Rule 144A and it is acquiring such Notes for its own account or for the account of a Qualified Institutional Buyer; it is aware, and each beneficial owner of such Notes has been advised, that the sale of such Notes to it is being made in reliance on Rule 144A.

- It acknowledges that the Series Trust, the Initial Purchasers and their affiliates and others will rely upon the truth and accuracy of the foregoing acknowledgments, representations and agreements.

- If it is acquiring any Notes for the account of one or more Qualified Institutional Buyers, it has sole investment discretion with respect to each such account and that it has full power to make the foregoing acknowledgments, representations, and agreements on behalf of each such account.

LEGAL MATTERS

Certain matters will be passed on for MassMutual, the Trust and the relevant Series Trusts by Sidley.

Certain insurance regulatory matters will be passed on for the Initial Purchasers by Sidley.

Certain matters will be passed on for the Trust and the relevant Series Trusts by Richards, Layton & Finger (as to Delaware law).

Certain matters regarding the Funding Agreements and corresponding Swaps, if any, will be passed on for MassMutual by Jaime Genua, Head of Corporate Law of MassMutual (as to Massachusetts law).

Certain matters will be passed on for the Initial Purchasers by Pillsbury Winthrop Shaw Pittman LLP.

GENERAL INFORMATION

Irish Listing

Application has been made to Euronext Dublin for any Notes issued during the period of 12 months from the date of this Offering Memorandum to be admitted to the Official List and trading on the GEM. However, Notes may also be (i) listed on a securities exchange, which is not a regulated market, or (ii) not listed on any regulated market or any other securities exchange. However, neither MassMutual nor any Trust is under any obligation to maintain the listing of any Notes that are listed.

If European or national legislation is adopted and is implemented or takes effect in Ireland in a manner that would require the Trust and/or MassMutual to publish or produce its financial statements according to accounting principles or standards that are different from, in the case of the Trust, U.S. GAAP or, in the case of MassMutual, SAP, or that would otherwise impose requirements on the Trust that the Trust in good faith determines are not reasonable, the Trust may de-list any Notes admitted to trading on Euronext Dublin. The Trust will use its reasonable best efforts to obtain an alternative admission to listing, trading and/or quotation for the Notes by another listing authority, exchange and/or system, within or outside the EU, as it may decide. If such an alternative admission is not available to the Trust or, in the opinion of the Trust, cannot reasonably be effected or maintained, an alternative admission may not be obtained. Notice of any de-listing and/or alternative admission will be given as described in the "Description of the Notes."

Authorizations

The establishment of, and the Trust's ongoing activities under, the Program were authorized by the Trust on December 10, 2001. The August 26, 2004 update of the Program increased the Program size from USD 3,000,000,000 to USD 5,000,000,000. The increase in the Program amount to USD 5,000,000,000 was authorized by the Trust on August 26, 2004. The November 27, 2007 update of the Program increased the Program size from USD 5,000,000,000 to USD 8,000,000,000. The June 9, 2011 update of the Program increased the Program size from USD 8,000,000,000 to USD 12,000,000,000. The June 3, 2014 update of the Program increased the Program size from USD 12,000,000,000 to USD 17,000,000,000. The May 31, 2018 update of the Program increased the Program size from USD 17,000,000,000 to USD 21,000,000,000. The Trust will verify that each Series Trust has respected all resolutions, authorizations and approval of the legal authority of the Trust. MassMutual is authorized to issue the Funding Agreements contemplated under the Program and to enter into and guarantee the payments to the relevant Series Trust under Swaps pursuant to the authority delegated to designated officers of MassMutual by the Rules and Regulations of the board of directors.

Litigation

The Trust is not and has not been involved in any governmental, legal or arbitration proceedings (including any such proceedings, which are pending or threatened of which the Trust is aware) in the 12 months preceding the date of this Offering Memorandum, which may have or have in such period had a significant effect on the financial position or profitability of the Trust. Except as disclosed in this Offering Memorandum (*See* "Business of MassMutual – Legal Proceedings") or in MassMutual's Statutory Financial Statements, there have been no legal, governmental or arbitration proceedings in the last 12 months preceding the date of this Offering Memorandum, which may have, or have had, a significant effect on the financial position or profitability of MassMutual.

No Material Change

There has been no material adverse change in the prospects of MassMutual since its last published audited financial statements and no material adverse change in the prospects of the Trust since its creation and formation. There has been no significant change in the financial or trading position of MassMutual or the Trust since the interim financial information has been published.

Notices

All notices shall be deemed to have been given upon (a) the mailing by first class mail, postage prepaid, of such notices to each Holder of the Registered Notes of any Series at their registered addresses as recorded in the register of Notes for such Series, and (b) so long as any Registered Notes of a Series Trust are listed on Euronext Dublin and it is required by the rules of Euronext Dublin, publication of such notice to each Holder of the Notes of such Series Trust in English in a leading newspaper having general circulation in Ireland (which is expected to be the *Irish Times*) or, if such publication is not practicable, in one other leading English language daily newspaper with general circulation in Europe, such newspaper being published on each business day in morning editions, whether or not it shall be published in Saturday, Sunday or holiday editions.

Independent Auditors

The Statutory Financial Statements of MassMutual as of December 31, 2018 and 2017 and for the years ended December 31, 2018, 2017 and 2016 have been audited by KPMG LLP, 755 Main Street, Hartford, Connecticut 06103, independent auditors, as stated in their report appearing herein.

KPMG LLP is a member firm of the American Institute of Certified Public Accountants (AICPA).

Clearing Systems

The Notes to be sold outside the U.S. in reliance on Regulation S have been accepted for clearance through Euroclear and Clearstream. The appropriate common code and the International Securities Identification Number ("**ISIN**") in relation to the Notes of each Series will be specified in the Pricing Supplement relating thereto. In addition, the Series Trust made an application with respect to the Notes to be accepted for trading in book-entry form by DTC. The CUSIP numbers for each Series of Registered Notes, together with the relevant ISIN and common code, will be specified in the relevant Pricing Supplement. The relevant Pricing Supplement shall specify any other clearing system as shall have accepted the relevant Notes for clearance together with any further appropriate information.

Legal Entity Identifier

The Legal Entity Identifier for the Trust is 549300K1IE3K7YU6VG29.

FORM OF PRICING SUPPLEMENT

NO PROSPECTUS IS REQUIRED IN ACCORDANCE WITH DIRECTIVE 2003/71/EC FOR THE ISSUE OF NOTES DESCRIBED BELOW

PROHIBITION OF SALES TO EEA RETAIL INVESTORS – The Notes are not intended to be offered, sold or otherwise made available to and should not be offered, sold or otherwise made available to any retail investor in the EEA. For these purposes, a retail investor means a person who is one (or more) of: (i) a retail client as defined in point (11) of Article 4(1) of Directive 2014/65/EU, as amended ("MiFID II"); or (ii) a customer within the meaning of Directive (EU) 2016/97 (the "**Insurance Distribution Directive**"), as amended or superseded, where that customer would not qualify as a professional client as defined in point (10) of Article 4(1) of MiFID II. Consequently no key information document required by Regulation (EU) No 1286/2014, as amended (the "**PRIIPs Regulation**") for offering or selling the Notes or otherwise making them available to retail investors in the EEA has been prepared and therefore offering or selling the Notes or otherwise making them available to any retail investor in the EEA may be unlawful under the PRIIPs Regulation. This Pricing Supplement is not a prospectus for the purposes of Directive 2003/71/EC, as amended or superseded.

[**MiFID II product governance / target market** – Solely for the purpose of [the/each] manufacturer's product approval process, the target market assessment in respect of the Notes has led to the conclusion that: (i) the target market for the Notes is eligible counterparties and professional clients only, each as defined in Directive 2014/65/EU (as amended, "**MiFID II**"); and (ii) all channels for distribution of the Notes to eligible counterparties and professional clients are appropriate. [Consider any negative target market.] Any person subsequently offering, selling or recommending the Notes (a "**distributor**") should take into consideration the manufacturer['s/s'] target market assessment; however, a distributor subject to MiFID II is responsible for undertaking its own target market assessment in respect of the Notes (by either adopting or refining the manufacturer['s/s'] target market assessment) and determining appropriate distribution channels.]]

[**For Singapore residents only:** The notes may not be offered or sold, or be made the subject of an invitation for subscription or purchase, whether directly or indirectly, to persons in Singapore other than (i) to an institutional investor under Section 274 of the Securities and Futures Act, Chapter 289 of Singapore (the "**SFA**"), (ii) to a relevant person, or any person pursuant to Section 275(1A), and in accordance with the conditions, specified in Section 275 of the SFA or (iii) otherwise pursuant to, and in accordance with the conditions of, any other applicable provisions of the SFA. Where the notes are subscribed or purchased under Section 275 of the SFA by a relevant person which is: (a) a corporation (which is not an accredited investor) the sole business of which is to hold investments and the entire share capital of which is owned by one or more individuals, each of whom is an accredited investor; or (b) a trust (where the trustee is not an accredited investor) whose sole purpose is to hold investments and each beneficiary is an accredited investor, shares, debentures and units of shares and debentures of that corporation or the beneficiaries' rights and interest in that trust shall not be transferable for 6 months after that corporation or that trust has acquired the notes under Section 275 except:

(i) to an institutional investor under Section 274 of the SFA or to a relevant person, or any person pursuant to Section 275(1A), and in accordance with the conditions, specified in Section 275 of the SFA;

(ii) where no consideration is given for the transfer; or

(iii) by operation of law.

Solely for the purposes of its obligations pursuant to Sections 309B(1)(a) and 309B(1)(c) of the SFA, the Trust has determined, and hereby notifies all relevant persons (as defined in Section 309A of the SFA) that all Notes to be issued under the Program are "prescribed capital markets products" (as defined in the Securities and Futures (Capital Markets Products) Regulations 2018) and Excluded Investment Products (as defined in MAS Notice SFA 04-N12: Notice on the Sale of Investment Products and MAS Notice FAA-N16: Notice on Recommendations on Investment Products).]

Pricing Supplement No. [ ] dated [ ]

Series No.: [ ]-[ ]

$21,000,000,000 Global Funding Program

MassMutual Global Funding II
[ ] [Floating Rate/%] Notes due [ ] secured by Funding Agreement No. issued by

Massachusetts Mutual Life
Insurance Company

[and the rights of the Series Trust in and to that certain Swap transaction to be entered into with [Swap Counterparty]]

[This document constitutes the Pricing Supplement of the Notes described herein and must be read in conjunction with the accompanying Offering Memorandum dated June 11, 2019 [as supplemented by the [ ] dated[ ]](such Offering Memorandum, the "**Offering Memorandum**"), relating to the $21,000,000,000 global funding program of MassMutual Global Funding II, and full information on MassMutual Global Funding II and the offer of the Notes is only available on the basis of the combination of the Offering Memorandum and this Pricing Supplement. Terms used herein will have the meaning ascribed to them in the Offering Memorandum. Euronext Dublin has approved the Offering Memorandum dated June 11, 2019. The Offering Memorandum will be published on the website of Euronext Dublin at www.ise.ie.]

PROVISIONS RELATING TO NOTES

Issuer:	MassMutual Global Funding II (the "**Trust**")
Legal Entity Identifier:	549300K1IE3K7YU6VG29
Funding Agreement Provider:	Massachusetts Mutual Life Insurance Company ("**MassMutual**")
Swap Counterparty	[MassMutual acting on behalf of [the General Account/the Guaranteed Separate Account]][Not Applicable] Registered address [ ]
Series Number:	[ ]-[ ]
Tranche Number:	[ ]
Principal Amount:	[ ]
Issue Price:	[ ]% of Principal Amount
Proceeds to Series Trust:	[ ]
Issue Date:	[ ]
Interest Commencement Date (if different from Issue Date):	[Not Applicable] [ ]

Maturity Date:	[ ]
Closing Date:	[ ]
Specified Currency or Currencies:	[ ]
Authorized Denominations:	[ ] and integral multiples of [ ] in excess thereof
Interest Rate:	[Base Rate + Spread] [ ]
Interest Payment Dates:	[ ] of each year, beginning [ ]. If an Interest Payment Date falls on a day that is not a Business Day, it will be postponed to the [ ] Business Day [, except that, as applicable, if that Business Day is in the next calendar month, the Interest Payment Date will be the [ ] Business Day].
Notes:	The Notes will be issued in registered form. [Rule 144A Notes will be represented by one or more DTC Global Notes. Regulation S Notes will initially be represented by a Regulation S Temporary Global Registered Note. Beneficial interests in the Regulation S Temporary Global Registered Note will be exchanged for beneficial interests in a Regulation S Permanent Global Registered Note on the 40th day after the completion of the distribution of the Notes. Interests in a Regulation S Global Registered Note will be exchangeable for Definitive Registered Notes only under circumstances described in the Offering Memorandum under “Description of the Notes – Forms of Notes.”] [In relation to any issue of Notes, which are a Global Note exchangeable to Definitive Registered Notes such notes shall be tradable only in principal amounts of at least the Specified Denomination (or if more than one Specified Denomination, the lowest Specified Denomination).] *See* “Description of the Notes – Global Notes.”
Applicable TEFRA Exemption:	[C Rules/D Rules/Not Applicable]
Rule 144A ISIN:	[ ]
Rule 144A CUSIP Number:	[ ]
[Rule 144A Common Code:]	[ ]
Reg S ISIN:	[ ]
Reg S CUSIP Number:	[ ]
[Reg S Common Code:]	[ ]
CFI:	[See the website of the Association of National Numbering Agencies (ANNA) or alternatively sourced

	from the responsible National Numbering Agency that assigned the ISIN / Not Applicable / Not Available]
FISN:	[See the website of the Association of National Numbering Agencies (ANNA) or alternatively sourced from the responsible National Numbering Agency that assigned the ISIN / Not Applicable / Not Available]
Relevant Clearing System(s):	[DTC for Rule 144A Notes] [Euroclear and Clearstream for Regulation S Notes]
Delivery:	Delivery against payment
Listing:	[Euronext Dublin's Global Exchange Market / Other non-regulated market/None]
Admission to trading:	[Application has been made for the Notes to be admitted to trading on [ ] with effect from [ ]] [Not Applicable]
Estimates of total expenses related to admission to trading:	[ ]
Calculation Agent:	Citibank, N.A.
Principal Paying Agent:	Citibank, N.A.
Agent(s):	[ ]
Lead Manager:	[ ]
Relevant Benchmark[s]:	[[*specify benchmark*] is provided by [*administrator legal name*]][*repeat as necessary*]. As at the date hereof, [[*administrator legal name*][appears]/[does not appear]][*repeat as necessary*] in the register of administrators and benchmarks established and maintained by ESMA pursuant to Article 36 (*Register of administrators and benchmarks*) of the Benchmark Regulation (Regulation (EU) 2016/1011)]/[Not Applicable]

[PROVISIONS RELATING SOLELY TO FLOATING RATE NOTES]

Base Rate:	[ ]
Spread:	[ ]
Spread Multiplier:	[ ]
Initial Interest Rate:	[ ]
Interest Period:	[ ]
Index Maturity:	[ ]

Maximum Interest Rate:	[ ]
Minimum Interest Rate:	[ ]
Rounding:	[ ]

[ADDITIONAL PROVISIONS RELATING TO ISDA RATE NOTES]

ISDA Definitions:	[ ]
Fixed Rate Payer/Fixed Amount Payer/Fixed Price Payer/Floating Rate Payer/Floating Amount Payer/Floating Price Payer:	[ ] [ ]
Effective Date:	[ ]
Termination Date:	[ ]
Calculation Agent:	[ ]
Calculation Periods:	[ ]
Period End Dates:	[ ]
Payment Dates:	[ ]
Reset Dates:	[ ]
Calculation Amount:	[ ]
Day Count Fraction:	[ ]
Applicable Business Day Convention:	[ ]
LIBOR:	[LIBOR/Reuters and relevant page number]

INFORMATION RELATING TO THE FUNDING AGREEMENT

Funding Agreement Number:	[ ]
Principal Amount:	[ ]
Effective Date:	[ ]
Maturity Date:	[ ]

EXPECTED RATINGS OF THE SECURITIES

		Notes
S&P Global Ratings	....	[AA+]
Moody's	....	[Aa3]
Fitch	....	[AA+]

The rating of the Notes by S&P Global Ratings is based primarily upon the financial strength and claims paying ability of MassMutual. The current financial strength and claims paying ability rating of MassMutual by S&P Global Ratings is "AA+." The rating of the Notes will be monitored and is subject to reconsideration at S&P Global Ratings' sole discretion. S&P Global Ratings will change its rating of the Notes in accordance with any change in the creditworthiness of MassMutual or with any change in the priority status under the state jurisdiction governing group annuity contracts or funding agreements issued by MassMutual.

The rating of the Notes by Moody's is based primarily upon the insurance financial strength and claims paying ability rating of MassMutual. The current insurance financial strength and claims paying ability rating of MassMutual by Moody's is "Aa3." The rating of the Notes will be monitored and is subject to reconsideration at Moody's sole discretion. Moody's will change its rating of the Notes in accordance with any change in the creditworthiness rating of MassMutual by Moody's or with any change in the priority status under the state jurisdiction governing group annuity contracts or funding agreements issued by MassMutual.

The rating of the Notes by Fitch is based primarily upon the insurance financial strength and claims paying ability rating of MassMutual. The current insurance financial strength and claims paying ability rating of MassMutual by Fitch is "AA+." The rating of the Notes will be monitored and is subject to reconsideration at Fitch's sole discretion. Fitch will change its rating of the Notes in accordance with any change in the creditworthiness rating of MassMutual by Fitch or with any change in the priority status under the state jurisdiction governing group annuity contracts or funding agreements issued by MassMutual.

The ratings of the Notes should be evaluated independently from similar rating of other types of notes. A security rating is not a recommendation to buy, sell or hold securities and may be subject to review, revision, suspension, reduction or withdrawal at any time by the assigning rating agency.

USE OF PROCEEDS

The Series Trust will use the proceeds of $[ ] from the current offering of the Notes to acquire Funding Agreement No. [ ] from MassMutual [and to make payments under the Swap]. MassMutual will pay certain expenses of the relevant Series Trust in connection with the current offering of the Notes, including the commission of the Initial Purchaser (as defined below).

SUPPLEMENTAL PLAN OF DISTRIBUTION

Subject to the terms and conditions set forth in the Third Amended and Restated Purchase Agreement dated May 31, 2018, as amended by the First Amendment thereto dated as of June 11, 2019, and as may be further amended from time to time, the Series Trust has agreed to sell to [each of] the Initial Purchaser[s] named below (the "**Initial Purchaser[s]**") and [each of] the Initial Purchaser[s] has [severally] agreed to purchase, the [respective] amount of the Notes set forth opposite its name below:

Name[s] of Initial Purchaser[s]	Principal Amount of Notes
[ ]	$[ ]
[ ]	$[ ]
Total	$[ ]

The Notes represent a new issue of notes with no established trading market. The Series Trust has been advised by the Initial Purchaser[s] that [it/they] intend[s] to make a market in the Notes but [is/are] not obligated to do so and may discontinue any market making at any time without notice. There can be no assurance that there will be a secondary market for the Notes or that there will be liquidity in such a market if one develops.

[LISTING APPLICATION

This Pricing Supplement comprises the details required to list the Series of Notes described herein on [Euronext Dublin's Global Exchange Market] [other non-regulated market], pursuant to the $21,000,000,000 Global Funding Program of MassMutual Global Funding II.]

RESPONSIBILITY

The Trust and Series Trust accept responsibility for the information contained in this Pricing Supplement. The Trust and the Series Trust confirm that, having taken all reasonable care to ensure that such is the case, the information given in this Pricing Supplement is, to the best of their knowledge, in accordance with the facts and does not omit anything likely to affect its import.

It is expressly understood and agreed by the parties to the Indenture that (a) the Indenture is executed and delivered by U.S. Bank Trust National Association, not individually or personally, but solely as Administrative Trustee, in the exercise of the powers and authority conferred and vested in it, pursuant to the Trust Agreement, (b) each of the representations, undertakings and agreements herein made on the part of the Trust and/or any relevant Series Trust is made and intended not as personal representations, undertakings and agreements by U.S. Bank Trust National Association but is made and intended for the purpose of binding only the Trust and/or any relevant Series Trust, (c) nothing contained herein shall be construed as creating any liability on U.S. Bank Trust National Association, individually or personally, to perform any covenant either expressed or implied contained therein, all such liability, if any, being expressly waived by the parties hereto and by any person claiming by, through or under the parties hereto, and (d) under no circumstances shall U.S. Bank Trust National Association be personally liable for the payment of any indebtedness or expenses of the Trust or any relevant Series Trust or be liable for the breach or failure of any obligation, representation, warranty or covenant made or undertaken by the Trust or any relevant Series Trust under the Indenture or any other related documents.

Signed on behalf of MassMutual Global Funding II, with respect to MassMutual Global Funding II – Series [ ]-[ ]:

By: U.S. Bank Trust National Association, not in its individual capacity but solely as Administrative Trustee

By: ____
Name:
Title:

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
STATUTORY FINANCIAL STATEMENTS

Table of Contents

KPMG LLP
One Financial Plaza
755 Main Street
Hartford, CT 06103

Independent Auditors' Report

The Board of Directors and Policyholders of
Massachusetts Mutual Life Insurance Company:

We have audited the accompanying financial statements of Massachusetts Mutual Life Insurance Company (the Company), which comprise the statutory statements of financial position as of December 31, 2018 and 2017, and the related statutory statements of operations, changes in surplus, and cash flows for the three-year period ended December 31, 2018, and the related notes to the statutory financial statements.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with statutory accounting practices prescribed or permitted by the Commonwealth of Massachusetts Division of Insurance. Management is also responsible for the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditors' Responsibility

Our responsibility is to express an opinion on these financial statements based on our audits. We conducted our audits in accordance with auditing standards generally accepted in the United States of America. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditors' judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. Accordingly, we express no such opinion. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinions.

Basis for Adverse Opinion on U.S. Generally Accepted Accounting Principles

As described in Note 2 to the financial statements, the financial statements are prepared by the Company using statutory accounting practices prescribed or permitted by the Commonwealth of Massachusetts Division of Insurance , which is a basis of accounting other than U.S. generally accepted accounting principles. Accordingly, the financial statements are not intended to be presented in accordance with U.S. generally accepted accounting principles.

The effects on the financial statements of the variances between the statutory accounting practices as described in Note 2 and U.S. generally accepted accounting principles, although not reasonably determinable, are presumed to be material.

Adverse Opinion on U.S. Generally Accepted Accounting Principles

In our opinion, because of the significance of the variances between statutory accounting practices and U.S. generally accepted accounting principles discussed in the Basis for Adverse Opinion on U.S. Generally Accepted Accounting Principles paragraph, the financial statements referred to above do not present fairly, in accordance with U.S. generally accepted accounting principles, the financial position of the Company as of December 31, 2018 and 2017, or the results of its operations or its cash flows for the three-year period ended December 31, 2018.

Opinion on Statutory Basis of Accounting

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of the Company as of December 31, 2018 and 2017, and the results of its operations and its cash flows for the three-year period ended December 31, 2018, in accordance with statutory accounting practices prescribed or permitted by the Commonwealth of Massachusetts Division of Insurance described in Note 2.

KPMG LLP

Hartford, Connecticut
February 23, 2019, except for Note 18,
as to which the date is March 19, 2019

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
STATUTORY STATEMENTS OF FINANCIAL POSITION

	December 31, 2018	December 31, 2017
	(In Millions)	
Assets:		
Bonds	$ 97,079	$ 90,435
Preferred stocks	744	768
Common stocks – subsidiaries and affiliates	12,327	14,424
Common stocks – unaffiliated	500	1,212
Mortgage loans	23,624	22,580
Policy loans	13,873	13,327
Real estate	488	857
Partnerships and limited liability companies	8,599	7,678
Derivatives	8,741	8,857
Cash, cash equivalents and short-term investments	4,318	3,580
Other invested assets	943	203
Total invested assets	171,236	163,921
Investment income due and accrued	3,018	2,199
Federal income taxes	612	544
Deferred income taxes	983	761
Other than invested assets	3,320	3,476
Total assets excluding separate accounts	179,169	170,901
Separate account assets	64,478	69,162
Total assets	$ 243,647	$ 240,063
Liabilities and Surplus:		
Policyholders' reserves	$ 121,978	$ 115,764
Liabilities for deposit-type contracts	14,370	13,014
Contract claims and other benefits	479	513
Policyholders' dividends	1,713	1,601
General expenses due or accrued	1,096	1,074
Asset valuation reserve	3,307	3,207
Repurchase agreements	4,768	4,204
Commercial paper	250	250
Collateral	2,946	2,661
Derivatives	4,912	5,979
Funds held under coinsurance	4,099	4,001
Other liabilities	3,641	2,928
Total liabilities excluding separate accounts	163,559	155,196
Separate account liabilities	64,478	69,162
Total liabilities	228,037	224,358
Surplus	15,610	15,705
Total liabilities and surplus	$ 243,647	$ 240,063

See notes to statutory financial statements

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
STATUTORY STATEMENTS OF OPERATIONS

	Years Ended December 31,		
	2018	2017	2016
	(In Millions)		
Revenue:			
Premium income	$ 22,929	$ 17,486	$ 21,432
Net investment income	7,774	6,542	6,334
Fees and other income	1,018	1,425	1,283
Total revenue	31,721	25,453	29,049
Benefits and expenses:			
Policyholders' benefits	23,007	20,019	18,312
Change in policyholders' reserves	4,499	740	7,387
Change in group annuity reserves assumed	(1,221)	(887)	(1,510)
General insurance expenses	2,366	2,604	2,251
Commissions	1,062	1,009	938
State taxes, licenses and fees	258	245	237
Total benefits and expenses	29,971	23,730	27,615
Net gain from operations before dividends and federal income taxes	1,750	1,723	1,434
Dividends to policyholders	1,695	1,569	1,566
Net gain from operations before federal income taxes	55	154	(132)
Federal income tax expense (benefit)	(168)	(320)	(326)
Net gain from operations	223	474	194
Net realized capital (losses) gains	(1,044)	(422)	(208)
Net (loss) income	$ (821)	$ 52	$ (14)

See notes to statutory financial statements

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
STATUTORY STATEMENTS OF CHANGES IN SURPLUS

	Years Ended December 31,		
	2018	2017	2016
	(In Millions)		
Surplus, beginning of year	$ 15,705	$ 15,423	$ 14,983
Decrease due to:			
Net (loss) income	(821)	52	(14)
Change in net unrealized capital gains (losses), net of tax	1,779	368	1,105
Change in net unrealized foreign exchange capital (losses) gains, net of tax	(594)	721	(441)
Change in other net deferred income taxes	291	(1,084)	247
Change in nonadmitted assets	(716)	124	(326)
Change in asset valuation reserve	(100)	(29)	(361)
Change in surplus notes	-	36	-
Change in minimum pension liability	128	61	6
Prior period adjustments	(47)	45	34
Other	(15)	(12)	190
Net (decrease) increase	(95)	282	440
Surplus, end of year	$ 15,610	$ 15,705	$ 15,423

See notes to statutory financial statements

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
STATUTORY STATEMENTS OF CASH FLOWS

	Years Ended December 31, 2018	2017	2016
	(In Millions)		
Cash from operations:			
Premium and other income collected	$ 23,625	$ 22,194	$ 21,685
Net investment income	6,762	6,542	6,394
Benefit payments	(22,916)	(19,718)	(17,832)
Net transfers from separate accounts	3,091	3,510	2,282
Net receipts from group annuity reserves assumed	1,221	887	1,510
Commissions and other expenses	(3,924)	(3,523)	(3,355)
Dividends paid to policyholders	(1,588)	(1,577)	(1,698)
Federal and foreign income taxes recovered (paid)	162	(3)	353
Net cash from operations	6,433	8,312	9,339
Cash from investments:			
Proceeds from investments sold, matured or repaid:			
Bonds	19,214	19,838	14,660
Preferred and common stocks – unaffiliated	985	516	577
Common stocks – affiliated	1,723	346	75
Mortgage loans	2,330	3,062	3,847
Real estate	276	226	59
Partnerships and limited liability companies	2,155	1,972	908
Derivatives	633	54	545
Other	(548)	(273)	(122)
Total investment proceeds	26,768	25,741	20,549
Cost of investments acquired:			
Bonds	(26,526)	(24,910)	(21,393)
Preferred and common stocks – unaffiliated	(311)	(887)	(379)
Common stocks – affiliated	(583)	(230)	(1,499)
Mortgage loans	(3,698)	(4,543)	(3,505)
Real estate	233	(267)	(201)
Partnerships and limited liability companies	(1,653)	(1,851)	(1,568)
Derivatives	(927)	(598)	(627)
Other	202	(89)	115
Total investments acquired	(33,263)	(33,375)	(29,057)
Net increase in policy loans	(546)	(867)	(648)
Net cash from investing activities	(7,041)	(8,501)	(9,156)
Cash from financing and miscellaneous sources:			
Net deposits on deposit-type contracts	87	1,360	755
Cash provided by surplus note issuance	-	36	-
Change in repurchase agreements	565	(525)	(401)
Change in collateral	50	(180)	712
Other cash provided (used)	644	(648)	(572)
Net cash from financing and miscellaneous sources	1,346	43	494
Net change in cash, cash equivalents and short-term investments	738	(146)	677
Cash, cash equivalents and short-term investments:			
Beginning of year	3,580	3,726	3,049
End of year	$ 4,318	$ 3,580	$ 3,726

See notes to statutory financial statements

1. Nature of operations

Massachusetts Mutual Life Insurance Company (the Company), a mutual life insurance company domiciled in the Commonwealth of Massachusetts, and its domestic life insurance subsidiaries provide individual and group life insurance, disability insurance, individual and group annuities and guaranteed interest contracts (GIC) to individual and institutional customers in all 50 states of the United States of America (U.S.), the District of Columbia and Puerto Rico. Products and services are offered primarily through the Company's MassMutual Financial Advisors (MMFA), Direct to Consumer (DTC), Institutional Solutions (IS) and Workplace Solutions (WS) distribution channels.

MMFA is a sales force that includes financial advisors that operate in the U.S. MMFA sells individual life, individual annuities and disability insurance. The Company's DTC distribution channel sells individual life and supplemental health insurance primarily through direct response television advertising, digital media, search engine optimization and search engine marketing. The Company's IS distribution channel sells group annuities, group life and GIC primarily through retirement advisory firms, actuarial consulting firms, investment banks, insurance benefit advisors and investment management companies. The Company's WS distribution channel sells group life insurance and annuity products as well as individual life insurance, critical illness and long term care products distributed through investment advisors.

2. Summary of significant accounting policies

a. Basis of presentation

The statutory financial statements have been prepared in conformity with the statutory accounting practices of the National Association of Insurance Commissioners (NAIC) and the accounting practices prescribed or permitted by the Commonwealth of Massachusetts Division of Insurance (the Division).

Statutory accounting practices are different in some respects from financial statements prepared in accordance with U.S. generally accepted accounting principles (U.S. GAAP). The more significant differences between statutory accounting practices and U.S. GAAP are as follows: (a) bonds are generally carried at amortized cost, whereas U.S. GAAP reports bonds at fair value for bonds available for sale and trading or at amortized cost for bonds held to maturity; (b) changes in the fair value of derivative financial instruments are recorded as changes in surplus, whereas U.S. GAAP generally reports these changes as revenue unless deemed an effective hedge; (c) interest rate and credit default swaps associated with replicated asset transactions are carried at amortized cost, whereas U.S. GAAP would carry them at fair value; (d) embedded derivatives are recorded as part of the underlying contract, whereas U.S. GAAP would identify and bifurcate certain embedded derivatives from the underlying contract or security and account for them separately at fair value; (e) income recognition on partnerships and limited liability companies (LLCs), which are accounted for under the equity method, is limited to the amount of cash distribution, whereas U.S. GAAP is without limitation; (f) certain majority-owned subsidiaries and variable interest entities are accounted for using the equity method, whereas U.S. GAAP would consolidate these entities; (g) changes in the balances of deferred income taxes, which provide for book versus tax temporary differences, are subject to limitation and are recorded in surplus, whereas U.S. GAAP would generally include the change in deferred taxes in net income without limitation; (h) assets and liabilities associated with certain group annuity and variable universal life contracts, which do not pass-through all investment experience to contract holders, are maintained in separate accounts and are presented on a single line in the statutory financial statements, whereas U.S. GAAP reports these contracts as general investments and liabilities of the Company; (i) assets are reported at admitted asset value and assets designated as nonadmitted are excluded through a charge against surplus, whereas U.S. GAAP recognizes all assets, net of any valuation allowances; (j) statutory policy reserves are based upon prescribed methods, such as the Commissioners' Reserve Valuation Method (CRVM), Commissioners' Annuity Reserve Valuation Method (CARVM) or net level premium method, and prescribed statutory mortality, morbidity and interest assumptions at the time of issuance, whereas U.S. GAAP policy reserves would generally be based upon the net level premium method or the estimated gross margin method with estimates, at time of issuance, of future mortality, morbidity, persistency and interest; (k) liabilities for policyholder reserves, unearned premium, and unpaid claims are presented net of reinsurance ceded, whereas U.S. GAAP would present the liabilities on a direct basis and report an asset for the amounts due from reinsurers for the amounts ceded; (l) an asset valuation reserve (AVR) is reported as a contingency reserve to stabilize surplus against fluctuations in the statement value of real estate, partnerships and LLCs and certain common stocks as well as credit-related changes in the value of bonds, mortgage loans and certain derivatives, whereas U.S. GAAP does not record this reserve; (m) after-tax realized capital gains (losses) that result from changes in the overall level of interest rates for all types of fixed-income investments and interest-related hedging activities are deferred into the interest maintenance reserve (IMR) and amortized into revenue, whereas U.S. GAAP reports these gains and losses as revenue; (n) changes to the mortgage loan valuation allowance are recognized in net unrealized capital gains (losses), net of tax, in the Statutory Statements of Changes in Surplus, whereas U.S. GAAP reports these changes in net realized capital gains (losses); (o) the overfunded status of pension and other postretirement plans, which is the excess of the fair value of the plan assets over the projected benefit obligation, is a nonadmitted asset for statutory accounting whereas U.S. GAAP recognizes the overfunded status as an asset; (p) surplus notes are reported in surplus, whereas U.S. GAAP would report these notes as liabilities; (q) payments received for universal and variable life insurance products, certain variable and fixed deferred annuities and group annuity contracts are reported as premium income and corresponding change in reserves, whereas U.S. GAAP would treat these payments as deposits to policyholders' account balances; (r) certain acquisition costs, such as commissions and other variable costs, directly related to successfully acquiring new business are charged to current operations as incurred, whereas U.S. GAAP would generally capitalize these expenses and amortize them based on profit emergence over the expected life of the policies or over the premium payment period; (s) Statutory Statements of Changes in Surplus includes net income, change in net unrealized capital gains (losses), change in net unrealized foreign exchange capital gains (losses), change in other net deferred income taxes, change in nonadmitted assets, change in AVR, prior period adjustments and change in minimum pension liability, whereas U.S. GAAP presents net income as retained earnings and net unrealized capital gains (losses), change in net unrealized foreign exchange capital gains (losses), change in minimum pension liability as other comprehensive income; and (t) the change in the fair value for unaffiliated common stock is recorded in surplus, whereas the change in the fair value for ownership interests in an entity not accounted for under the equity method or consolidated are recorded in revenue for U.S. GAAP.

The preparation of financial statements requires management to make estimates and assumptions that impact the reported amounts of assets and liabilities, the disclosure of assets and liabilities as of the date of the statutory financial statements and the reported amounts of revenues and expenses during the reporting periods. The most significant estimates and assumptions include those used in determining the carrying values of investments including the amount of mortgage loan investment valuation reserves, other-than-temporary impairment(s) (OTTI), the value of the investment in MassMutual Holding LLC (MMHLLC), the liabilities for policyholders' reserves, the determination of admissible deferred tax assets (DTA), the liability for taxes and the liability for litigation or other contingencies. Future events including, but not limited to, changes in the level of mortality, morbidity, interest rates, persistency, asset valuations and defaults could cause results to differ from the estimates used in the statutory financial statements. Although some variability is inherent in these estimates, management believes the amounts presented are appropriate.

Certain prior year amounts within these financial statements have been reclassified to conform to the current year presentation.

b. Bonds

Bonds are generally valued at amortized cost using the constant yield interest method with the exception of NAIC Category 6 bonds, which are in or near default, and certain residential mortgage-backed securities (RMBS) and commercial mortgage-backed securities (CMBS), which are rated by outside modelers, which are carried at the lower of amortized cost or fair value. NAIC ratings are applied to bonds and other securities. Categories 1 and 2 are considered investment grade, while Categories 3 through 6 are considered below investment grade. Bonds are recorded on a trade date basis, except for private placement bonds, which are recorded on the funding date.

For loan-backed and structured securities, such as asset-backed securities (ABS), mortgage-backed securities (MBS), including RMBS and CMBS, and structured securities, including collateralized debt obligations (CDOs), amortization or accretion is revalued quarterly based on the current estimated cash flows, using either the prospective or retrospective adjustment methodologies.

Certain fixed income securities, with the highest ratings from a rating agency follow the retrospective method of accounting. Under the retrospective method, the recalculated effective yield equates the present value of the actual and anticipated cash flows, including new prepayment assumptions, to the original cost of the investment. Prepayment assumptions are based on borrower constraints and economic incentives such as the original term, age and coupon of the loan as affected by the interest rate environment. The current carrying value is then increased or decreased to the amount that would have resulted had the revised yield been applied since inception, and investment income is correspondingly decreased or increased.

All other fixed income securities, such as floating rate bonds and interest only securities, including those that have been impaired, follow the prospective method of accounting. Under the prospective method, the recalculated future effective yield equates the carrying value of the investment to the present value of the anticipated future cash flows.

The fair value of bonds is based on quoted market prices when available. If quoted market prices are not available, values provided by other third-party organizations are used. If values provided by other third-party organizations are unavailable, fair value is estimated using internal models by discounting expected future cash flows using observable current market rates applicable to yield, credit quality and maturity of the investment or using quoted market values for comparable investments. Internal inputs used in the determination of fair value include estimated prepayment speeds, default rates, discount rates and collateral values, among others. Structure characteristics and cash flow priority are also considered. Fair values resulting from internal models are those expected to be received in an orderly transaction between willing market participants.

Refer to *Note 2cc "Realized capital gains (losses) including other-than-temporary impairments and unrealized capital gains (losses)"* for information on the Company’s policy for determining OTTI.

c. Preferred stocks

Preferred stocks in good standing, those that are rated Categories 1 through 3 by the Securities Valuation Office (SVO) of the NAIC, are generally valued at amortized cost. Preferred stocks not in good standing, those that are rated Categories 4 through 6 by the SVO of the NAIC, are valued at the lower of amortized cost or fair value. Fair values are based on quoted market prices, when available. If quoted market prices are not available, values provided by third-party organizations are used. If values provided by third-party organizations are unavailable, fair value is estimated using internal models. These models use inputs not directly observable or correlated with observable market data. Typical inputs integrated into the Company’s internal discounted expected earnings models include, but are not limited to, earnings before interest, taxes, depreciation and amortization estimates. Fair values resulting from internal models are those expected to be received in an orderly transaction between willing market participants.

Refer to *Note 2cc "Realized capital gains (losses) including other-than-temporary impairments and unrealized capital gains (losses)"* for information on the Company’s policy for determining OTTI.

d. Common stocks – subsidiaries and affiliates

Common stocks of unconsolidated subsidiaries, primarily C.M. Life Insurance Company (C.M. Life), MML Bay State Life Insurance Company (MML Bay State), and MassMutual Holding LLC (MMHLLC), are accounted for using the statutory equity method. The Company accounts for the value of MMHLLC at its underlying U.S. GAAP equity value, adjusted by a portion of its noncontrolling interests (NCI) after consideration of MMHLLC's fair value and the Company’s capital levels. The Division has affirmed the statutory recognition of the Company’s application of the NCI guidelines in MMHLLC’s statutory carrying value. However, the Company has limited this recognition to $2,749 million as of December 31, 2018 and $2,703 million as of December 31, 2017. Operating results, less dividends declared, for MMHLLC is reflected as net unrealized capital gains (losses) in the Statutory Statements of Changes in Surplus. Dividends declared from MMHLLC are recorded in net investment income when declared and are limited to MMHLLC’s U.S. GAAP retained earnings. The cost basis of common stocks – subsidiaries and affiliates is adjusted for impairments deemed to be other than temporary.

MassMutual International LLC (MMI) was classified as common stocks – subsidiaries and affiliates as of December 31, 2017 and as partnerships and LLCs as of December 31, 2018. MMI was accounted for using the statutory equity method in both years. Prior to December 31, 2018, the Company accounts for the value of MMI at its underlying U.S. GAAP equity value adjusted to remove certain nonadmitted and intangible assets. At December 31, 2018, the value of MMI was recorded at its underlying U.S. GAAP equity value. The change in the value of MMI is reflected as net unrealized capital gains (losses) in the Statutory Statements of Changes in Surplus.

Refer to *Note 5c. "Common stocks – subsidiaries and affiliates"* for further information on the valuation of MMHLLC and MMI.

e. Common stocks – unaffiliated

Unaffiliated common stocks are carried at fair value, which is based on quoted market prices when available. If quoted market prices are not available, values provided by third-party organizations are used. If values from third parties are unavailable, fair values are determined by management using estimates based upon internal models. The Company's internal models include estimates based upon comparable company analysis, review of financial statements, broker quotes and last traded price. Fair values resulting from internal models are those expected to be received in an orderly transaction between willing market participants.

Refer to *Note 2cc "Realized capital gains (losses) including other-than-temporary impairments and unrealized capital gains (losses)"* for information on the Company's policy for determining OTTI.

f. Mortgage loans

Mortgage loans are valued at the unpaid principal balance of the loan, net of unamortized premium, discount, mortgage origination fees and valuation allowances. Interest income earned on impaired loans is accrued on the outstanding principal balance of the loan based on the loan's contractual coupon rate. Interest is not accrued for (a) impaired loans more than 60 days past due, (b) delinquent loans more than 90 days past due, or (c) loans that have interest that is not expected to be collected. The Company continually monitors mortgage loans where the accrual of interest has been discontinued, and will resume the accrual of interest on a mortgage loan when the facts and circumstances of the borrower and property indicate that the payments will continue to be received according to the terms of the original or modified mortgage loan agreement.

Refer to *Note 2cc "Realized capital gains (losses) including other-than-temporary impairments and unrealized capital gains (losses)"* for information on the Company's policy for determining OTTI.

g. Policy loans

Policy loans are carried at the outstanding loan balance less amounts unsecured by the cash surrender value of the policy and amounts ceded to reinsurers. At issuance, policy loans are fully secured by the cash surrender value of the policy. Unsecured amounts can occur when subsequent charges are incurred on the underlying policy without the receipt of additional premium. If the premium is not paid during the contractual grace period, the policy will lapse. Unsecured nonadmitted amounts were less than $1 million as of December 31, 2018 and 2017. Policy loans earn interest calculated based upon either a fixed or a variable interest rate. Accrued investment income on policy loans more than 90 days past due is included in the unpaid balance of the policy loan to the extent it does not exceed the cash surrender value of the underlying contract.

h. Real estate

Investment real estate, which the Company has the intent to hold for the production of income, and real estate occupied by the Company are carried at depreciated cost, less encumbrances. Depreciation is calculated using the straight-line method over the estimated useful life of the real estate holding, not to exceed 40 years. Depreciation expense is included in net investment income.

Real estate held for sale is initially carried at the lower of depreciated cost or fair value less estimated selling costs and is no longer depreciated. Adjustments to carrying value, including for further declines in fair value, are recorded in a valuation reserve, which is included in realized capital losses.

Fair value is generally estimated using the present value of expected future cash flows discounted at a rate commensurate with the underlying risks. The Company also obtains external appraisals for a rotating selection of properties annually. If an external appraisal is not obtained, an internal appraisal is performed.

Refer to *Note 2cc "Realized capital gains (losses) including other-than-temporary impairments and unrealized capital gains (losses)"* for information on the Company’s policy for determining OTTI.

i. Partnerships and limited liability companies

Partnerships and LLCs, except for partnerships that generate and realize low income housing tax credits (LIHTCs), are accounted for using the equity method with the change in the equity value of the underlying investment recorded in surplus. Distributions received are recognized as net investment income to the extent the distribution does not exceed previously recorded accumulated undistributed earnings.

Investments in partnerships that generate LIHTCs are carried at amortized cost unless considered impaired. Under the amortized cost method, the excess of the carrying value of the investment over its estimated residual value is amortized into net investment income during the period in which tax benefits are recognized.

The equity method is suspended if the carrying value of the investment is reduced to zero due to losses from the investment. Once the equity method is suspended, losses are not recorded until the investment returns to profitability and the equity method is resumed. However, if the Company has guaranteed obligations of the investment or is otherwise committed to provide further financial support for the investment, losses will continue to be reported up to the amount of those guaranteed obligations or commitments.

MMI was classified as common stocks – subsidiaries and affiliates as of December 31, 2017 and as partnerships and LLCs as of December 31, 2018. MMI was accounted for using the statutory equity method in both years. Prior to December 31, 2018, the Company accounts for the value of MMI at its underlying U.S. GAAP equity value adjusted to remove certain nonadmitted and intangible assets. At December 31, 2018, the value of MMI was recorded at its underlying U.S. GAAP equity value. The change in the value of MMI is reflected as net unrealized capital gains (losses) in the Statutory Statements of Changes in Surplus.

Refer to *Note 2cc "Realized capital gains (losses) including other-than-temporary impairments and unrealized capital gains (losses)"* for information on the Company’s policy for determining OTTI.

j. Derivatives

Interest rate swaps and credit default swaps associated with replicated assets are valued at amortized cost and all other derivative types are carried at fair value, which is based primarily upon quotations obtained from counterparties and independent sources. These quotations are compared to internally derived prices and a price challenge is lodged with the counterparties and independent sources when a significant difference cannot be explained by appropriate adjustments to the internal model. When quoted market values are not reliable or available, the value is based on an internal valuation process using market observable inputs that other market participants would use. Changes in the fair value of these instruments other than interest rate swaps and credit default swaps associated with replicated assets are recorded as unrealized capital gains (losses) in surplus. Gains and losses realized on settlement, termination, closing or assignment of contracts are recorded as realized capital gains (losses). Amounts receivable and payable are accrued as net investment income.

k. Cash, cash equivalents and short-term investments

Cash and cash equivalents, which are carried at amortized cost, consist of all highly liquid investments purchased with original maturities of three months or less.

Short-term investments, which are carried at amortized cost, consist of short-term bonds, money market mutual funds and all highly liquid investments purchased with maturities of greater than three months and less than or equal to 12 months.

The carrying value reported in the Statutory Statements of Financial Position for cash, cash equivalents and short-term investment instruments approximates the fair value.

l. Investment income due and accrued

Accrued investment income consists primarily of interest and dividends. Interest is recognized on an accrual basis and dividends are recorded as earned on the ex-dividend date.

m. Federal income taxes

Total federal income taxes are based upon the Company’s best estimate of its current and DTAs or liabilities. Current tax expense (benefit) is reported in the Statutory Statements of Operations as federal income tax expense (benefit) if resulting from operations and within net realized capital gains (losses) if resulting from invested asset transactions. Changes in the balances of deferred taxes, which provide for book-to-tax temporary differences, are subject to limitations and are reported within various lines within surplus. Accordingly, the reporting of book-to-tax temporary differences, such as reserves and policy acquisition costs, and of book-to-tax permanent differences, such as tax-exempt interest and tax credits, may result in effective tax rates in the Statutory Statements of Operations that differ from the federal statutory tax rate.

n. Other than invested assets

Other than invested assets primarily includes the Company’s investment in corporate-owned life insurance, deferred and uncollected life insurance premium, receivable from subsidiaries and affiliates, reinsurance recoverable, fixed assets and other receivables.

o. Separate accounts

Separate accounts and sub-accounts are segregated funds administered and invested by the Company, the performance of which primarily benefits the policyholders/contract holders with an interest in the separate accounts. Group and individual variable annuity, variable life and other insurance policyholders/contract holders select from among the separate accounts and sub-accounts made available by the Company. The separate accounts and sub-accounts are offered as investment options under certain insurance contracts or policies. The returns produced by separate account assets increase or decrease separate account reserves. Separate account assets consist principally of marketable securities reported at fair value. Except for the Company’s seed money and certain guaranteed separate accounts issued in Minnesota, separate account assets can only be used to satisfy separate account liabilities and are not available to satisfy the general obligations of the Company. Separate account administrative and investment advisory fees are included in fees and other income.

Assets may be transferred from the general investments of the Company to seed the separate accounts. When assets are transferred, they are transferred at fair market value. Gains related to the transfer are deferred to the extent that the Company maintains a proportionate interest in the separate account. The deferred gain is recognized as the Company’s ownership decreases or when the underlying assets are sold. Losses associated with these transfers are recognized immediately.

Separate accounts reflect two categories of risk assumption: nonguaranteed separate accounts for which the policyholder/contract holder assumes the investment risk and guaranteed separate accounts for which the Company contractually guarantees a minimum return, a minimum account value, or both to the policyholder/contract holder. For certain guaranteed separate account products such as interest rate guaranteed products and indexed separate account products, reserve adequacy is performed on a contract-by-contract basis using, as applicable, prescribed interest rates, mortality rates and asset risk deductions. If the outcome from this adequacy analysis produces a deficiency relative to the current account value, a liability is recorded in policyholders' reserves or liabilities for deposit-type contracts in the Statutory Statements of Financial Position with the corresponding change in the liability recorded as change in policyholders' reserves or policyholders' benefits in the Statutory Statements of Operations.

Premium income, benefits and expenses of the separate accounts are included in the Statutory Statements of Operations with the offset recorded in the change in policyholders' reserves. Investment income, realized capital gains (losses) and unrealized capital gains (losses) on the assets of separate accounts, other than seed money, accrue to policyholders/contract holders and are not recorded in the Statutory Statements of Operations.

p. Nonadmitted assets

Assets designated as nonadmitted by the NAIC primarily include pension plan assets, intangibles, certain electronic data processing (EDP) equipment, advances and prepayments, certain investments in partnerships and LLCs for which qualifying audits are not performed, the amount of DTAs (subject to certain limitations) that will not be realized by the end of the third calendar year following the current year end, furniture and equipment, certain other receivables and uncollected premium greater than 90 days past due. Due and accrued income is nonadmitted on: (a) bonds delinquent more than 90 days or where collection of interest is improbable; (b) impaired bonds more than 60 days past due; (c) bonds in default; (d) mortgage loans in default where interest is 180 days past due; (e) rent in arrears for more than 90 days; and (f) policy loan interest due and accrued more than 90 days past due and included in the unpaid balance of the policy loan in excess of the cash surrender value of the underlying contract. Assets that are designated as nonadmitted are excluded from the Statutory Statements of Financial Position through a change in nonadmitted assets on the Statutory Statements of Changes in Surplus.

q. Reinsurance

The Company enters into reinsurance agreements with affiliated and unaffiliated insurers in the normal course of business to limit its insurance risk or to assume business.

Premium income, benefits to policyholders (including unpaid claims) and policyholders' reserves are reported net of reinsurance. Premium, benefits and reserves related to reinsured business are accounted for on bases consistent with those used in accounting for the original policies issued and the terms of the reinsurance contracts. The Company records a receivable for reinsured benefits paid, but not yet reimbursed by the reinsurer and reduces policyholders' reserves for the portion of insurance liabilities that are reinsured. Commissions and expense allowances on reinsurance ceded and modified coinsurance (Modco) reserve adjustments on reinsurance ceded are recorded as revenue. Commissions and expense allowances on Retirement Plan Group reinsurance assumed and Modco reserve adjustments on reinsurance assumed are recorded as an expense.

r. Policyholders' reserves

Policyholders' reserves provide for the present value of estimated future obligations in excess of estimated future premium on policies in force.

Reserves for individual life insurance contracts are developed using accepted actuarial methods computed principally on the net level premium or CRVM bases using the American Experience or the 1941, 1958, 1980 or the 2001 Commissioners' Standard Ordinary mortality tables with assumed interest rates. Reserves for disability riders associated with life contracts are calculated using morbidity rates from the 1952 Period 2 Intercompany Disability Table, modified to reflect the Company's morbidity experience.

The Company waives deduction of deferred fractional premium at death and returns any portion of the final premium beyond the date of death. Reserves are computed using continuous functions to reflect these practices.

The Company charges a higher premium on certain contracts that cover substandard mortality risk. For these policies, the reserve calculations are based on a substandard mortality rate, which is a multiple of the standard mortality tables.

Certain variable universal life and universal life contracts include features such as guaranteed minimum death benefits (GMDB) or other guarantees that ensure continued death benefit coverage when the policy would otherwise lapse. The value of the guarantee is only available to the beneficiary in the form of a death benefit. The liability for variable and universal life GMDBs and other guarantees is included in policyholders' reserves and the related change in this liability is included in change in policyholders' reserves in the Statutory Statements of Operations.

Reserves for individual and group payout annuities are developed using accepted actuarial methods computed principally under CARVM using applicable interest rates and mortality tables. Individual payout annuities primarily use the 1971 and 1983 Individual Annuity Mortality and Annuity 2000 tables. Group payout annuities primarily use the 1983 Group Annuity Mortality and 1994 Group Annuity Reserving tables.

Certain individual variable annuity products have a variety of additional guarantees such as GMDBs and variable annuity guaranteed living benefits (VAGLB). The primary types of VAGLBs include guaranteed minimum accumulation benefits (GMAB), guaranteed minimum income benefits (GMIB) including GMIB Basic and GMIB Plus and guaranteed minimum withdrawal benefits (GMWB). In general, these benefit guarantees require the contract owner or policyholder to adhere to a company-approved asset allocation strategy. The liabilities for individual variable annuity GMDBs and VAGLBs are included in policyholders' reserves in the Statutory Statements of Financial Position and the related changes in these liabilities are included in change in policyholders' reserves in the Statutory Statement of Operations.

Variable annuity GMDBs provide a death benefit in excess of the contract value if the contract value is less than the guaranteed minimum amount. Some contracts provide that guarantee upon the contract owner's death and others provide it upon the annuitant's death. This amount may be based on a return of premium (the premium paid generally adjusted for withdrawals), a roll-up (an accumulation of premium at a specified interest rate adjusted for withdrawals), a reset (the contract value on a specified anniversary date adjusted for subsequent withdrawals, which is allowed to decrease when reset) or a ratchet (the contract value on a specified anniversary date adjusted for subsequent withdrawals, which is never allowed to decrease when reset). For a variable annuity contract, a decline in the stock or bond markets causing the contract value to fall below the guaranteed specified amount will increase the net amount at risk, which is the amount of the GMDBs in excess of the contract value.

GMABs provide the annuity contract holder with a guaranteed minimum contract value at the end of the product's guarantee period. If the contract value is below that guarantee at the end of the period, the contract value is increased to the guaranteed minimum account benefit value and the contract continues from that point. Options for the guarantee period are 10, 12, 20 and 26 years. These options are only available upon contract issue.

GMWBs provide the annuity contract holder with a guarantee that a minimum amount will be available for withdrawal annually for life regardless of the contract value.

GMIBs provide the annuity contract holder with a guaranteed minimum amount when the contract is annuitized. The GMIBs would be beneficial to the contract holder if the contract holder's contract value would otherwise not provide a higher annuitization value using currently offered rates at the time of annuitization. GMIBs generally anticipate payout between ages 60 and 90. The Company issued GMIB Basic from 2002 to 2007.

GMIB Plus replaced GMIB Basic and was issued from 2007 to 2009. GMIB Plus includes a product version, which provides a minimum floor amount that can be applied to an annuity option. The GMIB Plus value is equal to the initial purchase amount increased by a compound annual interest rate. If a contract owner takes a withdrawal, the GMIB Plus value is recalculated by making an adjustment for withdrawals. There are two types of adjustments for withdrawals: (1) Dollar for dollar adjustment – during each contract year, the GMIB Plus value will be lower for each dollar that is withdrawn up to and equal to the current contract year interest credited on the GMIB Plus value; (2) Pro-rata adjustment – during each contract year, for any amount withdrawn that exceeds the current contract year interest credited on the GMIB Plus value, the GMIB Plus value will be further reduced by a pro-rata adjustment. Such a withdrawal will negatively impact the GMIB Plus value. GMIB Plus cannot be annuitized within ten years of contract issuance as the rider can only be exercised after a ten year waiting period has elapsed. This guarantee was only available upon contract issuance.

Reserves for individual and group fixed deferred annuities are developed using accepted actuarial methods computed principally under CARVM using applicable interest rates and mortality tables. Individual deferred annuities primarily use the 1971 and 1983 Individual Annuity Mortality and Annuity 2000 tables. Group deferred annuities primarily use the 1983 Group Annuity Mortality and 1994 Group Annuity Reserving tables.

Reserves for individual and group variable deferred annuities are developed using accepted actuarial methods computed principally under CARVM for variable annuities using applicable interest rates and mortality tables. Individual variable deferred annuities primarily use the 1994 Minimum Guaranteed Death Benefit or Annuity 2000 tables. The liability is evaluated under both a standard scenario and stochastic scenarios net of currently held applicable hedge asset cash flows. The Company holds the reserve liability valuation at the higher of the standard or stochastic scenario values. Based on the Company's currently held hedges, if market interest rates increase, the fair value of the Company hedges would decrease in value and reserves would decrease. Should market interest rates decrease, the fair value of the Company hedges would increase in value and reserves would increase. In addition, the Company elected to hold additional reserves above those indicated based on the stochastic or standard scenario in order to maintain a prudent level of reserve adequacy.

The standard scenario is a prescriptive reserve with minimal company discretion. The primary driver of the standard scenario result is the composition of the in force policies, with the key factor being the extent to which the product guarantees are "in the money." The value of the reserve guarantees under the standard scenario is driven primarily by equity markets.

For the stochastic scenarios, the Company uses the American Academy of Actuaries' scenarios. Prudent estimate assumptions are used for mortality, expenses and commissions, investment management fees, taxes and policyholder behavior including lapses, partial withdrawals, annuitization and additional premium. These assumptions are consistent with those used for asset adequacy testing and are based on Company experience. Stochastic reserves are driven by the degree that the variable annuity benefits are "in the money" at projected interest rates and equity market levels, expenses, discount rates, net derivative values, and policyholder behavior.

Separate accounts include certain group annuity contracts used to fund retirement plans that offer a guarantee of a contract holder's principal, which can be withdrawn over a stated period of time. These contracts offer a stated rate of return backed by the Company. Contract payments are not contingent upon the life of the retirement plan participants.

Disability income policy reserves are generally calculated using the two-year preliminary term method and actuarially accepted morbidity tables using the 1964 Commissioners' Disability Table and the 1985 Commissioners' Individual Disability Table A with assumed interest and mortality rates in accordance with applicable statutes and regulations.

Disabled life claim reserves are generally calculated using actuarially accepted methodologies and actuarially accepted morbidity tables using the 1964 Commissioners' Disability Table and 1985 Commissioners' Individual Disability Tables A and C with assumed interest rates in accordance with applicable statutes and regulations.

LTC policy reserves are generally calculated using the one-year preliminary term method and actuarially accepted morbidity, mortality and lapse tables with assumed interest rates in accordance with applicable statutes and regulations.

LTC claim reserves are generally calculated using actuarially accepted methodologies and actuarially accepted morbidity tables with assumed interest rates in accordance with applicable statutes and regulations.

Unpaid claims and claim expense reserves are related to disability and LTC claims. Unpaid disability claim liabilities are projected based on the average of the last three disability payments. LTC unpaid claim liabilities are projected using policy specific daily benefit amounts and aggregate utilization factors. Claim expense reserves are based on an analysis of the unit expenses related to the processing and examination of new and ongoing claims. Interest accrued on reserves is calculated by applying NAIC prescribed interest rates to the average reserves by year incurred.

Tabular interest, tabular reserves, reserves released, and tabular cost for all life and annuity contracts and supplementary contracts involving life contingencies are determined in accordance with NAIC Annual Statement instructions. For tabular interest, whole life and term products use a formula that applies a weighted average interest rate determined from a seriatim valuation file to the mean average reserves. Universal life, variable life, group life, annuity and supplemental contracts use a formula that applies a weighted average credited rate to the mean account value. For contracts without an account value (e.g., a Single Premium Immediate Annuity) a weighted average statutory valuation rate is applied to the mean statutory reserve or accepted actuarial methods using applicable interest rates are applied.

All policyholders' reserves and accruals are presented net of reinsurance. Management believes that these liabilities and accruals represent management's best estimate and will be sufficient, in conjunction with future revenues, to meet future anticipated obligations of policies and contracts in force.

s. Liabilities for deposit-type contracts

Liabilities for funding agreements, dividend accumulations, premium deposit funds, investment-type contracts such as supplementary contracts not involving life contingencies and certain structured settlement annuities are based on account value or accepted actuarial methods using applicable interest rates.

t. Participating contracts

Participating contracts are those that may be eligible to share in any dividends declared by the Company. Participating contracts issued by the Company represented 56% of the Company's policyholders' reserves and liabilities for deposit-type contracts as of December 31, 2018 and December 31, 2017.

u. Policyholders' dividends

Dividends expected to be paid to policyholders in the following year are approved annually by MassMutual's Board of Directors and are recorded as an expense in the current year. The allocation of these dividends to policyholders reflects the relative contribution of each group of participating policies to surplus and considers, among other factors, investment returns, mortality and morbidity experience, expenses and taxes. The liability for policyholders' dividends includes the estimated amount of annual dividends and settlement dividends. A settlement dividend is an extra dividend payable at termination of a policy upon maturity, death or surrender.

v. Asset valuation reserve

The Company maintains an AVR that is a contingency reserve to stabilize surplus against fluctuations in the carrying value of common stocks, real estate, partnerships and LLCs as well as credit-related changes in the value of bonds, preferred stocks, mortgage loans, and certain derivatives. The AVR is reported as a liability within the Statutory Statements of Financial Position and the change in AVR, net of tax, is reported within the Statutory Statements of Changes in Surplus.

w. Repurchase agreements

Repurchase agreements are contracts under which the Company sells securities and simultaneously agrees to repurchase the same or substantially the same securities. These repurchase agreements are carried at cost and accounted for as collateralized borrowings with the proceeds from the sale of the securities recorded as a liability while the underlying securities continue to be recorded as an investment by the Company. Earnings on these investments are recorded as investment income and the difference between the proceeds and the amount at which the securities will be subsequently reacquired is amortized as interest expense. Repurchase agreements are used as a tool for overall portfolio management to help ensure the Company maintains adequate assets in order to provide yield, spread and duration to support liabilities and other corporate needs.

The Company provides collateral, as dictated by the repurchase agreements, to the counterparty in exchange for a loan. If the fair value of the securities sold becomes less than the loan, the counterparty may require additional collateral.

The carrying value reported in the Statutory Statements of Financial Position for repurchase agreements approximates the fair value.

x. Commercial paper

The Company issues commercial paper (CP) in the form of unsecured notes. Interest on CP is calculated using a 360-day year based on the actual number of days elapsed. Due to the short-term nature of CP, the carrying value approximates fair value.

y. Interest maintenance reserve

The Company maintains an IMR that is used to stabilize net income against fluctuations in interest rates. After-tax realized capital gains (losses), which result from changes in interest rates for all types of fixed-income investments and interest-related derivatives, are deferred into the IMR and amortized into net investment income using the grouped amortization method. In the grouped amortization method, assets are grouped based on years of maturity. IMR is reduced by the amount ceded to reinsurers when entering into in force coinsurance ceding agreements. The IMR is included in other liabilities, or if negative, is recorded as a nonadmitted asset.

z. Employee compensation plans

The Company has a long-term incentive compensation plan, under which certain employees of the Company and its subsidiaries may be issued phantom share-based compensation awards. These awards include Phantom Stock Appreciation Rights (PSARs) and Phantom Restricted Stock (PRS). These awards do not grant an equity or ownership interest in the Company.

PSARs provide the participant with the opportunity to share in the value created in the total enterprise. The PSAR value is the appreciation in the phantom stock price between the grant price and the share price at the time of exercise. Awards can only be settled in cash. PSARs typically cliff vest at the end of three years and expire five years after the date of grant. Vested PSARs may be exercised during quarterly two-week exercise periods prior to expiration. The compensation expense for an individual award is recognized over the service period.

PRS provide the participant with the opportunity to share in the value created in the total enterprise. Participants receive the full phantom share value (grant price plus/minus any change in share price) over the award period. Awards can only be settled in cash. PRS typically vests on a graded basis over five years, one third per year after years three, four and five. On each vesting date, a lump sum cash settlement is paid to the participant based on the number of shares vested multiplied by the most recent phantom stock price. Compensation expense is recognized on the accelerated attribution method. The accelerated attribution method recognizes compensation expense over the vesting period by which each separate payout year is treated as if it were, in substance, a separate award.

All awards granted under the Company’s plans are compensatory classified awards. Compensation costs are based on the most recent quarterly calculated intrinsic value of the PSARs (current share price less grant price per share not less than zero) and PRS (current share price per share), considering vesting provisions, net of forfeiture assumptions and are included in the Statutory Statements of Financial Position as a liability in general expenses due or accrued. The compensation expense for an individual award is recognized over the service period. The cumulative compensation expense for all outstanding awards in any period is equal to the change in calculated liability period over period. The requisite service period for the awards is the vesting period.

At the time of death or disability, awards contain vesting conditions, whereby employees’ unvested awards immediately vest on an accelerated basis with a one-year exercise period for PSARs, full accelerated vesting and settlement for PRS awards granted 2016 and after. For PRS awards granted prior to 2016, awards vest on a pro-rata basis with immediate settlement.

At the time of retirement, for awards granted beginning in 2016, both PRS and PSAR vest according to the original grant terms. For awards granted prior to 2016, unvested awards immediately vest on an accelerated basis with a two-year exercise period for PSARs, and a pro-rata basis with immediate settlement for PRS.

The phantom share price is determined as the greater of the share price calculated using management basis core operating income or the share price calculated using management basis equity. This phantom share price is calculated and communicated to all participants quarterly and is used in calculating the liability of the Company based on intrinsic value.

aa. Other liabilities

Other liabilities primarily consist of the derivative interest expense liability, remittances and items not allocated, amounts withheld, other miscellaneous liabilities, liabilities for employee benefits and due and accrued separate account transfers.

bb. Premium and related expense recognition

Life insurance premium revenue is generally recognized annually on the anniversary date of the policy. However, premium for flexible products, primarily universal life and variable universal life contracts, is recognized as revenue when received. Annuity premium is recognized as revenue when received. Disability income and LTC premium is recognized as revenue when due.

Premium revenue is adjusted by the related deferred premium adjustment. Deferred premium adjusts for the overstatement created in the calculation of reserves as the reserve computation assumes the entire year's net premium is collected annually at the beginning of the policy year and does not take into account installment or modal payments.

Commissions and other costs related to issuance of new policies and policy maintenance and settlement costs are charged to current operations when incurred. Surrender fee charges on certain life and annuity products are recorded as a reduction of benefits and expenses.

cc. Realized capital gains (losses) including other-than-temporary impairments and unrealized capital gains (losses)

Realized capital gains (losses), net of taxes, exclude gains (losses) deferred into the IMR and gains (losses) of the separate accounts. Realized capital gains (losses), including OTTI, are recognized in net income and are determined using the specific identification method.

Bonds - general

The Company employs a systematic methodology to evaluate OTTI by conducting a quarterly analysis of bonds. OTTI is evaluated in a manner consistent with market participant assumptions. The Company considers the following factors, where applicable depending on the type of securities, in the evaluation of whether a decline in value is other than temporary: (a) the likelihood that the Company will be able to collect all amounts due according to the contractual terms of the debt security; (b) the present value of the expected future cash flows of the security; (c) the characteristics, quality and value of the underlying collateral or issuer securing the position; (d) collateral structure; (e) the length of time and extent to which the fair value has been below amortized cost; (f) the financial condition and near-term prospects of the issuer; (g) adverse conditions related to the security or industry; (h) the rating of the security; (i) the Company's ability and intent to hold the investment for a period of time sufficient to allow for an anticipated recovery to amortized cost; and (j) other qualitative and quantitative factors in determining the existence of OTTI including, but not limited to, unrealized loss trend analysis and significant short-term changes in value.

In addition, if the Company has the intent to sell, or the inability, or lack of intent to retain the investment for a period sufficient to recover the amortized cost basis, an OTTI is recognized as a realized loss equal to the entire difference between the investment's amortized cost basis and its fair value at the balance sheet date.

When a bond is other-than-temporarily impaired, a new cost basis is established.

Bonds - corporate

For corporate securities, if it is determined that a decline in the fair value of a bond is other than temporary, OTTI is recognized as a realized loss equal to the difference between the investment's amortized cost basis and, generally, its fair value at the balance sheet date.

Bonds - loan-backed and structured securities

For loan-backed and structured securities, if the present value of cash flows expected to be collected is less than the amortized cost basis of the security, an OTTI is recognized as a realized loss equal to the difference between the investment's amortized cost basis and the present value of cash flows expected to be collected. The expected cash flows are discounted at the security's effective interest rate. Internal inputs used in determining the amount of the OTTI on structured securities include collateral performance, prepayment speeds, default rates, and loss severity based on borrower and loan characteristics, as well as deal structure including subordination, over-collateralization and cash flow priority.

ABS and MBS are evaluated for OTTI using scenarios and assumptions based on the specifics of each security including collateral type, loan type, vintage and subordination level in the structure. Cash flow estimates are based on these assumptions and inputs obtained from external industry sources along with internal analysis and actual experience. Where applicable, assumptions include prepayment speeds, default rates and loss severity, weighted average maturity and changes in the underlying collateral values.

The Company has a review process for determining if CDOs are at risk for OTTI. For the senior, mezzanine and junior debt tranches, cash flows are modeled using multiple scenarios based on the current ratings and values of the underlying corporate credit risks and incorporating prepayment and default assumptions that vary according to collateral attributes of each CDO. The prepayment and default assumptions are varied within each model based upon rating (base case), historical expectations (default), rating change improvement (optimistic), rating change downgrade (pessimistic) and fair value (market). The default rates produced by these multiple scenarios are assigned an expectation weight according to current market and economic conditions and fed into a final scenario. OTTI is recorded if this final scenario results in the loss of any principal or interest payments due.

For the most subordinated junior CDO tranches, the present value of the projected cash flows in the final scenario is measured using an effective yield. If the current book value of the security is greater than the present value measured using an effective yield, an OTTI is taken in an amount sufficient to produce its effective yield. Certain CDOs cannot be modeled using all of the scenarios because of limitations on the data needed for all scenarios. The cash flows for these CDOs, including foreign currency denominated CDOs, are projected using a customized scenario management believes is reasonable for the applicable collateral pool.

For loan-backed and structured securities, any difference between the new amortized cost basis and any increased present value of future cash flows expected to be collected is accreted into net investment income over the expected remaining life of the bond.

Common and preferred stock

The cost basis of common and preferred stocks is adjusted for impairments deemed to be other than temporary. The Company considers the following factors in the evaluation of whether a decline in value is other than temporary: (a) the financial condition and near-term prospects of the issuer; (b) the Company's ability and intent to retain the investment for a period sufficient to allow for a near-term recovery in value; and (c) the period and degree to which the value has been below cost. The Company conducts a quarterly analysis of issuers whose common or preferred stock is not-in-good standing or valued below 80% of cost. The Company also considers other qualitative and quantitative factors in determining the existence of OTTI including, but not limited to, unrealized loss trend analysis and significant short-term changes in value.

Mortgage loans

The Company performs internal reviews at least annually to determine if individual mortgage loans are performing or nonperforming. The fair values of performing mortgage loans are estimated by discounting expected future cash flows using current interest rates for similar loans with similar credit risk. For nonperforming loans, the fair value is the estimated collateral value of the underlying real estate. If foreclosure is probable, the Company will obtain an external appraisal.

Mortgage loans are considered to be impaired when, based upon current available information and events, it is probable that the Company will be unable to collect all amounts of principal and interest due according to the contractual terms of the mortgage loan agreement. A valuation allowance is recorded on a loan-by-loan basis in net unrealized capital losses for the excess of the carrying value of the mortgage loan over the fair value of its underlying collateral. Such information or events could include property performance, capital budgets, future lease roll, a property inspection as well as payment trends. Collectability and estimated decreases in collateral values are also assessed on a loan-by-loan basis considering all events and conditions relevant to the loan. This evaluation is inherently subjective as it requires estimates that are susceptible to significant revisions as more information becomes available, as changes occur in the market or as negotiations with the borrowing entity evolve. If there is a change in the fair value of the underlying collateral or the estimated loss on the loan, the valuation allowance is adjusted accordingly. An OTTI occurs upon the realization of a credit loss, typically through foreclosure or after a decision is made to accept a discounted payoff, and is recognized in realized capital losses. The previously recorded valuation allowance is reversed from unrealized capital losses. When an OTTI is recorded, a new cost basis is established reflecting estimated value of the collateral.

Real estate

For real estate held for the production of income, depreciated cost is adjusted for impairments whenever events or changes in circumstances indicate the carrying amount of the asset may not be recoverable, with the impairment being included in realized capital losses. An impairment is recorded when the property’s estimated future net operating cash flows over ten years, undiscounted and without interest charges, is less than book value.

Adjustments to the carrying value of real estate held for sale are recorded in a valuation reserve as realized capital losses when the fair value less estimated selling costs is less than the carrying value.

Partnerships and LLCs

When it is probable that the Company will be unable to recover the outstanding carrying value of an investment based on undiscounted cash flows, or there is evidence indicating an inability of the investee to sustain earnings to justify the carrying value of the investment, OTTI is recognized in realized capital losses reflecting the excess of the carrying value over the estimated fair value of the investment. The estimated fair values of limited partnership interests are generally based on the Company’s share of the net asset value (NAV) as provided in the financial statements of the investees. In certain circumstances, management may adjust the NAV by a premium or discount when it has sufficient evidence to support applying such adjustments.

For determining impairments in partnerships that generate LIHTCs, the Company uses the present value of all future benefits, the majority of which are tax credits, discounted at a risk-free rate for future benefits of ten or more years and compares the results to its current book value. Impairments are recognized in realized capital losses reflecting the excess of the carrying value over the estimated fair value of the investment.

Unrealized capital gains (losses)

Unrealized capital gains (losses) include changes in the fair value of derivatives, excluding interest rate swaps and credit default index swaps associated with replicated assets; currency translation adjustments on foreign-denominated bonds; changes in the fair value of unaffiliated common stocks; changes in the fair value of bonds and preferred stocks that are carried at fair value; and changes in the inflation adjustments on U.S Treasury inflation-indexed securities. Changes in the Company's equity investments in partnerships and LLCs, including the earnings as reported on the financial statements, earnings recorded as accumulated undistributed earnings, foreign exchange asset valuation and mark-to-market on operating assets, and certain subsidiaries and affiliates are also reported as changes in unrealized capital gains (losses). Unrealized capital gains (losses) are recorded as a change in net unrealized capital gains (losses), net of tax, within the Statutory Statements of Changes in Surplus.

3. New accounting standards

Adoption of new accounting standards

In June 2016, the NAIC adopted substantive revisions to Statements of Statutory Accounting Principles (SSAP) No. 51R, *Life Contracts*, to incorporate references to the Valuation Manual and to facilitate the implementation of principles-based reserving (PBR), which were effective on January 1, 2017. The adoption of PBR only applies to new life insurance policies issued after January 1, 2017, however the Company plans to adopt these revisions to SSAP No. 51R using the 3-year phased in approach by no later than January 1, 2020. The Company currently uses formulas and assumptions to determine reserves as prescribed by state laws and regulations. Under PBR, the Company will be required to hold the higher of (a) the reserve using prescribed factors and (b) the PBR reserve which considers a wide range of future economic conditions, computed using justified company experience factors, such as mortality, policyholder behavior and expenses. The modifications are not expected to have a material effect on the Company's total life reserves and surplus in the financial statements.

In June 2017, the NAIC adopted modifications to SSAP No. 37, *Mortgage Loans*, which became effective June 8, 2017. These modifications clarify that a reporting entity providing a mortgage loan as a "participant in a mortgage loan agreement", should consider the mortgage loan in the scope of SSAP No. 37. Specifically, in addition to mortgage loans directly originated, a mortgage loan also includes mortgages acquired through assignment, syndication or participation. These modifications also clarify the impairment assessment and incorporate new disclosures for these types of mortgage loans to identify mortgage loans in which the insurer is a participant or co-lender. These modifications did not have a financial impact on the Company. The Company has added the additional disclosures to the Company's financial statements.

In January 2017, the NAIC adopted modifications to SSAP No. 86, *Derivatives*, which were effective January 1, 2018. The modifications maintain gross reporting of derivative variation margin as a separate unit of account, rather than characterizing as a legal settlement with mark-to-market changes recorded in surplus. Regarding exchange traded futures, these modifications further clarified that variation margin and mark-to-market changes should be recorded in the same manner as all other derivative instruments. Starting in 2018, the Company records mark-to-market gains and losses from exchange traded futures as unrealized gains or losses instead of realized gains or losses and grosses up the derivatives and collateral line items on its financial statements. These modifications did not impact total surplus and did not have a material impact on the Company's financial statements.

In April 2017, the NAIC adopted modifications to SSAP No. 69, *Statement of Cash Flows*, to adopt Accounting Standards Update (ASU) No. 2016-15, *Classification of Certain Cash Receipts and Cash Payments*, in its entirety, effective January 1, 2018 on a retrospective basis. These modifications address the classification and disclosure of certain items within the statements of cash flows. Upon adoption, proceeds from the settlement of the Company's corporate owned life insurance policies were classified as investing activities instead of operating activities. Additionally, the Company elected to apply the nature of distribution approach to subsidiary, controlled or affiliated equity method investments and the cumulative earnings approach to all other equity method investments in determining whether distributions received from equity method investees are returns on investment, recorded as operating activities, or returns of investment, recorded as investing activities. Although the adoption of these modifications required reclassification between investing and operating cash flows, they did not have a material impact on the Company's financial statements.

In November 2017, the NAIC adopted modifications to SSAP No. 100R, *Fair Value*, allowing NAV per share as a practical expedient to fair value, either when specifically named in a SSAP or when the investee qualifies as an investment company, which were effective January 1, 2018. These modifications adopted, with modification, applicable U.S. GAAP, allowing greater consistency with Financial Accounting Standards Board's allowable use of NAV. These modifications also included the U.S. GAAP requirement to report instruments measured at NAV as a practical expedient outside of the fair value hierarchy disclosure as a separate item, along with a description of the terms and conditions of redemption features, amounts of unfunded commitments, restrictions to sell, and various other items. As a result of these modifications, the NAIC issued SSAP No. 100R, *Fair Value*. The adoption of these modifications did not have an impact on the Company's financial statements.

In November 2017, the NAIC adopted modifications to SSAP No. 97, *Investments in Subsidiary, Controlled and Affiliated Entities*, for Subsidiary and Controlled Affiliate (SCA) loss tracking and filing deadlines, which were effective December 31, 2018. The modifications add a loss-tracking disclosure for inclusion in year-end financial statements, which will track the losses beginning when the SCA's equity value falls below zero and will remain as long as the SCA's equity value remains in a deficit position and through the first year in which the equity position becomes positive. The modifications further clarify the SCA filing deadlines that have extended the Sub-1 filings from a 30-day to a 90-day timeframe and the Sub 2 from a June 30th deadline to an August 31st deadline. For SCA filings that regularly occur after the August 31st deadline, the filing is due one month after the audit date. The Company has adopted these modifications and currently has very few SCA's in a loss position. The adoption of this modification did not materially impact the Company's financial statements.

In February 2018, the NAIC adopted modifications to SSAP No. 9, *Subsequent Events*, and SSAP No. 101, *Income Taxes*, to temporarily allow any revised tax calculations resulting from the Tax Cuts and Job Act (the Act) that occurred after statutory filing, to be classified as changes in estimate, thus avoiding classification as Type 1 subsequent events. Under SSAP No. 9, reporting entities are generally required to amend their filed statutory financial statements in their domestic state to ensure that the statutory financial statements and the audited financial statements are consistent if a Type 1 event is identified after the statutory financial statements are filed, but before the audited financial statements are issued. The adoption of this modification did not materially impact the Company's financial statements.

In February 2018, the NAIC adopted modifications to SSAP No. 92, *Pensions*, and SSAP No. 102, *Postretirement Benefits Other Than Pension*, to eliminate the reconciliation of level 3 pension plan assets from the Company's financial statement disclosures, which were effective March 24, 2018. These modifications further clarify that detailed information regarding the reconciliation of the level 3 fair value categories of these assets is no longer required for statutory reporting purposes as the plan assets are not reported in the balance sheet of insurance entities. The Company has adopted these modifications.

In November 2018, the NAIC adopted modifications to SSAP No. 15, *Debt and Holding Company Obligations*, and SSAP No. 25, *Affiliates and Other Related Parties*, to clarify that (1) forgiveness of a reporting entity obligation should be recognized as contributed capital; (2) forgiveness of an amount owed to the reporting entity should be recognized as a dividend; and (3) waivers or modifications to 'amounts charged' in transactions involving services provided between related parties should be reassessed to determine that the fair and reasonable standards requirement continues to be met. These modifications also clarify that if the transaction is with a parent or other stockholder and the charge for services has been fully waived the guidance in SSAP No. 72, *Surplus and Quasi-Reorganization*, for recognition as contributed capital (forgiveness of a reporting entity obligation) or as a dividend (forgiveness of amount owed to the reporting entity) should be applied. The Company has adopted these modifications.

Future adoption of new accounting standards

In November 2018, the NAIC adopted modifications to the liquidity risk disclosure requirements of SSAP No. 51R, *Life Contracts*, No. 52, *Deposit-Type Contracts*, and No. 61R, *Life, Deposit-Type and Accident and Health Reinsurance*, effective December 31, 2019. The modifications will require the Company to provide additional liquidity risk information such as current surrender charges, amount of account value, cash value and reserves breakouts by withdrawal characteristics for certain general and separate account products and groups of products. Additionally, a reconciliation of amounts of total reserves disclosed to the applicable annual statement exhibits, and the corresponding financial statement line items will be required. The Company is currently evaluating the impact of the modifications to the liquidity risk disclosures in its financial statements.

In November 2018, the NAIC issued SSAP No. 30R, *Unaffiliated Common Stock*, effective January 1, 2019. These clarifications to unaffiliated common stock include SEC registered investment companies, such as closed-end mutual funds and unit investments trusts. The modification also includes public stock warrants, while nonpublic stock warrants would be classified as derivative instruments. The Company is currently evaluating these modifications to determine the potential impact on its financial statements.

In November 2018, the NAIC issued SSAP No. 108, *Derivatives Hedging Variable Annuity Guarantees*, to provide special accounting guidance for limited derivatives hedging variable annuity guarantee benefits that are subject to fluctuations from interest rates. This modification applies to variable annuity contracts and other contracts involving certain guaranteed benefits that are valued under principles-based reserving. This modification permits an insurer to use macro-hedging by designating as the host contract, an entire book of business or subsection consisting of interest sensitive variable annuity guarantee benefits, in a fair value hedge. The Company is required to record at fair value the interest rate sensitive variable annuity guarantee (that is, the hedged item) and the related derivative hedging instrument. Changes in the fair value of the derivatives attributable to the hedged item are recorded in realized gains and losses to offset the changes in the fair value of the hedged item. The excess or deficiency of the change in fair value of the derivative compared to the change in the fair value of the hedged item should be recorded as an admitted deferred asset or deferred liability, and amortized through realized capital gains and losses over the remaining term of the interest rate sensitive variable annuity, not to exceed 10 years. The Company is also required to record a special surplus allocation of an amount equal to the deferred asset and deferred liability from unassigned surplus. Changes in the fair value of the derivative that is not attributable to the hedge risk should be recorded in unrealized gains and losses. The Company will be required to disclose information about the derivative and related hedged items. The Company is currently evaluating this guidance to determine the potential impact on its financial statements.

4. *Fair value of financial instruments*

The following presents a summary of the carrying values and fair values of the Company's financial instruments:

	December 31, 2018				
	Carrying Value	Fair Value	Level 1	Level 2	Level 3
	(In Millions)				
Financial assets:					
Bonds:					
U. S. government and agencies	$ 5,854	$ 6,193	$ -	$ 6,193	$ -
All other governments	1,487	1,481	-	1,415	66
States, territories and possessions	614	647	-	647	-
Political subdivisions	547	571	-	571	-
Special revenue	5,927	6,421	-	6,412	9
Industrial and miscellaneous	75,124	74,538	10	42,695	31,833
Parent, subsidiaries and affiliates	7,526	7,570	-	1,172	6,398
Preferred stocks	744	734	12	-	722
Common stocks - subsidiaries and affiliates	398	398	233	-	165
Common stocks - unaffiliated	500	500	194	-	306
Mortgage loans - commercial	22,357	22,794	-	-	22,794
Mortgage loans - residential	1,267	1,211	-	-	1,211
Derivatives:					
Interest rate swaps	6,629	6,858	-	6,858	-
Options	911	911	-	911	-
Currency swaps	843	843	-	843	-
Forward contracts	106	113	-	113	-
Credit default swaps	18	6	-	6	-
Interest rate caps and floors	18	18	-	18	-
Financial futures	216	216	-	216	-
Cash, cash equivalents and short-term investments	4,318	4,318	175	4,143	-
Separate account assets	64,478	64,478	41,358	22,569	551
Financial liabilities:					
Guaranteed interest contracts	8,825	8,729	-	-	8,729
Group annuity contracts and other deposits	17,863	17,951	-	-	17,951
Individual annuity contracts	8,131	8,925	-	-	8,925
Supplementary contracts	1,178	1,179	-	-	1,179
Repurchase agreements	4,768	4,768	-	4,768	-
Commercial paper	250	250	-	250	-
Derivatives:					
Interest rate swaps	4,647	5,111	-	5,111	-
Options	5	5	-	5	-
Currency swaps	232	232	-	232	-
Forward contracts	12	28	-	28	-
Credit default swaps	2	3	-	3	-
Financial futures	14	14	-	14	-

Common stocks – subsidiaries and affiliates do not include unconsolidated subsidiaries, which had statutory carrying values of $11,929 million.

	December 31, 2017				
	Carrying Value	Fair Value	Level 1	Level 2	Level 3
	(In Millions)				
Financial assets:					
Bonds:					
U. S. government and agencies	$ 7,149	$ 7,697	$ -	$ 7,696	$ 1
All other governments	1,181	1,269	-	1,200	69
States, territories and possessions	596	651	-	651	-
Political subdivisions	532	576	-	576	-
Special revenue	5,814	6,518	-	6,507	11
Industrial and miscellaneous	68,140	71,342	-	41,333	30,009
Parent, subsidiaries and affiliates	7,023	7,133	-	1,075	6,058
Preferred stocks	768	786	36	-	750
Common stocks - subsidiaries and affiliates	454	454	344	-	110
Common stocks - unaffiliated	1,212	1,212	901	-	311
Mortgage loans - commercial	20,777	21,301	-	-	21,301
Mortgage loans - residential	1,803	1,760	-	-	1,760
Derivatives:					
Interest rate swaps	7,684	8,269	-	8,269	-
Options	745	745	-	745	-
Currency swaps	386	386	-	385	1
Forward contracts	13	22	-	22	-
Credit default swaps	29	36	-	36	-
Cash, cash equivalents and short-term investments	3,580	3,580	218	3,362	-
Separate account assets	69,162	69,162	46,006	22,447	709
Financial liabilities:					
Guaranteed interest contracts	8,834	8,549	-	-	8,549
Group annuity contracts and other deposits	18,132	18,505	-	-	18,505
Individual annuity contracts	6,570	8,009	-	-	8,009
Supplementary contracts	1,167	1,168	-	-	1,168
Repurchase agreements	4,204	4,204	-	4,204	-
Commercial paper	250	250	-	250	-
Derivatives:					
Interest rate swaps	5,314	5,372	-	5,372	-
Options	7	7	-	7	-
Currency swaps	569	569	-	561	8
Forward contracts	88	88	-	88	-
Credit default swaps	1	1	-	1	-

Common stocks – subsidiaries and affiliates do not include unconsolidated subsidiaries, which had statutory carrying values of $13,970 million.

Fair value is defined as the price that would be received from selling an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. The authoritative guidance for fair value establishes a measurement framework that includes a hierarchy used to classify the inputs used in measuring fair value. The hierarchy prioritizes the inputs to valuation techniques into three levels. Each level reflects a unique description of the inputs that are significant to the fair value measurements. The levels of the fair value hierarchy are as follows:

Level 1 – Observable inputs in the form of quoted prices for identical instruments in active markets.

Level 2 – Observable inputs other than Level 1 prices, such as quoted prices for similar assets or liabilities, quoted prices in markets that are not active or other inputs that are observable or can be derived from observable market data for substantially the full term of the assets or liabilities.

Level 3 – One or more unobservable inputs that are supported by little or no market activity and are significant to the fair value of the assets or liabilities. Level 3 assets and liabilities include financial instruments whose value is determined using internal models, as well as instruments for which the determination of fair value requires significant management judgment or estimation.

When available, the Company generally uses unadjusted quoted market prices from independent sources to determine the fair value of investments, and classifies such items within Level 1 of the fair value hierarchy. If quoted prices are not available, prices are derived from observable market data for similar assets in an active market or obtained directly from brokers for identical assets traded in inactive markets. Investments that are priced using these inputs are classified within Level 2 of the fair value hierarchy. When some of the necessary observable inputs are unavailable, fair value is based upon internally developed models. These models use inputs not directly observable or correlated with observable market data. Typical inputs, which are integrated in the Company’s internal discounted cash flow models and discounted earnings models include, but are not limited to, issuer spreads derived from internal credit ratings and benchmark yields such as London Inter-Bank Offered Rate (LIBOR), cash flow estimates and earnings before interest, taxes, depreciation and amortization estimates. Investments that are priced with such unobservable inputs are classified within Level 3 of the fair value hierarchy.

The Company has established and maintains policies and guidelines that govern its valuation methodologies and their consistent application. These policies and guidelines address the use of inputs, price source hierarchies and provide controls around the valuation processes. These controls include appropriate review and analysis of prices against market activity or indicators for reasonableness, approval of price source changes, price overrides, methodology changes and classification of fair value hierarchy levels. The valuation policies and guidelines are reviewed and updated as appropriate.

Annually, the Company reviews the primary pricing vendor to validate that the inputs used in that vendor’s pricing process are deemed to be market observable as defined above. While the Company was not provided access to proprietary models of the vendor, the reviews have included on-site walk-throughs of the pricing process, methodologies and control procedures for each asset class and level for which prices are provided. The review also included an examination of the underlying inputs and assumptions for a sample of individual securities across asset classes. In addition, the Company and its pricing vendors have an established challenge process in place for all security valuations, which facilitates identification and resolution of prices that fall outside expected ranges. The Company believes that the prices received from the pricing vendors are representative of prices that would be received to sell the assets at the applicable measurement date (exit prices) and are classified appropriately in the hierarchy.

The Company reviews the fair value hierarchy classifications at each reporting period. Overall, reclassifications between levels occur when there are changes in the observability of inputs and market activity used in the valuation of a financial asset or liability. Such reclassifications are reported as transfers between levels at the beginning fair value for the reporting period in which the changes occur. Given the types of assets classified as Level 1 (primarily equity securities including mutual fund investments), transfers between Level 1 and Level 2 measurement categories are expected to be infrequent. Transfers into and out of Level 3 are summarized in the schedule of changes in Level 3 assets and liabilities.

The fair value of group annuity contracts and other deposits is determined by multiplying the book value of the contract by an average market value adjustment factor. The market value adjustment factor is directly related to the difference between the book value of client liabilities and the present value of installment payments discounted at current market value yields. The market value yield is measured by the Barclay's Aggregate Bond Index, subject to certain adjustments, and the installment period is equivalent to the duration of the Company's invested asset portfolio.

The fair value of individual annuity and supplementary contracts is determined using one of several methods based on the specific contract type. For short-term contracts, generally less than 30 days, the fair value is assumed to be the book value. For contracts with longer durations, GICs and investment-type contracts, the fair value is determined by calculating the present value of future cash flows discounted at current market interest rates, the risk-free rate or a current pricing yield curve based on pricing assumptions using assets of a comparable corporate bond quality. Annuities receiving dividends are accumulated at the average minimum guaranteed rate and discounted at the risk-free rate. All others are valued using cash flow projections from the Company's asset/liability management analysis.

The use of different assumptions or valuation methodologies may have a material impact on the estimated fair value amounts.

The following presents the Company's fair value hierarchy for assets and liabilities that are carried at fair value:

	December 31, 2018			
	Level 1	Level 2	Level 3	Total
	(In Millions)			
Financial assets:				
Bonds:				
Industrial and miscellaneous	$ 10	$ 30	$ 64	$ 104
Parent, subsidiaries and affiliates	-	82	66	148
Common stocks - subsidiaries and affiliates	233	-	165	398
Common stocks - unaffiliated	194	-	306	500
Derivatives:				
Interest rate swaps	-	6,629	-	6,629
Options	-	911	-	911
Currency swaps	-	843	-	843
Forward contracts	-	106	-	106
Interest rate caps and floors	-	18	-	18
Financial futures	-	216	-	216
Separate account assets	41,358	22,569	551	64,478
Total financial assets carried at fair value	$ 41,795	$ 31,404	$ 1,152	$ 74,351
Financial liabilities:				
Derivatives:				
Interest rate swaps	$ -	$ 4,647	$ -	$ 4,647
Options	-	5	-	5
Currency swaps	-	232	-	232
Forward contracts	-	12	-	12
Financial futures	-	15	-	15
Total financial liabilities carried at fair value	$ -	$ 4,911	$ -	$ 4,911

For the year ended December 31, 2018, there were no significant transfers between Level 1 and Level 2 and the Company does not have any financial instruments that were carried at NAV as a practical expedient.

The following presents the Company's fair value hierarchy for assets and liabilities that are carried at fair value:

	December 31, 2017			
	Level 1	Level 2	Level 3	Total
	(In Millions)			
Financial assets:				
Bonds:				
Special revenue	$ -	$ 6	$ -	$ 6
Industrial and miscellaneous	-	11	55	66
Parent, subsidiaries and affiliates	-	18	61	79
Preferred stocks	3	-	2	5
Common stocks - subsidiaries and affiliates	344	-	110	454
Common stocks - unaffiliated	901	-	311	1,212
Derivatives:				
Interest rate swaps	-	7,684	-	7,684
Options	-	745	-	745
Currency swaps	-	385	1	386
Forward contracts	-	13	-	13
Separate account assets	46,006	22,447	709	69,162
Total financial assets carried at fair value	$ 47,254	$ 31,309	$ 1,249	$ 79,812
Financial liabilities:				
Derivatives:				
Interest rate swaps	$ -	$ 5,314	$ -	$ 5,314
Options	-	7	-	7
Currency swaps	-	561	8	569
Forward contracts	-	88	-	88
Total financial liabilities carried at fair value	$ -	$ 5,970	$ 8	$ 5,978

The Company reviews the fair value hierarchy classifications each reporting period. Changes in the observability of the valuation attributes and the level of market activity may result in a reclassification of certain financial assets or liabilities between fair value hierarchy classifications. Such reclassifications are reported as transfers between levels at the beginning fair value for the reporting period in which the changes occur. For the year ended December 31, 2017, $298 million of unaffiliated common stock were transferred from Level 2 to Level 1.

Valuation Techniques and Inputs

The Company determines the fair value of its investments using primarily the market approach or the income approach. The use of quoted prices for identical assets and matrix pricing or other similar techniques are examples of market approaches, while the use of discounted cash flow methodologies is an example of the income approach. The Company attempts to maximize the use of observable inputs and minimize the use of unobservable inputs in selecting whether the market or the income approach is used.

A description of the significant valuation techniques and inputs to the determination of estimated fair value for the more significant asset and liability classes measured at fair value on a recurring basis and categorized within Level 2 and Level 3 of the fair value hierarchy is as follows:

Separate account assets – These assets primarily include bonds (industrial and miscellaneous; U.S. government and agencies), and derivatives. Their fair values are determined as follows:

> *Bonds (Industrial and miscellaneous)* – These securities are principally valued using the market or the income approaches. Level 2 valuations are based primarily on quoted prices in markets that are not active, broker quotes, matrix pricing or other similar techniques that use standard market observable inputs such as benchmark yields, spreads versus benchmark yields, new issuances, issuer ratings, duration, and trades of identical or comparable securities. Privately placed securities are valued using discounted cash flow models using standard market observable inputs, and inputs derived from, or corroborated by, market observable data including market yield curve, duration, call provisions, observable prices and spreads for similar publicly traded or privately traded issuances that incorporate the credit quality and industry sector of the issuer. This level also includes securities priced by independent pricing services that use observable inputs. Valuations based on matrix pricing or other similar techniques that utilize significant unobservable inputs or inputs that cannot be derived principally from, or corroborated by, observable market data, including adjustments for illiquidity, delta spread adjustments or spreads to reflect industry trends or specific credit‒related issues are classified as Level 3. In addition, inputs including quoted prices for identical or similar securities that are less liquid and based on lower levels of trading activity than securities classified in Level 2 are classified as Level 3.
>
> *Bonds (U.S. government and agencies)* – These securities are principally valued using the market approach. Level 2 valuations are based primarily on quoted prices in markets that are not active, or using matrix pricing or other similar techniques using standard market observable inputs such as the benchmark U.S. Treasury yield curve, the spreads versus the U.S. Treasury yield curve for the identical security and comparable securities that are actively traded.

Derivative assets and liabilities – These financial instruments are primarily valued using the market approach. The estimated fair value of derivatives is based primarily on quotations obtained from counterparties and independent sources, such as quoted market values received from brokers. These quotations are compared to internally derived prices and a price challenge is lodged with the counterparties and an independent source when a significant difference cannot be explained by appropriate adjustments to the internal model. When quoted market values are not reliable or available, the value is based upon an internal valuation process using market observable inputs that other market participants would use. Significant inputs to the valuation of derivative financial instruments include overnight index swaps and LIBOR basis curves, interest rate volatility, swap yield curve, currency spot rates, cross currency basis curves and dividend yields. Due to the observability of the significant inputs to these fair value measurements, they are classified as Level 2.

The use of different assumptions or valuation methodologies may have a material impact on the estimated fair value amounts. For the periods presented, there were no significant changes to the Company's valuation techniques.

The following presents changes in the Company's Level 3 assets carried at fair value:

	Balance as of 1/1/18	Gains (Losses) in Net Income	Gains (Losses) in Surplus	Purchases	Issuances	Sales	Settlements	Transfers In	Transfers Out	Other	Balance as of 12/31/18
	(In Millions)										
Financial assets:											
Bonds:											
Industrial and miscellaneous	$ 55	$ (4)	$ (5)	$ -	$ 1	$ -	$ (9)	$ -	$ -	$ 26	$ 64
Parent, subsidiaries, and affiliates	61	4	(7)	9	-	-	(6)	5	-	-	66
Preferred stocks	2	-	-	-	-	-	-	-	-	(2)	-
Common stocks - subsidiaries and affiliates	110	-	41	5	6	-	(10)	9	-	4	165
Common stocks - unaffiliated	311	6	14	16	3	-	(44)	-	-	-	306
Derivatives:											
Currency swaps	1	-	-	-	-	-	-	-	(1)	-	-
Separate account assets	709	7	1	112	-	(278)	-	-	-	-	551
Total financial assets	$ 1,249	$ 13	$ 44	$ 142	$ 10	$ (278)	$ (69)	$ 14	$ (1)	$ 28	$ 1,152
Financial liabilities											
Derivatives:											
Currency swaps	$ 8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (8)	$ -	$ -

Other transfers include assets that are either no longer carried at fair value, or have just begun to be carried at fair value, such as assets with no level changes but a change in the lower of cost or market carrying basis. Industrial and miscellaneous bonds in other contain assets that are now carried at fair value due to ratings changes and assets are no longer carried at fair value where the fair value is now lower than the book value.

	Balance as of 1/1/17	Gains (Losses) in Net Income	Gains (Losses) in Surplus	Purchases	Issuances	Sales	Settlements	Transfers In	Transfers Out	Other	Balance as of 12/31/17
	(In Millions)										
Financial assets:											
Bonds:											
Industrial and miscellaneous	$ 57	$ 1	$ (4)	$ -	$ -	$ -	$ (4)	$ -	$ (8)	$ 13	$ 55
Parent, subsidiaries, and affiliates	52	-	9	-	-	-	-	-	-	-	61
Preferred stocks	3	-	-	1	-	-	-	-	-	(2)	2
Common stocks - subsidiaries and affiliates	63	-	13	-	46	-	(11)	-	-	(1)	110
Common stocks - unaffiliated	189	(6)	30	38	-	(8)	(3)	75	(6)	2	311
Derivatives:											
Currency swaps	-	-	(5)	-	-	-	-	6	-	-	1
Separate account assets	738	55	-	72	-	(150)	(1)	-	(5)	-	709
Total financial assets	$ 1,102	$ 50	$ 43	$ 111	$ 46	$ (158)	$ (19)	$ 81	$ (19)	$ 12	$ 1,249
Financial liabilities											
Derivatives:											
Currency swaps	$ -	$ -	$ 4	$ -	$ -	$ -	$ -	$ 4	$ -	$ -	$ 8

Level 3 transfers in are assets that are consistently carried at fair value but have had a level change. Common stocks unaffiliated assets were transferred from Level 2 to Level 3 due to a change in the observability of pricing inputs, at the beginning fair value for the reporting period.

5. Investments

The Company maintains a diversified investment portfolio. Investment policies limit concentration in any asset class, geographic region, industry group, economic characteristic, investment quality or individual investment.

a. Bonds

The carrying value and fair value of bonds were as follows:

	December 31, 2018			
	Carrying Value	Gross Unrealized Gains	Gross Unrealized Losses	Fair Value
	(In Millions)			
U.S. government and agencies	$ 5,854	$ 360	$ 21	$ 6,193
All other governments	1,487	29	35	1,481
States, territories and possessions	614	35	2	647
Political subdivisions	547	27	3	571
Special revenue	5,927	517	23	6,421
Industrial and miscellaneous	75,124	1,337	1,923	74,538
Parent, subsidiaries and affiliates	7,526	112	68	7,570
Total	$ 97,079	$ 2,417	$ 2,075	$ 97,421

The December 31, 2018 gross unrealized losses exclude $30 million of losses included in the carrying value. These losses include $30 million from NAIC Class 6 bonds and were primarily included in industrial and miscellaneous or parent, subsidiaries and affiliates.

	December 31, 2017			
	Carrying Value	Gross Unrealized Gains	Gross Unrealized Losses	Fair Value
	(In Millions)			
U.S. government and agencies	$ 7,149	$ 566	$ 18	$ 7,697
All other governments	1,181	93	5	1,269
States, territories and possessions	596	56	1	651
Political subdivisions	532	45	1	576
Special revenue	5,814	711	7	6,518
Industrial and miscellaneous	68,140	3,510	308	71,342
Parent, subsidiaries and affiliates	7,023	147	37	7,133
Total	$ 90,435	$ 5,128	$ 377	$ 95,186

The December 31, 2017 gross unrealized losses exclude $24 million of losses included in the carrying value. These losses include $22 million from NAIC Class 6 bonds and $2 million from RMBS and CMBS whose ratings were obtained from outside modelers. These losses were primarily included in industrial and miscellaneous or parent, subsidiaries and affiliates.

The quality of the bond portfolio is determined by the use of SVO ratings and the equivalent rating agency designations, except for RMBS and CMBS that use outside modelers. The following sets forth the NAIC class ratings for the bond portfolio including RMBS and CMBS:

		December 31,			
		2018		2017	
NAIC Class	Equivalent Rating Agency Designation	Carrying Value	% of Total	Carrying Value	% of Total
		($ In Millions)			
1	Aaa/ Aa/ A	$ 53,587	55 %	$ 48,770	54 %
2	Baa	36,789	38	33,221	37
3	Ba	2,852	3	4,253	5
4	B	2,005	2	2,809	3
5	Caa and lower	1,495	2	995	1
6	In or near default	351	-	387	-
	Total	$ 97,079	100 %	$ 90,435	100 %

The following summarizes NAIC ratings for RMBS and CMBS investments subject to NAIC modeling:

	December 31,							
	2018				2017			
	RMBS		CMBS		RMBS		CMBS	
NAIC Class	Carrying Value	% of Total	Carrying Value	% of Total	Carrying Value	% of Total	Carrying Value	% of Total
	($ In Millions)							
1	$ 968	100 %	$ 2,109	95 %	$ 672	100 %	$ 1,749	99 %
2	-	-	23	1	-	-	6	-
3	-	-	-	-	-	-	3	-
4	-	-	11	1	-	-	-	-
5	-	-	48	2	-	-	-	-
6	-	-	24	1	-	-	26	1
	$ 968	100 %	$ 2,215	100 %	$ 672	100 %	$ 1,784	100 %

The following is a summary of the carrying value and fair value of bonds as of December 31, 2018 by contractual maturity. Expected maturities may differ from contractual maturities because issuers may have the right to call or prepay obligations with or without prepayment penalties. Securities with more than one maturity date are included in the table using the final maturity date.

	Carrying Value	Fair Value
	(In Millions)	
Due in one year or less	$ 3,331	$ 3,340
Due after one year through five years	21,610	21,676
Due after five years through ten years	22,357	22,327
Due after ten years	49,781	50,078
Total	$ 97,079	$ 97,421

Sales proceeds and related gross realized capital gains (losses) from bonds were as follows:

	Years Ended December 31, 2018	2017	2016
	(In Millions)		
Proceeds from sales	$ 10,742	$ 6,669	$ 6,097
Gross realized capital gains from sales	151	114	132
Gross realized capital losses from sales	(199)	(153)	(248)

The following is a summary of the fair values and gross unrealized losses aggregated by bond category and length of time that the securities were in a continuous unrealized loss position:

	December 31, 2018					
	Less Than 12 Months			12 Months or Longer		
	Fair Value	Unrealized Losses	Number of Issuers	Fair Value	Unrealized Losses	Number of Issuers
	($ In Millions)					
U.S. government and agencies	$ 10	$ -	7	$ 1,459	$ 21	14
All other governments	586	20	35	255	16	22
States, territories and possessions	9	-	2	88	2	5
Political subdivisions	23	-	4	115	2	7
Special revenue	362	5	52	534	18	96
Industrial and miscellaneous	29,105	865	1,748	16,852	1,071	1,145
Parent, subsidiaries and affiliates	2,146	37	25	3,582	48	8
Total	$ 32,241	$ 927	1,873	$ 22,885	$ 1,178	1,297

The December 31, 2018 gross unrealized losses include $30 million of losses included in the carrying value. These losses include $30 million from NAIC Class 6 bonds and were primarily included in industrial and miscellaneous or parent, subsidiaries and affiliates.

	December 31, 2017					
	Less Than 12 Months			12 Months or Longer		
	Fair Value	Unrealized Losses	Number of Issuers	Fair Value	Unrealized Losses	Number of Issuers
	($ In Millions)					
U.S. government and agencies	$ 857	$ 11	14	$ 194	$ 7	9
All other governments	39	1	11	73	3	15
States, territories and possessions	83	1	3	3	-	4
Political subdivisions	12	-	2	19	-	5
Special revenue	302	2	41	164	5	61
Industrial and miscellaneous	7,161	101	794	5,824	227	678
Parent, subsidiaries and affiliates	3,247	40	6	104	3	5
Total	$ 11,701	$ 156	871	$ 6,381	$ 245	777

The December 31, 2017 gross unrealized losses include $24 million of losses included in the carrying value. These losses include $22 million from NAIC Class 6 bonds and $2 million from RMBS and CMBS whose ratings were obtained from outside modelers. These losses were primarily included in industrial and miscellaneous or parent, subsidiaries and affiliates.

As of December 31, 2018 and 2017, management has not deemed these unrealized losses to be other than temporary because the investment's carrying value is expected to be realized and the Company has the ability and intent not to sell these investments until recovery, which may be at maturity.

As of December 31, 2018, investments in structured and loan-backed securities that had unrealized losses, which were not recognized in earnings, had a fair value of $9,992 million. Securities in an unrealized loss position for less than 12 months had a fair value of $7,859 million and unrealized losses of $141 million. Securities in an unrealized loss position for greater than 12 months had a fair value of $2,133 million and unrealized losses of $78 million. These securities were primarily categorized as industrial and miscellaneous or parent, subsidiaries and affiliates.

As of December 31, 2017, investments in structured and loan-backed securities that had unrealized losses, which were not recognized in earnings, had a fair value of $3,157 million. Securities in an unrealized loss position for less than 12 months had a fair value of $1,504 million and unrealized losses of $18 million. Securities in an unrealized loss position for greater than 12 months had a fair value of $1,653 million and unrealized losses of $49 million. These securities were primarily categorized as industrial and miscellaneous or parent, subsidiaries and affiliates.

In the course of the Company's investment management activities, securities may be sold and reacquired within 30 days to enhance the Company's yield on its investment portfolio. The Company did not sell any securities with the NAIC Designation 3 or below for the years ended December 31, 2018 or 2017, that were reacquired within 30 days of the sale date.

The Company had assets on deposit with government authorities or trustees, as required by law, in the amount of $9 million as of December 31, 2018 and 2017.

Residential mortgage-backed exposure

Residential mortgage-backed securities (RMBS) are included in the U.S. government and agencies, special revenue, and industrial and miscellaneous bond categories. The Alt-A category includes option adjustable-rate mortgages and the subprime category includes 'scratch and dent' or reperforming pools, high loan-to-value pools, and pools where the borrowers have very impaired credit but the average loan-to-value is low, typically 70% or below. In identifying Alt-A and subprime exposure, management used a combination of qualitative and quantitative factors, including FICO scores and loan-to-value ratios.

As of December 31, 2018, RMBS had a total carrying value of $1,287 million and a fair value of $1,395 million, of which approximately 20%, based on carrying value, was classified as Alt-A. Alt-A and subprime RMBS had a total carrying value of $472 million and a fair value of $553 million. As of December 31, 2017, RMBS had a total carrying value of $1,452 million and a fair value of $1,620 million, of which approximately 21%, based on carrying value, was classified as Alt-A. Alt-A and subprime RMBS had a total carrying value of $566 million and a fair value of $687 million.

During the year ended December 31, 2018, there were no significant credit downgrades for the securities held by the Company that were backed by residential mortgage pools.

Leveraged loan exposure

Leveraged loans are loans extended to companies that already have considerable amounts of debt. The Company reports leveraged loans as bonds. These leveraged loans have interest rates higher than typical loans, reflecting the additional risk of default from issuers with high debt-to-equity ratios.

As of December 31, 2018, total leveraged loans and leveraged loan CDOs had a carrying value of $12,376 million and a fair value of $12,290 million, of which approximately 82%, based on carrying value, were domestic leveraged loans and CDOs. As of December 31, 2017, total leveraged loans and leveraged loan CDOs had a carrying value of $10,698 million and a fair value of $10,831 million, of which approximately 84%, based on carrying value, were domestic leveraged loans and CDOs.

Commercial mortgage-backed exposure

The Company holds bonds backed by pools of commercial mortgages. The mortgages in these pools have varying risk characteristics related to underlying collateral type, borrower's risk profile and ability to refinance and the return provided to the borrower from the underlying collateral. These investments had a carrying value of $2,231 million and fair value of $2,238 million as of December 31, 2018 and a carrying value of $1,818 million and fair value of $1,835 million as of December 31, 2017.

b. *Preferred stocks*

The carrying value and fair value of preferred stocks were as follows:

	December 31,	
	2018	2017
	(In Millions)	
Carrying value	$ 744	$ 768
Gross unrealized gains	28	29
Gross unrealized losses	(38)	(11)
Fair value	$ 734	$ 786

As of December 31, 2018, investments in preferred stocks in an unrealized loss position included holdings with a fair value of $507 million in thirteen issuers, $506 million of which were in an unrealized loss position for more than 12 months. As of December 31, 2017, investments in preferred stocks in an unrealized loss position included holdings with a fair value of $545 million in fifteen issuers, $139 million of which were in an unrealized loss position for more than 12 months. Based upon the Company’s impairment review process discussed in *Note 2cc "Realized capital gains (losses) including other-than-temporary impairments and unrealized capital gains (losses)"* the decline in value of these securities was not considered to be other than temporary as of December 31, 2018 or 2017.

The Company held preferred stocks for which the transfer of ownership was restricted by contractual requirements with carrying values of $681 million as of December 31, 2018 and $688 million as of December 31, 2017.

c. Common stocks – subsidiaries and affiliates

The Company has two primary domestic life insurance subsidiaries, C.M. Life, which primarily provides fixed and variable annuities and universal life insurance business, and MML Bay State, a subsidiary of C.M. Life, which primarily issues variable life and bank-owned life insurance (BOLI) policies.

Summarized below is certain combined statutory financial information for the unconsolidated domestic life insurance subsidiaries:

	As of and for the Years Ended December 31,		
	2018	2017	2016
	(In Millions)		
Total revenue	$ 782	$ 691	$ 532
Net income	105	82	82
Assets	12,863	13,323	12,988
Liabilities	11,226	11,750	11,441
Shareholder's equity	1,637	1,573	1,547

MMHLLC, a wholly-owned subsidiary of MassMutual, is the parent of subsidiaries that include Oppenheimer Acquisition Corp. (OAC) and Barings LLC (Barings) and deals in markets that include retail and institutional asset management entities and registered broker dealers.

MMI, a wholly-owned subsidiary of MassMutual, includes investments in international life insurance companies. On December 31, 2018, MMI was transferred from Common stocks - subsidiaries and affiliates to Partnerships and limited liability companies due to the sale of majority interests in two international life insurance operating subsidiaries in 2018.

The MMHLLC statutory carrying value was $9.3 billion as of December 31, 2018 and $9.1 billion as of December 31, 2017. The current fair value of MMHLLC remains greater than its statutory carrying value.

Summarized below is certain U.S. GAAP financial information for MMHLLC. MMI was included in this information for the period ended September 30, 2016. As of October 1, 2016, MMI was no longer a MMHLLC subsidiary.

	As of and for the Years Ended December 31,								
	2018			2017			2016		
	(In Billions)								
	Continuing Operations	Discontinued Operations	Total	Continuing Operations	Discontinued Operations	Total	Continuing Operations	Discontinued Operations	Total
Total revenue	$ 3.1	$ 2.2	$ 5.3	$ 2.8	$ 1.9	$ 4.7	$ 2.2	$ 6.6	$ 8.8
Net income	0.5	0.5	1.0	0.4	0.4	0.8	-	1.6	1.6
Assets	16.5	2.6	19.1	14.7	2.4	17.1	14.3	2.4	16.7
Liabilities	7.5	0.8	8.3	5.7	0.9	6.6	5.4	0.7	6.1
Member's equity	10.8	-	10.8	10.5	-	10.5	10.6	-	10.6

MMHLLC declared $900 million in dividends, of which $250 million was paid for the year ended December 31, 2018 and declared and paid $425 million for the year ended December 31, 2017, and declared and paid $430 million for the year ended December 31, 2016.

MassMutual contributed additional capital of $343 million to MMHLLC for the year ended December 31, 2018, $145 million for the year ended December 31, 2017, and $889 million for the year ended December 31, 2016. The 2016 capital contributions included the transfer of nine investments with book value of $670 million from the Company to MMHLLC. The contribution of the nine investments was recorded at book value, and accordingly, there was no gain or loss recognized.

In October 2018, MassMutual announced a transaction in which Invesco Ltd. (Invesco), a global asset manager, will acquire MassMutual's retail asset management affiliate, OppenheimerFunds, Inc (OFI). In turn, MassMutual is expected to receive an approximate 15.5% common equity interest in the combined company. Under the terms of the agreement, MassMutual and OFI employee shareholders will receive 81.9 million shares of Invesco common equity and $4.0 billion in preferred shares with a fixed dividend rate of 5.9%. As part of this transaction, Invesco and MassMutual will enter into a shareholder agreement in which MassMutual will have customary minority shareholder rights, including appointment of a director to Invesco's board of directors. Pending regulatory and other customary approvals, the transaction is expected to close in the second quarter of 2019.

In March 2017, MassMutual contributed MetLife Securities Inc. Financial Services (MSIFS) to MMHLLC at carrying value of $115 million, which excluded the remaining unamortized statutory goodwill of $35 million. The remaining unamortized statutory goodwill was transferred from MassMutual's carrying value of MSIFS to its carrying value of MMHLLC. MSIFS was subsequently merged with MMHLLC's other broker dealer, MML Investor Services LLC. MMHLLC carried $29 million of goodwill as of December 31, 2018.

Summarized below is certain U.S. GAAP financial information for MMI, which includes discontinued operations:

	As of and for the Years Ended December 31,								
	2018			2017			2016		
	(In Billions)								
	Continuing Operations	Discontinued Operations	Total	Continuing Operations	Discontinued Operations	Total	Continuing Operations	Discontinued Operations	Total
Total revenue	$ -	$ 2.0	$ 2.0	$ -	$ 3.3	$ 3.3	$ -	$ 4.8	$ 4.8
Net income	-	0.4	0.4	(0.3)	0.3	-	-	0.6	0.6
Assets	1.3	-	1.3	-	32.7	32.7	0.6	30.2	30.8
Liabilities	0.3	-	0.3	0.3	29.3	29.6	-	27.7	27.7
Member's equity	1.0	-	1.0	3.1	-	3.1	3.1	-	3.1

In November 2018, MassMutual International (MMI) completed the sale of MassMutual Asia Limited (MM Asia) to Yunfeng Financial Group (Yunfeng FG) and several Asia-based investors. Under the terms of the agreement, MMI received $1,012 million in cash and 800 million shares of Yunfeng FG, which represented approximately 24.8% ownership at the time of the close. In turn, Yunfeng FG will hold a 60% interest in MM Asia and the other investors will hold the remainder. The transaction was initially announced in November of 2017.

In March 2018, MassMutual and MMI entered into an agreement to sell 85.1% of MassMutual Life Insurance Company in Japan (MM Japan), a wholly-owned life insurance and wealth management subsidiary of MMI, to Nippon Life. MMI estimated the fair value of the retained portion of MM Japan based upon an internal valuation model. The sale of MM Japan closed in May 2018. MMI received $960 million in cash proceeds from the sale.

The amount of the proceeds from the sale of MM Japan and MM Asia was less than MMI's book value. As such, MMI's book value was reduced to an estimated fair value of $2,700 million and an impairment of $1,257 million was recorded in net realized capital gains (losses).

MassMutual contributed additional capital of $214 million to MMI during the year ended December 31, 2018 and $56 million during the year ended December 31, 2017.

During the year ended December 31, 2018, MassMutual received $1,583 million as a return of capital from MMI.

Subsidiaries of MMHLLC are involved in litigation and investigations arising in the ordinary course of their business, which seek compensatory damages, punitive damages and equitable remedies. Although the Company is not aware of any actions or allegations that reasonably could give rise to a material adverse impact to the Company's financial position or liquidity, the outcome of litigation cannot be foreseen with certainty. It is the opinion of management that the ultimate resolution of these matters will not materially impact the Company's financial position or liquidity. However, the outcome of a particular proceeding may be material to the Company's Statutory Statements of Changes in Surplus for a particular period depending upon, among other factors, the size of the loss and the level of the Company's changes in surplus for the period.

The Company does not rely on dividends from its subsidiaries to meet its operating cash flow requirements. For the domestic life insurance subsidiaries, substantially all of their statutory shareholder's equity of $1,637 million as of December 31, 2018 was subject to dividend restrictions imposed by the State of Connecticut.

For further information on related party transactions with subsidiaries and affiliates, see *Note 17. "Related party transactions"*.

d. Common stocks - unaffiliated

The adjusted cost basis and carrying value of unaffiliated common stocks were as follows:

	December 31, 2018	December 31, 2017
	(In Millions)	
Adjusted cost basis	$ 453	$ 1,030
Gross unrealized gains	84	223
Gross unrealized losses	(37)	(42)
Carrying value	$ 500	$ 1,212

As of December 31, 2018, investments in unaffiliated common stocks in an unrealized loss position included holdings with a fair value of $98 million in 75 issuers, $51 million of which were in an unrealized loss position for more than 12 months. As of December 31, 2017, investments in unaffiliated common stocks in an unrealized loss position included holdings with a fair value of $253 million in 172 issuers, $146 million of which were in an unrealized loss position for more than 12 months. Based upon the Company's impairment review process discussed in *Note 2cc "Realized capital gains (losses) including other-than-temporary impairments and unrealized capital gains (losses)"* the decline in value of these securities was not considered to be other than temporary as of December 31, 2018 or 2017.

The Company held common stocks, for which the transfer of ownership was restricted by contractual requirements, with carrying values of $159 million as of December 31, 2018 and $275 million as of December 31, 2017.

e. Mortgage loans

Mortgage loans comprised commercial mortgage loans and residential mortgage loans. The Company's commercial mortgage loans primarily finance various types of real estate properties throughout the U.S., the United Kingdom and Canada. The Company holds commercial mortgage loans for which it is the primary lender or a participant or co-lender in a mortgage loan agreement and mezzanine loans that are subordinate to senior secured first liens. The Company's loan agreements with the senior lender contain negotiated provisions that are designed to maximize the Company's influence with the objective of mitigating the Company's risks as the secondary lender for mezzanine loans. Commercial mortgage loans have varying risk characteristics including, among others, the borrower's liquidity, the underlying percentage of completion of a project, the returns generated by the collateral, the refinance risk associated with maturity of the loan and deteriorating collateral value.

Residential mortgage loans are primarily seasoned pools of homogeneous residential mortgage loans substantially backed by Federal Housing Administration (FHA) and Veterans Administration (VA) guarantees. As of December 31, 2018 and 2017, the Company did not have any direct subprime exposure through the purchases of unsecuritized whole-loan pools.

Geographical concentration is considered prior to the purchase of mortgage loans and residential mortgage loan pools. The mortgage loan portfolio is diverse with no significant collateral concentrations in any particular geographic region as of December 31, 2018 or 2017.

The carrying value and fair value of the Company's mortgage loans were as follows:

	December 31, 2018		December 31, 2017	
	Carrying Value	Fair Value	Carrying Value	Fair Value
	(In Millions)			
Commercial mortgage loans:				
Primary lender	$ 22,287	$ 22,723	$ 20,729	$ 21,253
Mezzanine loans	70	71	48	48
Total commercial mortgage loans	22,357	22,794	20,777	21,301
Residential mortgage loans:				
FHA insured and VA guaranteed	1,263	1,207	1,799	1,756
Other residential loans	4	4	4	4
Total residential mortgage loans	1,267	1,211	1,803	1,760
Total mortgage loans	$ 23,624	$ 24,005	$ 22,580	$ 23,061

As of December 31, 2018 and 2017, the loan-to-value ratios of 99% of the Company's commercial mortgage loans were less than 81%.

The Company uses an internal rating system as its primary method of monitoring credit quality. The following illustrates the Company’s mortgage loan portfolio rating, translated into the equivalent rating agency designation:

	December 31, 2018					
	AAA/AA/A	BBB	BB	B	CCC and Lower	Total
	(In Millions)					
Commercial mortgage loans:						
Primary lender	$ 10,903	$ 10,314	$ 874	$ 168	$ 28	$ 22,287
Mezzanine loans	-	-	70	-	-	70
Total commercial mortgage loans	10,903	10,314	944	168	28	22,357
Residential mortgage loans:						
FHA insured and VA guaranteed	1,263	-	-	-	-	1,263
Other residential loans	4	-	-	-	-	4
Total residential mortgage loans	1,267	-	-	-	-	1,267
Total mortgage loans	$ 12,170	$ 10,314	$ 944	$ 168	$ 28	$ 23,624

	December 31, 2017					
	AAA/AA/A	BBB	BB	B	CCC and Lower	Total
	(In Millions)					
Commercial mortgage loans:						
Primary lender	$ 11,498	$ 8,567	$ 468	$ 196	$ -	$ 20,729
Mezzanine loans	-	-	48	-	-	48
Total commercial mortgage loans	11,498	8,567	516	196	-	20,777
Residential mortgage loans:						
FHA insured and VA guaranteed	1,799	-	-	-	-	1,799
Other residential loans	4	-	-	-	-	4
Total residential mortgage loans	1,803	-	-	-	-	1,803
Total mortgage loans	$ 13,301	$ 8,567	$ 516	$ 196	$ -	$ 22,580

The maximum percentage of any one commercial mortgage loan to the estimated value of secured collateral at the time the loan was originated, exclusive of mezzanine, insured, guaranteed or purchase money mortgages, was 81.6% as of December 31, 2018 and 2017. The maximum percentage of any one mezzanine loan to the estimated value of secured collateral at the time the loan was originated was 61.3% as of December 31, 2018 and 2017.

The geographic distribution of commercial mortgage loans was as follows:

	December 31, 2018	
	Carrying Value	Average Loan-to-Value Ratio
	($ In Millions)	
California	$ 5,304	50 %
New York	2,470	49 %
United Kingdom	2,024	48 %
Illinois	1,934	49 %
Texas	1,818	55 %
Washington	1,383	48 %
District of Columbia	1,137	53 %
All other	6,287	52 %
Total commercial mortgage loans	$ 22,357	51 %

All other consists of 28 jurisdictions, with no individual exposure exceeding $818 million.

	December 31, 2017	
	Carrying Value	Average Loan-to-Value Ratio
	($ In Millions)	
California	$ 4,917	49 %
New York	2,161	49 %
Illinois	1,953	49 %
United Kingdom	1,554	48 %
Texas	1,462	55 %
Massachusetts	1,329	47 %
Washington	1,235	55 %
All other	6,166	52 %
Total commercial mortgage loans	$ 20,777	50 %

All other consists of 27 jurisdictions, with no individual exposure exceeding $1,047 million.

Interest rates, including fixed and variable, on the Company's portfolio of mortgage loans were:

	Years Ended December 31			
	2018		2017	
	Low	High	Low	High
Commercial mortgage loans	3.1 %	10.6 %	3.1 %	12.3 %
Residential mortgage loans	3.0 %	11.4 %	2.8 %	11.4 %
Mezzanine mortgage loans	11.4 %	12.0 %	10.4 %	12.0 %

Interest rates, including fixed and variable, on new mortgage loans were:

	Years Ended December 31,			
	2018		2017	
	Low	High	Low	High
Commercial mortgage loans	3.7 %	8.9 %	3.3 %	9.8 %
Residential mortgage loans	3.7 %	4.6 %	3.6 %	4.6 %

As of December 31, 2018 and 2017, the Company had no impaired mortgage loans with or without a valuation allowance or mortgage loans derecognized as a result of foreclosure, including mortgage loans subject to a participant or co-lender mortgage loan agreement with a unilateral mortgage loan foreclosure restriction.

The following presents changes in the valuation allowance recorded for the Company's commercial mortgage loans:

	Years Ended December 31,		
	2018	2017	2016
	Primary Lender		
	(In Millions)		
Beginning balance	$ -	$ (3)	$ -
Additions	-	-	(8)
Decreases	-	3	-
Write-downs	-	-	5
Ending balance	$ -	$ -	$ (3)

The Company did not hold any restructured mortgage loans, mortgage loans with principal or interest past due, or mortgage loans with suspended interest accruals as of December 31, 2018 or 2017. The carrying value of commercial mortgage loans subject to a participant or co-lender mortgage loan agreement was $665 million as of December 31, 2018 and $671 million as of December 31, 2017.

f. Real estate

The carrying value of real estate was as follows:

	December 31,	
	2018	2017
	(In Millions)	
Held for the production of income	$ 1,898	$ 1,806
Accumulated depreciation	(721)	(654)
Encumbrances	(904)	(544)
Held for the production of income, net	273	608
Held for sale	48	559
Accumulated depreciation	(1)	(387)
Encumbrances	(27)	(67)
Held for sale, net	20	105
Occupied by the Company	411	344
Accumulated depreciation	(216)	(200)
Occupied by the Company, net	195	144
Total real estate	$ 488	$ 857

Depreciation expense on real estate was $84 million for the year ended December 31, 2018, $102 million for the year ended December 31, 2017 and $90 million for the year ended December 31, 2016.

g. *Partnerships and limited liability companies*

The carrying value of partnership and LLC holdings by annual statement category were:

	December 31, 2018	December 31, 2017
	(In Millions)	
Joint venture interests:		
Common stocks - subsidiaries and affiliates	$ 3,108	$ 1,978
Common stocks - unaffiliated	1,950	2,210
Real estate	1,309	1,531
Fixed maturities/preferred stock	957	870
Other	280	302
LIHTCs	287	330
Mortgage loans	409	211
Surplus notes	299	246
Total	$ 8,599	$ 7,678

On December 31, 2018, MMI was transferred to Partnerships and limited liability companies from Common stocks - subsidiaries and affiliates. Refer to *Note 5c. Common Stocks – subsidiaries and affiliates* for additional details on MMI.

The Company held nine affiliated partnerships and LLCs in a loss position with accumulated losses of $43 million.

The Company's unexpired tax credits expire within a range of less than 1 year to 13 years.

The Company recorded tax credits on these investments of $47 million for the year ended December 31, 2018 and $49 million for the year ended December 31, 2017. The minimum holding period required for the Company's LIHTC investments extends from 1 year to 15 years.

For determining impairments for LIHTC investments, the Company uses the present value of all future benefits, the majority of which are tax credits, discounted at a risk-free rate ranging from 2.5% for future benefits of two years to 2.7% for future benefits of ten or more years, and compares the result to its current carry value. The Company recorded $5 million of impairments for the year ended December 31, 2018. The Tax Cuts and Jobs Act, enacted into law on December 22, 2017, reduced the statutory federal tax rate from 35% to 21%, effective January 1, 2018. Due to this law change, impairments of $2 million were recorded for the year ended December 31, 2017.

There were no write-downs or reclassifications of LIHTC partnerships made during the years ended December 31, 2018 or December 31, 2017, due to forfeiture or ineligibility of tax credits or similar issues. In addition, there are no LIHTC properties currently subject to regulatory review for the years ended December 31, 2018 or 2017.

h. Derivatives

The Company uses derivative financial instruments in the normal course of business to manage risks, primarily to reduce currency, interest rate and duration imbalances determined in asset/liability analyses. The Company also uses a combination of derivatives and fixed income investments to create synthetic investments. These synthetic investments are created when they are economically more attractive than the actual instrument or when similar instruments are unavailable. Synthetic investments are created either to hedge and reduce the Company's credit and foreign currency exposure or to create an investment in a particular asset. The Company held synthetic investments with a notional amount of $15,522 million as of December 31, 2018 and $13,137 million as of December 31, 2017. These notional amounts included replicated asset transaction values of $13,582 million as of December 31, 2018 and $11,517 million as of December 31, 2017, as defined under statutory accounting practices as the result of pairing of a long derivative contract with cash instruments.

The Company’s derivative strategy employs a variety of derivative financial instruments, including: interest rate, currency, equity, bond, and credit default swaps; options; forward contracts and financial futures. Investment risk is assessed on a portfolio basis and individual derivative financial instruments are not generally designated in hedging relationships; therefore, as allowed by statutory accounting practices, the Company intentionally has not applied hedge accounting.

Interest rate swaps are primarily used to more closely match the cash flows of assets and liabilities. Interest rate swaps are also used to mitigate changes in the value of assets anticipated to be purchased and other anticipated transactions and commitments. The Company uses currency swaps for the purpose of managing currency exchange risks in its assets and liabilities.

The Company does not sell credit default swaps as a participant in the credit insurance market. The Company does, however, use credit default swaps as part of its investment management process. The Company buys credit default swaps as an efficient means to reduce credit exposure to particular issuers or sectors in the Company’s investment portfolio. The Company sells credit default swaps in order to create synthetic investment positions that enhance the return on its investment portfolio by providing comparable exposure to fixed income securities that might not be available in the primary market.

Options grant the purchaser the right to buy or sell a security or enter a derivative transaction at a stated price within a stated period. The Company’s option contracts have terms of up to 15 years. A swaption is an option to enter an interest rate swap to either receive or pay a fixed rate at a future date. The Company purchases these options for the purpose of managing interest rate risks in its assets and liabilities.

The Company adopted a clearly defined hedging strategy (CDHS) to enable the Company to incorporate currently held hedges in risk-based capital (RBC) calculations. The CDHS is used to significantly mitigate the impact that movements in capital markets have on the liabilities associated with annuity guarantees. The hedge portfolio consists mainly of interest rate swaps, equity swaps, interest rate swaptions and equity futures, and provides protection in the stress scenarios under which RBC is calculated. The hedge portfolio has offsetting impacts relative to the total asset requirement for RBC and surplus for GMDB and VAGLB.

The Company utilizes certain other agreements including forward contracts and financial futures. Currency forwards are contracts in which the Company agrees with other parties to exchange specified amounts of identified currencies at a specified future date. Typically, the exchange rate is agreed upon at the time of the contract. In addition, the Company also uses “to be announced” forward contracts (TBAs) to hedge interest rate risk and participate in the mortgage-backed securities market in an efficient and cost effective way. Typically, the price is agreed upon at contract inception and payment is made at a specified future date. The Company usually does not purchase TBAs with settlement by the first possible delivery date and thus, accounts for these TBAs as derivatives. TBAs that settle on the first possible delivery date are accounted for as bonds. The Company’s futures contracts are exchange traded and have credit risk. Margin requirements are met with the deposit of securities. Futures contracts are generally settled with offsetting transactions. Forward contracts and financial futures are used by the Company to reduce exposures to various risks including interest rates and currency rates.

The Company’s principal derivative exposures to market risk are interest rate risk, which includes inflation and credit risk. Interest rate risk pertains to the change in fair value of the derivative instruments as a result of changes in market interest rates. The Company is exposed to credit-related losses in the event of nonperformance by counterparties to derivative financial instruments. The Company regularly monitors counterparty credit ratings, derivative positions, valuations and the value of collateral posted to ensure counterparties are credit-worthy and the concentration of exposure is minimized, and monitors its derivative credit exposure as part of its overall risk management program.

The Company enters derivative transactions through bilateral derivative agreements with counterparties, or through over the counter cleared derivatives with a counterparty and the use of a clearinghouse. To minimize credit risk for bilateral transactions, the Company and its counterparties generally enter into master netting agreements based on agreed upon requirements that outline the framework for how collateral is to be posted in the amount owed under each transaction, subject to certain minimums. For over the counter cleared derivative transactions between the Company and a counterparty, the parties enter into a series of master netting and other agreements that govern, among other things, clearing and collateral requirements. These transactions are cleared through a clearinghouse and each derivative counterparty is only exposed to the default risk of the clearinghouse. Certain interest rate swaps and credit default swaps are considered cleared transactions. These cleared transactions require initial and daily variation margin collateral postings. These agreements allow for contracts in a positive position, in which amounts are due to the Company, to be offset by contracts in a negative position. This right of offset, combined with collateral obtained from counterparties, reduces the Company's credit exposure.

Net collateral pledged by the counterparties was $2,491 million as of December 31, 2018 and $2,493 million as of December 31, 2017. In the event of default, the full market value exposure at risk in a net gain position, net of offsets and collateral, was $146 million as of December 31, 2018 and $115 million as of December 31, 2017. The statutory net amount at risk, defined as net collateral pledged and statement values excluding accrued interest, was $695 million as of December 31, 2018 and $595 million as of December 31, 2017.

The Company had the right to rehypothecate or repledge securities totaling $709 million of the $2,491 million as of December 31, 2018 and $635 million of the $2,493 million as of December 31, 2017 of net collateral pledged by counterparties. There were no securities rehypothecated to other counterparties as of December 31, 2018 or December 31, 2017.

The following summarizes the carrying values and notional amounts of the Company's derivative financial instruments:

	December 31, 2018			
	Assets		Liabilities	
	Carrying Value	Notional Amount	Carrying Value	Notional Amount
	(In Millions)			
Interest rate swaps	$ 6,629	$ 88,214	$ 4,647	$ 86,096
Options	911	19,657	5	3
Currency swaps	843	8,976	232	4,022
Interest rate caps and floors	18	8,465	-	-
Forward contracts	106	6,642	12	3,633
Credit default swaps	18	1,135	2	104
Financial futures	216	3,036	14	291
Total	$ 8,741	$ 136,125	$ 4,912	$ 94,149

	December 31, 2017			
	Assets		Liabilities	
	Carrying Value	Notional Amount	Carrying Value	Notional Amount
	(In Millions)			
Interest rate swaps	$ 7,684	$ 77,193	$ 5,314	$ 86,754
Options	745	10,562	7	420
Currency swaps	386	4,308	569	6,405
Forward contracts	13	1,384	88	6,723
Credit default swaps	29	1,503	1	64
Financial futures	-	3,288	-	-
Total	$ 8,857	$ 98,238	$ 5,979	$ 100,366

The average fair value of outstanding derivative assets was $8,616 million for the year ended December 31, 2018 and $9,271 million for the year ended December 31, 2017. The average fair value of outstanding derivative liabilities was $5,423 million for the year ended December 31, 2018 and $5,957 million for the year ended December 31, 2017.

The following summarizes the notional amounts of the Company's credit default swaps by contractual maturity:

	December 31, 2018	December 31, 2017
	(In Millions)	
Due in one year or less	$ 20	$ -
Due after one year through five years	1,219	1,567
Total	$ 1,239	$ 1,567

The following presents the Company’s gross notional interest rate swap positions:

	December 31, 2018	December 31, 2017
	(In Millions)	
Open interest rate swaps in a fixed pay position	$ 91,240	$ 80,472
Open interest rate swaps in a fixed receive position	81,605	81,676
Other interest related swaps	1,465	1,799
Total interest rate swaps	$ 174,310	$ 163,947

The following summarizes the Company's net realized gains (losses) on closed contracts and change in net unrealized gains (losses) related to market fluctuations on open contracts by derivative type:

	Year Ended December 31, 2018	
	Net Realized Gains (Losses) on Closed Contracts	Change In Net Unrealized Gains (Losses) on Open Contracts
	(In Millions)	
Interest rate swaps	$ (105)	$ (390)
Currency swaps	37	795
Options	(38)	112
Credit default swaps	12	2
Interest rate caps and floors	(3)	6
Forward contracts	175	170
Financial futures	(316)	200
Total	$ (238)	$ 895

	Year Ended December 31, 2017	
	Net Realized Gains (Losses) on Closed Contracts	Change In Net Unrealized Gains (Losses) on Open Contracts
	(In Millions)	
Interest rate swaps	$ (224)	$ 202
Currency swaps	94	(1,082)
Options	(172)	(151)
Credit default swaps	23	-
Forward contracts	(147)	(72)
Financial futures	112	1
Total	$ (314)	$ (1,102)

	Year Ended December 31, 2016	
	Net Realized Gains (Losses) on Closed Contracts	Change In Net Unrealized Gains (Losses) on Open Contracts
	(In Millions)	
Interest rate swaps	$ (2)	$ (65)
Currency swaps	24	368
Options	(131)	(13)
Credit default swaps	16	2
Forward contracts	303	(46)
Financial futures	(217)	-
Total	$ (7)	$ 246

The following summarizes gross and net information of derivative assets and liabilities, along with collateral posted in connection with master netting agreements:

	December 31, 2018			December 31, 2017		
	Derivative Assets	Derivative Liabilities	Net	Derivative Assets	Derivative Liabilities	Net
	(In Millions)					
Gross	$ 8,741	$ 4,912	$ 3,829	$ 8,857	$ 5,979	$ 2,878
Due and accrued	839	1,899	(1,060)	867	1,781	(914)
Gross amounts offset	(6,034)	(6,034)	-	(6,936)	(6,936)	-
Net asset	3,546	777	2,769	2,788	824	1,964
Collateral posted	(3,657)	(1,166)	(2,491)	(3,296)	(803)	(2,493)
Net	$ (111)	$ (389)	$ 278	$ (508)	$ 21	$ (529)

i. Repurchase agreements

The Company had repurchase agreements with carrying values of $4,768 million as of December 31, 2018 and $4,204 million as of December 31, 2017. As of December 31, 2018, the maturities of these agreements ranged from January 4, 2019 through February 5, 2019 and the interest rates ranged from 2.4% to 2.7%. The outstanding amounts were collateralized by cash and bonds with a carrying value of $4,794 million as of December 31, 2018 and $4,221 million as of December 31, 2017.

j. Net investment income

Net investment income, including IMR amortization, comprised the following:

	Years Ended December 31,		
	2018	2017	2016
	(In Millions)		
Bonds	$ 4,062	$ 3,712	$ 3,583
Preferred stocks	35	17	24
Common stocks - subsidiaries and affiliates	910	436	431
Common stocks - unaffiliated	43	39	59
Mortgage loans	997	928	1,009
Policy loans	857	797	757
Real estate	110	159	174
Partnerships and LLCs	1,030	658	460
Derivatives	313	305	343
Cash, cash equivalents and short-term investments	71	42	33
Other	6	2	-
Subtotal investment income	8,434	7,095	6,873
Amortization of the IMR	64	113	135
Investment expenses	(724)	(666)	(674)
Net investment income	$ 7,774	$ 6,542	$ 6,334

k. Net realized capital (losses) gains

Net realized capital losses, which include other-than-temporary impairments (OTTI) and are net of deferral to the IMR, comprised the following:

	Years Ended December 31,		
	2018	2017	2016
	(In Millions)		
Bonds	$ (169)	$ (102)	$ (248)
Preferred stocks	-	(6)	9
Common stocks - subsidiaries and affiliates	(1,242)	27	11
Common stocks - unaffiliated	92	(9)	(60)
Mortgage loans	(1)	(27)	(14)
Real estate	168	68	14
Partnerships and LLCs	(57)	(87)	(94)
Derivatives	(238)	(314)	(7)
Other	(29)	(135)	(4)
Net realized capital (losses) before federal and state taxes and deferral to the IMR	(1,476)	(585)	(393)
Net federal and state tax benefit	48	175	40
Net realized capital (losses) before deferral to the IMR	(1,428)	(410)	(353)
Net after tax losses (gains) deferred to the IMR	384	(12)	145
Net realized capital (losses)	$ (1,044)	$ (422)	$ (208)

IMR had an asset balance of $563 million as of December 31, 2018 and $112 million as of December 31, 2017, which was nonadmitted. Refer to *Note 14. "Surplus notes"* for information on the other realized capital loss.

OTTI, included in the realized capital losses, consisted of the following:

	Years Ended December 31,		
	2018	2017	2016
	(In Millions)		
Bonds	$ (121)	$ (64)	$ (78)
Preferred stock	-	(6)	(1)
Common stocks- subsidiaries and affiliates	(1,259)		
Common stocks - unaffiliated	(12)	(62)	(11)
Mortgage loans	-	-	(7)
Partnerships and LLCs	(62)	(53)	(91)
Total OTTI	$ (1,454)	$ (185)	$ (188)

The Company recognized OTTI less than $1 million for the year ended December 31, 2018 and $7 million for the year ended December 31, 2017 on structured and loan-backed securities, which are included in bonds, primarily due to the present value of expected cash flows being less than the amortized cost.

The Company utilized internally-developed models to determine less than 1% of the $121 million of bond OTTI for the year ended December 31, 2018, less than 1% of the $64 million of bond OTTI for the year ended December 31, 2017 and less than 1% of the $78 million of bond OTTI for the year ended December 31, 2016. The remaining OTTI amounts were determined using external inputs such as publicly observable fair values and credit ratings. Refer *to Note 2cc "Realized capital gains (losses) including other-than-temporary impairments and unrealized capital gains (losses)"* for more information on assumptions and inputs used in the Company's OTTI models.

Refer to *Note 20. "Impairment listing for loan-backed and structured securities"* for a CUSIP level list of impaired structured securities where the present value of cash flows expected to be collected is less than the amortized cost basis.

6. Federal income taxes

On December 22, 2017, the president signed into law H.R. 1/Public Law 115-97, commonly known as the Act. The Act contains several key provisions that have significant financial statement effects in both the current and prior reporting periods. Effective January 1, 2018, the Act reduces the corporate tax rate to 21 percent, eliminates the corporate alternative minimum tax, increases the capitalization rates for determining deferred acquisition costs and extends the amortization period, modifies the life company proration rules, reduces the dividends received deduction applicable to corporate shareholders, and modifies the net operating loss deduction applicable to corporate taxpayers. The Act also imposed in 2017 a tax liability for mandatory deemed repatriation of previously untaxed foreign earnings, changed the method for computing deductions for life insurance reserves, introduced new taxes on foreign subsidiaries, and modified the provision for expensing of certain capital costs.

As a result of the reduction of the corporate tax rate to 21 percent, the Company remeasured its net admitted deferred taxes as of the enactment date and recognized a decrease in surplus of $507 million in 2017. Of the $507 million net decrease, $919 million was reflected in the change in other deferred income taxes, $27 million was reflected in the change in net unrealized foreign exchange capital gains (losses), offset by increases of $439 million reflected in the change in net unrealized capital gains (losses).

Effective January 1, 2018, the Act increased the capitalization rates for determining specified policy acquisition expenses. The provision increases the capitalization rate for annuity contracts from 1.75 percent to 2.09 percent, the rate for group life insurance contracts from 2.05 percent to 2.45 percent, and the rate for all other specified insurance contracts from 7.7 percent to 9.2 percent. This provision extends the amortization period for capitalized deferred acquisition costs (DAC) to 180 months from 120 months. A transition rule allows capitalized DAC as of December 31, 2017 to continue to be amortized over 10-years.

Effective January 1, 2018, the Act modified the life company proration rules by defining the company's share as 70 percent and the policyholders' share as 30 percent for purposes of the dividends received deduction and tax-exempt interest income.

Effective January 1, 2018, the Act reduced the dividends received deduction applicable to corporate shareholders for the 70 percent deductions to 50 percent, and for the 80 percent deduction to 65 percent. The 100 percent dividends received deduction remains in effect for dividends from affiliated group members.

The Act modifies the deduction for NOLs and imposes the general corporate regime on life insurers. Under prior law, NOLs generally had a carry back period of two years (three years in the case of a life insurance company) and a carryforward period of 20 years (15 years in the case of a life insurance company). The Act eliminates the carry back period and makes the carryforward period indefinite. The amount of the NOL deduction allowed is limited to 80 percent of taxable income computed without regard to the NOL deduction. This provision applies to NOLs arising in taxable years beginning after December 31, 2017.

Under the Act, a company is required to establish a liability for taxes due on mandatory deemed repatriation of previously untaxed foreign earnings. The Company recorded a provisional tax benefit of $3 million in the Statutory Statements of Operations for year ended December 31, 2017. The Company has completed the calculation of the deemed repatriation tax liability and reported $1 million decrease in income tax expense for year ended December 31, 2018.

The Act revised the computation of life insurance tax reserves to be the greater of the net surrender value of a contract and 92.81 percent of statutory reserves. The revised reserve computation is effective for taxable years beginning after December 31, 2017. A transition rule requires life insurers to evenly spread the difference between the prior year end reserves computed on the old basis and those computed on the new basis over eight years as either income or a deduction. For the year ended December 31, 2017, the Company recorded an estimated provision for this change by recognizing a net $487 million increase in its deferred tax asset, offset by a corresponding increase in its deferred tax liability (DTL) that will reverse over the eight year transition period. The Company adjusted this provisional amount for year ended December 31, 2018 by recognizing a $63 million decrease in its DTA, offset by a corresponding decrease in its DTL. In addition, the Company recognized $53 million in income tax expense reported on the Statutory Statements of Operations to reflect the first year's amortization of the eight-year transition rule.

The Act introduces a new tax on global intangible low-taxed income. Generally, a CFC may incur a global intangible low taxed income (GILTI) tax if its income exceeds a prescribed return on its tangible business property. For the year ended December 31, 2018, the estimated GILTI tax was deminimis.

The Act introduces full expensing as the principal capital cost recovery regime, increasing the current first-year "bonus" depreciation deduction from 50 percent to 100 percent on a temporary basis of the cost of qualified plant and equipment acquired and placed in service after September 27, 2017 and before January 1, 2023. The 100 percent bonus depreciation rule applies through 2022, then phases down 20 percent annually through 2026. For qualified property acquired before September 27, 2017, the applicable bonus percentage is 50 percent if placed in service before January 1, 2018, 40 percent if placed in service in 2018, 30 percent if placed in service in 2019, and 0 percent thereafter. The Company recorded a provisional current tax benefit of $22 million for qualified property acquired and placed in service after September 27, 2017, offset by a corresponding (DTL) that will reverse over the useful life of the qualified property. For the year ended December 31, 2018, the Company updated the provisional estimate by recording an additional current tax expense of $5.8 million, offset by a corresponding deferred tax asset that will reverse over the useful life of the qualified property.

The Company provides for DTAs in accordance with statutory accounting practices and has met the required threshold to utilize the three-year reversal period and 15% of surplus limitation.

The net DTA or deferred tax liability (DTL) recognized in the Company's assets, liabilities and surplus is as follows:

	December 31, 2018		
	Ordinary	Capital	Total
	(In Millions)		
Gross DTAs	$ 2,655	$ 334	$ 2,989
Statutory valuation allowance adjustment	-	-	-
Adjusted gross DTAs	2,655	334	2,989
DTAs nonadmitted	-	-	-
Subtotal net admitted DTA	2,655	334	2,989
Total gross DTLs	(1,548)	(458)	(2,006)
Net admitted DTA(L)	$ 1,107	$ (124)	$ 983

	December 31, 2017		
	Ordinary	Capital	Total
	(In Millions)		
Gross DTAs	$ 2,479	$ 154	$ 2,633
Statutory valuation allowance adjustment	-	-	-
Adjusted gross DTAs	2,479	154	2,633
DTAs nonadmitted	-	-	-
Subtotal net admitted DTA	2,479	154	2,633
Total gross DTLs	(1,637)	(235)	(1,872)
Net admitted DTA(L)	$ 842	$ (81)	$ 761

	Change		
	Ordinary	Capital	Total
	(In Millions)		
Gross DTAs	$ 176	$ 180	$ 356
Statutory valuation allowance adjustment	-	-	-
Adjusted gross DTAs	176	180	356
DTAs nonadmitted	-	-	-
Subtotal net admitted DTA	176	180	356
Total gross DTLs	89	(223)	(134)
Net admitted DTA(L)	$ 265	$ (43)	$ 222

The amount of adjusted gross DTA admitted under each component of the guidance and the resulting change by tax character are as follows:

	December 31, 2018		
	Ordinary	Capital	Total
	(In Millions)		
Admitted DTA 3 years:			
Federal income taxes that can be recovered	$ -	$ 52	$ 52
Remaining adjusted gross DTAs expected to be realized within 3 years (lesser of 1 or 2):			
1. Adjusted gross DTA to be realized	1,019	-	1,019
2. Adjusted gross DTA allowed per limitation threshold	2,055	-	2,055
Lesser of lines 1 or 2	1,019	-	1,019
Adjusted gross DTAs offset by existing DTLs	1,636	282	1,918
Total admitted DTA realized within 3 years	$ 2,655	$ 334	$ 2,989

	December 31, 2017		
	Ordinary	Capital	Total
	(In Millions)		
Admitted DTA 3 years:			
Federal income taxes that can be recovered	$ -	$ 67	$ 67
Remaining adjusted gross DTAs expected to be realized within 3 years			
1. Adjusted gross DTA to be realized	880	-	880
2. Adjusted gross DTA allowed per limitation threshold	2,202	-	2,202
Lesser of lines 1 or 2	880	-	880
Adjusted gross DTAs offset by existing DTLs	1,599	87	1,686
Total admitted DTA realized within 3 years	$ 2,479	$ 154	$ 2,633

	Change		
	Ordinary	Capital	Total
	(In Millions)		
Admitted DTA 3 years:			
Federal income taxes that can be recovered	$ -	$ (15)	$ (15)
Remaining adjusted gross DTAs expected to be realized within 3 years			
1. Adjusted gross DTA to be realized	139	-	139
2. Adjusted gross DTA allowed per limitation threshold	(147)	-	(147)
Lesser of lines 1 or 2	139	-	139
Adjusted gross DTAs offset by existing DTLs	37	195	232
Total admitted DTA realized within 3 years	$ 176	$ 180	$ 356

Effective January 1, 2018, the Act eliminates the ability to carryback net operating losses, therefore the amount of adjusted gross DTA admitted based on recoverable federal taxes is limited only to capital DTAs.

The Company's total realization threshold limitations are as follows:

	December 31, 2018	December 31, 2017
	($ In Millions)	
Ratio percentage used to determine recovery period and threshold limitation	861%	867%
Amount of adjusted capital and surplus used to determine recovery period and threshold limitation above	$ 13,700	$ 14,933

The ultimate realization of DTAs depends on the generation of future taxable income during the periods in which the temporary differences are deductible. Management considers the scheduled reversal of DTLs, including the impact of available carryback and carryforward periods, projected taxable income and tax-planning strategies in making this assessment. The impact of tax-planning strategies is as follows:

	December 31, 2018		
	Ordinary	Capital	Total
	(Percent)		
Impact of tax-planning strategies:			
Adjusted gross DTAs (% of total adjusted gross DTAs)	- %	- %	- %
Net admitted adjusted gross DTAs (% of total net admitted adjusted gross DTAs)	77 %	- %	77 %

	December 31, 2017		
	Ordinary	Capital	Total
	(Percent)		
Impact of tax-planning strategies:			
Adjusted gross DTAs (% of total adjusted gross DTAs)	- %	- %	- %
Net admitted adjusted gross DTAs (% of total net admitted adjusted gross DTAs)	57 %	- %	57 %

	Change		
	Ordinary	Capital	Total
	(Percent)		
Impact of tax-planning strategies:			
Adjusted gross DTAs (% of total adjusted gross DTAs)	- %	- %	- %
Net admitted adjusted gross DTAs (% of total net admitted adjusted gross DTAs)	20 %	- %	20 %

There are no reinsurance strategies included in the Company's tax-planning strategies.

The provision for current tax expense on earnings is as follows:

	Years Ended December 31,		
	2018	2017	2016
	(In Millions)		
Federal income tax benefit on operating earnings	$ (174)	$ (300)	$ (333)
Foreign income tax expense on operating earnings	1	2	7
Total federal and foreign income tax benefit before impact of change in enacted legislation	(173)	(298)	(326)
Impact of change in enacted tax legislation on operating earnings	5	(22)	-
Total federal and foreign income tax benefit on operating earnings	(168)	(320)	(326)
Federal income tax benefit on net realized capital gains (losses) before impact of change in enacted legislation	(48)	(178)	(40)
Impact of change in enacted tax legislation on net realized capital gains (losses)	-	3	-
Total federal and foreign income tax benefit	$ (216)	$ (495)	$ (366)

The tax effects of temporary differences that give rise to significant portions of the DTAs and DTLs are as follows:

	December 31,		
	2018	2017	Change
	(In Millions)		
DTAs:			
Ordinary			
Reserve items	$ 1,141	$ 1,059	$ 82
Policy acquisition costs	505	459	46
Nonadmitted assets	349	293	56
Pension and compensation related items	184	191	(7)
Policyholders' dividends	196	189	7
Investment items	135	150	(15)
Expense items	54	45	9
Unrealized investment losses	2	3	(1)
Other	89	90	(1)
Total ordinary DTAs	2,655	2,479	176
Nonadmitted DTAs	-	-	-
Admitted ordinary DTAs	2,655	2,479	176
Capital			
Unrealized investment losses	187	111	76
Investment items	147	43	104
Total capital DTAs	334	154	180
Admitted capital DTAs	334	154	180
Admitted DTAs	2,989	2,633	356
DTLs:			
Ordinary			
Reserve items	494	528	(34)
Unrealized investment gains	416	498	(82)
Deferred and uncollected premium	227	212	15
Pension items	214	180	34
Investment Items	-	46	(46)
Other	197	173	24
Total ordinary DTLs	1,548	1,637	(89)
Capital			
Unrealized investment gains	458	235	223
Total capital DTLs	458	235	223
Total DTLs	2,006	1,872	134
Net admitted DTA	$ 983	$ 761	$ 222

The change in net deferred income taxes comprised the following:

	Years Ended December 31, 2018	2017	2016
	(In Millions)		
Net DTA(L)	$ 222	$ (889)	$ 352
Less: Items not recorded in the change in net deferred income taxes:			
Tax-effect of unrealized gains/(losses)	69	(188)	(59)
Tax-effect of changes from acquisitions/transfers	-	(7)	(46)
Change in net deferred income taxes	$ 291	$ (1,084)	$ 247

The change in net deferred income taxes in 2017 includes a decrease of $507 million due to the remeasurement of net DTA(L), of which an increase of $412 million is reflected in the change in unrealized gains/(losses).

As of December 31, 2018, the Company had no net operating or capital loss carryforwards to include in deferred income taxes. The Company has no tax credit carryforwards included in deferred taxes.

The components of federal and foreign income tax are recorded in the Statutory Statements of Operations and the Statutory Statements of Changes in Surplus and are different from those which would be obtained by applying the prevailing federal income tax rate to net gain from operations before federal income taxes. The significant items causing this difference are as follows:

	Years Ended December 31, 2018	2017	2016
	(In Millions)		
	21%	35%	35%
Provision computed at statutory rate	$ (299)	$ (151)	$ (184)
Corporate rate reduction	-	919	-
Change in reserve valuation basis	(7)	15	26
Expense items	2	6	16
Foreign governmental income taxes	1	2	6
Investment items	(21)	(250)	(322)
Nonadmitted assets	(56)	67	(99)
Tax credits	(47)	(51)	(48)
Other impacts of tax reform	-	4	-
Other	(79)	28	(8)
Total statutory income tax expense (benefit)	$ (506)	$ 589	$ (613)
Federal and foreign income tax benefit	$ (215)	$ (495)	$ (366)
Change in net deferred income taxes	(291)	1,084	(247)
Total statutory income tax expense (benefit)	$ (506)	$ 589	$ (613)

The Company received federal income tax refunds of $162 million in 2018, paid $3 million in 2017, and received refunds of $353 million in 2016.

The total income taxes incurred in the current and prior years that will be available for recoupment in the event of future net losses total nil related to December 31, 2018, 2017, and 2016.

MassMutual and its eligible U.S. subsidiaries are included in a consolidated U.S. federal income tax return. MassMutual and its eligible U.S. subsidiaries also file income tax returns in various states and foreign jurisdictions. MassMutual and its eligible U.S. subsidiaries and certain affiliates (the Parties) have executed and are subject to a written tax allocation agreement (the Agreement). The Agreement sets forth the manner in which the total combined federal income tax is allocated among the Parties. The Agreement provides MassMutual with the enforceable right to recoup federal income taxes paid in prior years in the event of future net capital losses, which it may incur. Further, the Agreement provides MassMutual with the enforceable right to utilize its net losses carried forward as an offset to future net income subject to federal income taxes.

Companies are generally required to disclose unrecognized tax benefits, which are the tax effect of positions taken on their tax returns that may be challenged by various taxing authorities, in order to provide users of financial statements more information regarding potential liabilities. The Company recognizes tax benefits and related reserves in accordance with existing statutory accounting practices for liabilities, contingencies and impairments of assets.

The following is a reconciliation of the beginning and ending liability for unrecognized tax benefits (in millions):

Balance, January 1, 2018	$	191
Gross change related to positions taken in prior years		-
Gross change related to settlements		(66)
Gross change related to positions taken in current year		11
Gross change related to lapse of statutes of limitations		-
Balance, December 31, 2018	$	136

Included in the liability for unrecognized tax benefits as of December 31, 2018, are $129 million of tax positions for which the ultimate deductibility is highly certain but for which there is uncertainty about the timing of such deductibility. The liability for the unrecognized tax benefits as of December 31, 2018 includes $5 million of unrecognized tax benefits that, if recognized, would impact the Company's effective tax rate.

The Company recognized a decrease of $23 million in accrued interest related to the liability for unrecognized tax benefits as a component of the provision for income taxes. The amount of net interest recognized was $14 million as of December 31, 2018 and $37 million as of December 31, 2017. The Company has no accrued penalties related to the liability for unrecognized tax benefits. In the next year, the Company does not anticipate the total amount of uncertain tax positions to significantly increase or decrease.

The Internal Revenue Service (IRS) has completed its examination of MassMutual and its subsidiaries for the years 2013 and prior. The IRS commenced its exam of years 2014-2016 in September 2017. The adjustments resulting from these examinations are not expected to materially affect the financial position or liquidity of the Company.

As of December 31, 2018 and 2017, the Company did not recognize any protective deposits as admitted assets.

7. Other than invested assets

a. Corporate-owned life insurance

The Company holds corporate-owned life insurance issued by unaffiliated third party insurers to cover the lives of certain qualified senior employees. The primary purpose of the program is to offset future employee benefit expenses. The Company pays all premiums and is the owner and beneficiary of these policies. The Company had recorded cash surrender values of these policies of $2,115 million as of December 31, 2018 and $2,104 million as of December 31, 2017. The cash surrender value is allocated 19% cash and short-term investments, 34% other invested assets, 17% stocks, 28% bonds and 2% real estate as of December 31, 2018, and 17% cash and short-term investments, 28% other invested assets, 19% stocks, 35% bonds and 1% real estate as of December 31, 2017.

b. Deferred and uncollected life insurance premium

Deferred and uncollected life insurance premium, net of loading and reinsurance, are included in other than invested assets in the Company’s Statutory Statements of Financial Position. The following summarizes the deferred and uncollected life insurance premium on a gross basis, as well as, net of loading and reinsurance:

	December 31,			
	2018		2017	
	Gross	Net	Gross	Net
	(In Millions)			
Ordinary new business	$ 151	$ 48	$ 151	$ 47
Ordinary renewal	810	883	751	798
Group life	11	11	10	10
Total	$ 972	$ 942	$ 912	$ 855

Deferred premium is the portion of the annual premium not earned at the reporting date. Loading on deferred premium is an amount obtained by subtracting the valuation net deferred premium from the gross deferred premium and generally includes allowances for acquisition costs and other expenses. Refer to *Note 2r. "Policyholders' reserves"* for information on the Company’s accounting policies regarding gross premium and net premium.

Uncollected premium is gross premium net of reinsurance that is due and unpaid as of the reporting date, net of loading. Net premium is the amount used in the calculation of reserves. The change in deferred and uncollected life insurance premium is included in premium income. The change in loading is included as an expense and is not shown as a reduction to premium income.

Ordinary new business and ordinary renewal business consist of the basic amount of premium required on the underlying life insurance policies.

In certain instances, gross premium is less than net premium according to the standard valuation set by the Division and the Department. The gross premium is less than the net premium needed to establish the reserves because the statutory reserves must use standard conservative valuation mortality tables, while the gross premium calculated in pricing uses mortality tables that reflect both the Company’s experience and the transfer of mortality risk to reinsurers. The Company had life insurance in force of $33,798 million as of December 31, 2018 and $31,952 million as of December 31, 2017 for which gross premium was less than net premium.

8. Policyholders' liabilities

a. Policyholders' reserves

The Company had life insurance in force of $676,813 million as of December 31, 2018 and $621,740 million as of December 31, 2017.

The following summarizes policyholders' reserves, net of reinsurance, and the range of interest rates by type of product:

	December 31,										
	2018					2017					
	Amount		Interest Rates			Amount		Interest Rates			
	($ In Millions)										
Individual life	$	55,059	2.5%	-	6.0%	$	51,295	2.5%	-	6.0%	
Group life		17,220	2.5%	-	4.5%		16,486	2.5%	-	4.5%	
Group annuities		26,382	2.3%	-	11.3%		24,718	2.3%	-	11.3%	
Individual annuities		13,659	2.3%	-	11.8%		14,123	2.3%	-	11.8%	
Individual universal and variable life		6,355	3.5%	-	6.0%		5,957	3.5%	-	6.0%	
Disabled life claim reserves		1,847	3.5%	-	6.0%		1,852	3.5%	-	6.0%	
Disability active life reserves		1,121	3.5%	-	6.0%		1,007	3.5%	-	6.0%	
Other		335	2.5%	-	6.0%		326	2.5%	-	6.0%	
Total	$	121,978				$	115,764				

Individual life includes whole life and term insurance. Group life includes corporate-owned life insurance, bank-owned life insurance, group universal life and group variable universal life products. Individual annuities include individual annuity contracts, supplementary contracts involving life contingencies and structured settlements. Group annuities include deferred annuities and single premium annuity contracts. Disabled life claim reserves include disability income and LTC contracts and cover the future payments of known claims. Disability active life reserves include disability income and LTC contracts issued. Other is comprised of disability life and accidental death insurance.

The Company evaluated the accounting for payout annuities and determined that certain contracts did not contain mortality risk, and therefore, should have been classified as a deposit-type contract rather than policyholder reserves. As a result, approximately $1,329 million classified as policyholders' reserves as of December 31, 2017 were classified as liabilities for deposit-type contracts in 2018. Additionally, the related impacts within the Company's Statements of Operations and the Statements of Cash Flows reflect this classification. There were no corresponding differences in valuation, and as a result, there were no impacts to surplus or net income.

b. Liabilities for deposit-type contracts

The following summarizes liabilities for deposit-type contracts and the range of interest rates by type of product:

	December 31,			
	2018		2017	
	Amount	Interest Rates	Amount	Interest Rates
	($ In Millions)			
Guaranteed interest contracts:				
Note programs	$ 5,987	1.6% - 6.2%	$ 6,233	1.6% - 6.2%
Federal Home Loan Bank of Boston	1,104	1.4% - 3.4%	1,054	1.4% - 2.6%
Municipal contracts	815	1.3% - 7.3%	761	1.3% - 7.3%
Other	919	1.2% - 3.7%	787	1.0% - 9.7%
Supplementary contracts	2,477	0.6% - 6.8%	834	0.3% - 7.0%
Dividend accumulations	509	3.0% - 3.6%	522	3.2% - 4.0%
Other deposits	2,559	4.0% - 8.0%	2,823	4.0% - 8.0%
Total	$ 14,370		$ 13,014	

Note programs

Funding agreements are investment contracts sold to domestic and international institutional investors. Funding agreement liabilities are equal to the account value and are established by contract deposits, increased by interest credited and decreased by contract coupon payments and maturities. Contract holders do not have the right to terminate the contract prior to the contractually stated maturity date. The Company may retire funding agreements prior to the contractually-stated maturity date by repurchasing the agreement in the market or, in some cases, by calling the agreement. If this occurs, the difference in value is an adjustment to interest credited to liabilities for deposit-type contracts in the Statutory Statements of Operations. Credited interest rates vary by contract and can be fixed or floating. Agreements do not have put provisions or ratings-based triggers. The liability of non-U.S. dollar denominated funding agreements may increase or decrease due to changes in foreign exchange rates. Currency swaps are employed to eliminate foreign exchange risk from all funding agreements issued to back non-U.S. dollar denominated notes.

Under the note programs, the Company creates special purpose entities (SPEs), which are investment vehicles or trusts, for the purpose of issuing medium-term notes to investors. Proceeds from the sale of the medium-term notes issued by these SPEs are used to purchase funding agreements from the Company. The payment terms of any particular series of notes are matched by the payment terms of the funding agreement securing the series. Notes were issued from the Company's $2.0 billion European Medium-Term Note Program with approximately $113 million outstanding as of December 31, 2018. Notes are currently issued from the Company's $21.0 billion Global Medium-Term Note Program.

Federal Home Loan Bank of Boston

The Company has funding agreements with Federal Home Loan Bank of Boston (FHLB Boston) in an investment spread strategy, consistent with its other funding agreements. These funding agreements are collateralized by securities with estimated fair values of $1,090 million as of December 31, 2018. The Company's borrowing capacity with FHLB Boston is subject to the lower of the limitation on the pledge of collateral for a loan set forth by law or by the Company's internal limit. The Company's unused capacity was $896 million as of December 31, 2018. As a member of FHLB Boston, the Company held common stock of FHLB Boston with a statement value of $74 million as of December 31, 2018 and December 31, 2017.

Municipal contracts

Municipal guaranteed investment contracts (municipal contracts) include contracts that contain terms with above market crediting rates. Liabilities for these contracts includes the municipal contracts' account values, which are established by contract deposits, increased by interest credited (fixed or floating) and decreased by contract coupon payments, additional withdrawals, maturities and amortization of premium. Certain municipal contracts allow additional deposits, subject to restrictions, which are credited based on the rates in the contracts. Contracts have scheduled payment dates and amounts and interest is paid periodically. In addition, certain contracts allow additional withdrawals above and beyond the scheduled payments. These additional withdrawals have certain restrictions on the number per year, minimum dollar amount and are limited to the maximum contract balance. The majority of the municipal contracts allow early contract termination under certain conditions.

Certain municipal contracts contain make-whole provisions, which document the formula for full contract payout. Certain municipal contracts have ratings-based triggers that allow the trustee to declare the entire balance due and payable. Municipal contracts may also have terms that require the Company to post collateral to a third party based on the contract balance in the event of a downgrade in ratings below certain levels under certain circumstances. When the collateral is other than cash, the collateral value is required to be greater than the account balance. The collateral was $158 million as of December 31, 2018 and $169 million as of December 31, 2017. The Company employs a rigorous asset/liability management process to help mitigate the economic impacts of various liability risks. By performing asset liability management and performing other risk management activities, the Company believes that these contract provisions do not create an undue level of operating risk to the Company.

Other deposits

Other deposits primarily consist of investment contracts assumed as part of the indemnity reinsurance agreement discussed in *Note 9. "Reinsurance"*. These contracts are used to fund retirement plans. Contract payments are not contingent upon the life of the retirement plan participant.

As of December 31, 2018, the Company's GICs by expected maturity year were as follows (in millions):

2019	$	1,528
2020		1,407
2021		1,394
2022		1,123
2023		193
Thereafter		3,180
Total	$	8,825

Most guaranteed interest contracts only mature on their contractual maturity date. Actual maturities for municipal contracts may differ from their contractual maturity dates, as these contracts permit early contract termination under certain conditions.

c. Unpaid claims and claim expense reserves

The Company establishes unpaid claims and claim expense reserves to provide for the estimated costs of claims for individual disability and LTC policies. These reserves include estimates for both claims that have been reported and those that have been incurred but not reported, and include estimates of all future expenses associated with the processing and settling of these claims. This estimation process is primarily based on the assumption that experience is an appropriate indicator of future events and involves a variety of actuarial techniques that analyze experience, trends and other relevant factors. The amounts recorded for unpaid claims and claim expense reserves represent the Company's best estimate based upon facts and actuarial guidelines. Accordingly, actual claim payouts may vary from these estimates.

The following summarizes the changes in disabled life and LTC unpaid claims and claim expense reserves:

	December 31, 2018	December 31, 2017
	(In Millions)	
Claim reserves, beginning of year	$ 2,069	$ 2,083
Less: Reinsurance recoverables	192	163
Net claim reserves, beginning of year	1,877	1,920
Claims paid related to:		
Current year	(13)	(12)
Prior years	(334)	(335)
Total claims paid	(347)	(347)
Incurred related to:		
Current year's incurred	241	223
Current year's interest	3	3
Prior year's incurred	22	(4)
Prior year's interest	78	82
Total incurred	344	304
Net claim reserves, end of year	1,874	1,877
Reinsurance recoverables	228	192
Claim reserves, end of year	$ 2,102	$ 2,069

The changes in reserves for incurred claims related to prior years are generally the result of recent loss development trends. The $22 million increase in the prior years' incurred claims for 2018 and the $4 million decrease in the prior years' incurred claims for 2017 were generally the result of differences between actual termination experience and statutorily prescribed termination tables. In 2017 claim experience included normal claim volume with higher terminations, resulting in a reduction to the incurred reserve from favorable experience, while 2018 claims incurred was due to maturing LTC business partially offset by a corresponding increase in reinsurance recoverable.

The following reconciles disabled life claim reserves to the net claim reserves at the end of the years presented in the previous table. Disabled life claim reserves are recorded in policyholders' reserves. Accrued claim liabilities are recorded in other liabilities.

	December 31, 2018	December 31, 2017
	(In Millions)	
Disabled life claim reserves	$ 1,847	$ 1,852
Accrued claim liabilities	27	25
Net claim reserves, end of year	$ 1,874	$ 1,877

d. Additional liability for annuity contracts

Certain variable annuity contracts include additional death or other insurance benefit features, such as GMDBs, GMIBs, GMABs and GMWBs. In general, living benefit guarantees require the contract holder or policyholder to adhere to a company-approved asset allocation strategy. Election of these benefits is generally only available at contract issue.

The following shows the changes in the liabilities for GMDBs, GMIBs, GMABs and GMWBs (in millions):

Liability as of January 1, 2017	$	651
Incurred guarantee benefits		(131)
Paid guarantee benefits		(8)
Liability as of December 31, 2017		512
Incurred guarantee benefits		250
Paid guarantee benefits		(6)
Liability as of December 31, 2018	$	756

The Company held reserves in accordance with the stochastic scenarios as of December 31, 2018 and 2017. As of December 31, 2018 and 2017, the Company held additional reserves above those indicated based on the stochastic scenarios in order to maintain a prudent level of reserve adequacy.

The following summarizes the account values, net amount at risk and weighted average attained age for variable annuity contracts with GMDBs, GMIBs, GMABs and GMWBs classified as policyholders' reserves and separate account liabilities. The net amount at risk is defined as the minimum guarantee less the account value calculated on a policy-by-policy basis, but not less than zero.

	December 31, 2018			December 31, 2017		
	Account Value	Net Amount at Risk	Weighted Average Attained Age	Account Value	Net Amount at Risk	Weighted Average Attained Age
	($ In Millions)					
GMDB	$ 17,392	$ 132	64	$ 20,118	$ 25	64
GMIB Basic	700	97	69	910	37	68
GMIB Plus	2,687	813	67	3,210	416	66
GMAB	2,573	74	60	3,233	1	59
GMWB	160	23	70	204	7	69

As of December 31, 2018, the GMDB account value above consists of $3,838 million of Modco assumed within the separate accounts. As of December 31, 2017, the GMDB account value above consists of $4,717 million of Modco assumed within the separate accounts.

Account values of variable annuity contracts with GMDBs, GMIBs, GMABs and GMWBs are summarized below:

	December 31,					
	2018			2017		
	Separate Account	General Account	Total	Separate Account	General Account	Total
	(In Millions)					
GMDB	$ 13,487	$ 3,905	$ 17,392	$ 16,057	$ 4,061	$ 20,118
GMIB Basic	683	17	700	891	19	910
GMIB Plus	2,687	-	2,687	3,210	-	3,210
GMAB	2,534	39	2,573	3,183	50	3,233
GMWB	160	-	160	204	-	204

e. Additional liability for individual life contracts

Certain universal life and variable universal life contracts include features such as GMDBs or other guarantees that ensure continued death benefit coverage when the policy would otherwise lapse. The value of the guarantee is only available to the beneficiary in the form of a death benefit.

The following presents the changes in the liability, net of reinsurance, for guarantees on universal life and variable universal life type contracts:

	December 31,	
	2018	2017
	(In Millions)	
Beginning balance	$ 3,453	$ 3,098
Net liability increase	354	355
Ending balance	$ 3,807	$ 3,453

9. Reinsurance

The Company enters into reinsurance agreements with affiliated and unaffiliated insurers in the normal course of business in order to mitigate the impact of underwriting mortality and morbidity risks or to assume business. Such transfers do not relieve the Company of its primary liability to its customers and, as such, failure of reinsurers to honor their obligations could result in credit losses that could arise if a reinsurer defaults. The Company reduces reinsurance default risk by evaluating the financial condition of reinsurers and monitoring for possible concentrations within the Company’s reinsurers and using trust structures, when appropriate. The Company reinsures a portion of its mortality risk in its life business under either a first dollar quota-share arrangement or an in excess of the retention limit arrangement with reinsurers. The Company also reinsures a portion of its morbidity risk in its disability and LTC business. The amounts reinsured are on a yearly renewable term, coinsurance funds withheld, coinsurance or Modco basis. The Company’s highest retention limit for new issues of life policies ranges from $15 million to $25 million.

Refer to *Note 17. "Related party transactions"* for information about the Company’s affiliated assumed reinsurance transactions.

The Company did not reinsure any policies with a company chartered in a country other than the U.S., excluding U.S. branches of these companies, which was owned in excess of 10% or controlled directly or indirectly by an insured, a beneficiary, a creditor or any other person not primarily engaged in the insurance business. There are no reinsurance agreements in effect under which the reinsurer may unilaterally cancel any reinsurance for reasons other than for nonpayment of premium or other similar credits. The Company has no reinsurance agreements in effect such that the amount of losses paid or accrued through the statement date may result in a payment to the reinsurer of amounts which, in aggregate and allowing for offset of mutual credits from other reinsurance agreements with the same reinsurer, exceed the total direct premium collected under the reinsured policies.

If all reinsurance agreements were terminated by either party as of December 31, 2018, the resulting reduction in surplus due to loss of reinsurance reserve credits, net of unearned premium, would be approximately $4,241 million assuming no return of the assets, excluding assets in trust, backing these reserves from the reinsurer to the Company.

Reinsurance amounts included in the Statutory Statements of Operations were as follows:

	Years Ended December 31,		
	2018	2017	2016
	(In Millions)		
Direct premium	$ 23,294	$ 21,097	$ 21,319
Premium assumed	1,327	1,359	1,442
Premium ceded	(1,692)	(4,970)	(1,329)
Total net premium	$ 22,929	$ 17,486	$ 21,432
Ceded reinsurance recoveries	$ 732	$ 658	$ 566
Assumed losses	$ 206	$ 216	$ 95

Reinsurance amounts included in the Statutory Statements of Financial Position were as follows:

	December 31,	
	2018	2017
	(In Millions)	
Reinsurance reserves:		
Assumed	$ 8,816	$ 9,101
Ceded	(10,433)	(8,898)
Ceded amounts recoverable	$ 204	$ 165
Benefits payable on assumed business	$ 34	$ 37
Funds held under coinsurance		
Ceded	$ 4,099	$ 4,001

Reinsurance reserves ceded to unaffiliated reinsurers as of December 31, 2018 include $7,435 million associated with life insurance policies, $2,266 million for LTC, $696 million for annuity, $27 million for disability and $9 million for group life and health. Reinsurance reserves ceded to unaffiliated reinsurers as of December 31, 2017 include $7,125 million associated with life insurance policies, $1,733 million for LTC, $30 million for disability and $10 million for group life and health.

Effective December 31, 2017, the Company entered into a reinsurance agreement with a third-party, authorized reinsurer to reinsure certain inforce universal life policies. The agreement is structured as a combination of 90%

coinsurance funds withheld on certain universal life policies and 40% yearly renewable term on certain other universal life policies. The Company maintains responsibility for servicing the policies and managing the assets. Under the terms of the agreement, at December 31, 2017, the Company ceded policyholder reserves of $4,001 million and recorded a liability for funds held under coinsurance of $4,001 million on the Statutory Statement of Financial Position and ceded premium of $4,001 million and reduced changes in policyholder reserves of $4,001 million in the Statutory Statements of Operations.

In 2016, the Company entered into a series of reinsurance agreements with an authorized third-party to reinsure approximately 100% of certain of the Company's inforce universal life, variable life, and 20-year term life policies. Under the terms of the agreements, the Company gave approximately $85 million of consideration to the reinsurer. The universal life and term life policies are reinsured on a coinsurance basis, and the variable life policies on a Modco basis. Under the terms of the agreements, the Company will maintain responsibility for servicing the policies. In 2016, the Company ceded premium of $473 million and policyholders' reserves of $411 million in the change in policyholders' reserves in the Statutory Statement of Operations and recorded a $192 million increase in the Statutory Statements of Changes in Surplus in conjunction with these agreements.

In 2018, the Company strengthened its gross LTC policyholders' reserves by $660 million to reflect the risk inherent in the cash flows of this business. This risk is ceded to an unaffiliated reinsurer, therefore the ceded policyholders' reserves have also been increased by $660 million.

In 2017, the Company strengthened its gross LTC policyholders' reserves by $270 million to reflect the risk inherent in the cash flows of this business. This risk is ceded to an unaffiliated reinsurer, therefore the ceded policyholders' reserves have also been increased by $270 million.

In 2018, a $27 million net loss was recorded for the recapture of certain yearly renewable term life insurance treaties, with $14 million recorded in premium income and $41 million recorded in change in policyholder reserves.

As of December 31, 2018, one reinsurer accounted for 28% of the outstanding balance of the reinsurance recoverable and the next largest reinsurer had 27%. The Company continues to monitor its morbidity risk ceded to one unaffiliated reinsurer for its LTC business, in which 34% of the reserves are held in trust. Overall, the Company believes that each of these exposures to a single reinsurer does not create an undue concentration of risk and the Company's business is not substantially dependent upon any single reinsurer.

10. Withdrawal characteristics

a. Annuity actuarial reserves and liabilities for deposit-type contracts

The withdrawal characteristics of the Company's annuity actuarial reserves and deposit-type contracts as of December 31, 2018 are illustrated below:

	General Account	Separate Account w/ Guarantees	Separate Account Nonguaranteed	Amount	% of Total
	($ In Millions)				
Subject to discretionary withdrawal:					
With market value adjustment	$ 14,198	$ -	$ -	$ 14,198	12 %
At book value less current surrender charge of 5% or more	3,615	-	-	3,615	3
At fair value	-	9,628	42,428	52,056	50
Subtotal	17,813	9,628	42,428	69,869	66
Subject to discretionary withdrawal:					
At book value without fair value adjustment	9,832	605	-	10,437	9
Not subject to discretionary withdrawal	26,005	8,187	-	34,192	25
Total	$ 53,650	$ 18,420	$ 42,428	$ 114,498	100 %

The following is a summary of total annuity actuarial reserves and liabilities for deposit-type contracts as of December 31, 2018 (in millions):

Statutory Statements of Financial Position:	
Policyholders' reserves – group annuities	$ 26,377
Policyholders' reserves – individual annuities	12,903
Liabilities for deposit-type contracts	14,370
Subtotal	53,650
Separate Account Annual Statement:	
Annuities	52,661
Other annuity contract deposit-funds and guaranteed interest contracts	8,187
Subtotal	60,848
Total	$ 114,498

b. Separate accounts

The Company has guaranteed separate accounts classified as the following: nonindexed, which have multiple concurrent guarantees, including a guarantee that applies for as long as the contract is in effect and does not exceed a 4% rate of return. The Company has nonguaranteed separate accounts which are variable accounts where the benefit is determined by the performance and/or market value of the investments held in the separate account with incidental risk, notional expense and minimum death benefit guarantees.

Information regarding the separate accounts of the Company as of and for the year ended December 31, 2018 is as follows:

	Guaranteed			
	Indexed	Nonindexed Less Than/ Equal to 4%	Non Guaranteed	Total
	(In Millions)			
Net premium, considerations or deposits for the year ended December 31, 2018	$ -	$ -	$ 10,534	$ 10,534
Reserves at December 31, 2018:				
For accounts with assets at:				
Fair value	$ -	$ 18,420	$ 45,073	$ 63,493
Nonpolicy liabilities	-	-	985	985
Total separate account liabilities	$ -	$ 18,420	$ 46,058	$ 64,478
Reserves by withdrawal characteristics:				
Subject to discretionary withdrawal:				
At fair value	$ -	$ 17,815	$ 45,073	$ 62,888
At book value without market value adjustment and current surrender charge of less than 5%	-	605	-	605
Subtotal	-	18,420	45,073	63,493
Nonpolicy liabilities	-	-	985	985
Total separate account liabilities	$ -	$ 18,420	$ 46,058	$ 64,478

The Company does not have any reserves in separate accounts for asset default risk in lieu of AVR.

The following is a reconciliation of amounts reported as transfers (from) to separate accounts in the Summary of Operations of the Company's NAIC Separate Account Annual Statement to the amounts reported as net transfers (from) to separate accounts in change in policyholders' reserves in the accompanying Statutory Statements of Operations:

	Years Ended December 31,		
	2018	2017	2016
	(In Millions)		
From the Separate Account Annual Statement:			
Transfers to separate accounts	$ 8,326	$ 8,099	$ 7,366
Transfers from separate accounts	(9,846)	(9,078)	(8,408)
Subtotal	(1,520)	(979)	(1,042)
Reconciling adjustments:			
Net deposits on deposit-type liabilities	(1,488)	(1,902)	(1,183)
Net transfers from separate accounts	$ (3,008)	$ (2,881)	$ (2,225)

Net deposits on deposit-type liabilities are not considered premium and therefore are excluded from the Statutory Statements of Operations.

11. Debt

The Company issues commercial paper in the form of Notes in minimum denominations of $250 thousand up to a total aggregation of $1 billion with maturity dates up to a maximum of 270 days from the date of issuance. Noninterest bearing Notes are sold at par less a discount representing an interest factor. Interest bearing Notes are sold at par. The Notes are not redeemable or subject to voluntary prepayments by the Company. The Notes had a carrying value and face amount of $250 million as of December 31, 2018, 2017 and 2016. Notes issued in 2018 had interest rates ranging from 2.05% to 2.50% with maturity dates ranging from 25 to 40 days. Interest expense for commercial paper was $5 million for the year ended December 31, 2018, and less than $1 million for the year ended December 31, 2017.

MassMutual has a $1,000 million, five-year credit facility, with a syndicate of lenders that can be used for general corporate purposes and to support commercial paper borrowings. During December 2018, the facility was renewed and the scheduled maturity is December 2023. The facility includes two one-year extension options that may be exercised with proper notification as set forth in the agreement. The facility has an upsize option for an additional $500 million. The terms of the credit facility additionally provide for, among other provisions, covenants pertaining to liens, fundamental changes, transactions with affiliates and adjusted statutory surplus. As of and for the years ended December 31, 2018, 2017 and 2016, the Company was in compliance with all covenants under the credit facility. For the years ended December 31, 2018, 2017 and 2016, there were no draws on the credit facilities. Credit facility fees were less than $1 million for the years ended December 31, 2018, 2017 and 2016.

12. Employee benefit plans

The Company sponsors multiple employee benefit plans, providing retirement, life, health and other benefits to employees, certain employees of unconsolidated subsidiaries, agents, general agents and retirees who meet plan eligibility requirements.

The Society of Actuaries released updated mortality improvement scales in October 2017 (MP 2017). The Company adopted the new mortality projection scale and other key plan assumptions as part of its fourth quarter 2017 remeasurement. As a result of these changes in the projection scale, the Company’s aggregate projected benefit obligation decreased by approximately $20 million as of December 31, 2017.

a. Pension plans

The Company has funded and unfunded noncontributory defined benefit pension plans that cover substantially all employees, agents and retirees. The qualified defined benefit plan includes a defined benefit formula and a cash balance formula. Participants earn benefits under the plan based on the defined benefit formula, the cash balance formula, or a combination of both formulas as determined by their date of hire or rehire. Under the defined benefit formula, benefits are calculated based on final average earnings and length of service. Benefits under the cash balance formula are determined based on age, service and salary during the participants’ careers.

The Company’s policy is to fund qualified pension costs in accordance with the Employee Retirement Income Security Act of 1974. The Company contributed $188 million in 2018 and $88 million in 2017 to its qualified defined benefit plan.

b. Defined contribution plans

The Company sponsors funded (qualified 401(k) thrift savings) and unfunded (nonqualified deferred compensation thrift savings) defined contribution plans for its employees, agents and retirees. The qualified 401(k) thrift savings plan’s net assets available for benefits were $2,831 million as of December 31, 2018 and $2,874 million as of December 31, 2017. The Company match for the qualified 401(k) thrift savings plan is limited to 5% of eligible W-2 compensation. The Company’s total matching thrift savings contributions, included in general insurance expenses were $51 million for the year ended December 31, 2018 and $56 million for the year ended December 31, 2017 and $46 million for 2016.

The Company also maintains a defined contribution plan for agents, which was frozen in 2001. The net assets available for these benefits were $164 million as of December 31, 2018 and $182 million as of December 31, 2017.

c. Other postretirement benefits

The Company provides certain life insurance and health care benefits (other postretirement benefits) for its retired employees and agents, their beneficiaries and covered dependents. MMHLLC has the obligation to pay the Company's other postretirement benefits. The transfer of this obligation to MMHLLC does not relieve the Company of its primary liability. MMHLLC is allocated other postretirement expenses related to interest cost, amortization of actuarial gains (losses) and expected return on plan assets, whereas service cost and prior service cost are recorded by the Company.

Substantially all of the Company's U.S. employees and agents may become eligible to receive other postretirement benefits. These benefits are funded as the benefits are provided to the participants. For employees who retire after 2009, except certain employees who were close to retirement in 2010, the Company's cost is limited to a retiree health reimbursement account "RHRA" which accumulates during an employee's career and can be drawn down by the retiree to purchase coverage outside of the Company or for other health care costs. Retired employees with a RHRA also may choose to purchase coverage through the private retiree exchange.

For other current and future retired employees, and current and future retired agents, the Company provides access to postretirement health care plans through a private retiree exchange. The Company's cost is limited to the fixed annual subsidy provided to retirees through a Health Reimbursement Account each year that the retiree can use to purchase coverage on the exchange or for other health care costs.

Company-paid basic life insurance is provided to retirees who retired before 2010 and certain employees who retire after 2009 but were close to retirement in 2010. Supplemental life insurance is available to certain retirees on a retiree-pay-all basis.

The Company provides retiree life insurance coverage for home office employees who, as of January 1, 2010, were age 50 with at least 10 years of service or had attained 75 points, generally age plus service, with a minimum 10 years of service.

d. Benefit obligations

Accumulated benefit obligations are the present value of pension benefits earned as of a December 31 measurement date (the Measurement Date) based on service and compensation and do not take into consideration future salary levels.

Projected benefit obligations for pension benefits are the present value of pension benefits earned as of the Measurement Date projected for estimated salary increases to an assumed date with respect to retirement, termination, disability or death.

Refer to *Note 12f. "Amounts recognized in the Statutory Statements of Financial Position,"* for details on the funded status of the plans.

Accumulated and projected postretirement benefit obligations for other postretirement benefits are the present value of postretirement medical and life insurance benefits earned as of the Measurement Date projected for estimated salary and medical claim rate increases to an assumed date with respect to retirement, disability or death.

Actuarial (gains) losses represent the difference between the expected results and the actual results used to determine the projected benefit obligation, accumulated benefit obligation and current year expense. Select assumptions used in this calculation include expected future compensation levels, healthcare cost trends, mortality and expected retirement age.

The following presents the total pension and other postretirement accumulated benefit obligation:

	December 31,			
	2018	2017	2018	2017
	Pension Benefits		Other Postretirement Benefits	
	(In Millions)			
Accumulated benefit obligation	$ 2,739	$ 2,936	$ 341	$ 354

The following sets forth the change in projected benefit obligation of the defined benefit pension and other postretirement plans:

	December 31,			
	2018	2017	2018	2017
	Pension Benefits		Other Postretirement Benefits	
	(In Millions)			
Projected benefit obligation, beginning of year	$ 3,036	$ 2,785	$ 354	$ 340
Service cost	113	126	14	12
Interest cost	107	112	12	12
Actuarial (gains) losses	(39)	(17)	-	(9)
Benefits paid	(142)	(146)	(14)	(15)
Change in discount rate	(218)	194	(21)	15
Change in actuarial assumptions	(7)	(18)	(4)	(1)
Projected benefit obligation, end of year	$ 2,850	$ 3,036	$ 341	$ 354

The determination of the discount rate is based upon rates commensurate with current yields on high quality corporate bonds as of the Measurement Date. A spot yield curve is developed from this data that is used to determine the present value for the obligation. The projected plan cash flows are discounted to the Measurement Date based on the spot yield curve. A single discount rate is utilized to ensure the present value of the benefits cash flow equals the present value computed using the spot yield curve. A 25 basis point change in the discount rate results in approximately a $87 million change in the projected pension benefit obligation. The methodology includes producing a cash flow of annual accrued benefits. Refer to Note *12h. "Assumptions"* for details on the discount rate.

e. Plan assets

The assets of the qualified pension plan investments are invested through a MassMutual group annuity contract and investments held in a trust. The group annuity contract invests in the General Investment Account (GIA) of the Company and separate investment accounts. The separate investment accounts are managed by the Company, the Company's indirectly wholly owned asset manager, subsidiaries, as well as unaffiliated asset managers.

The Company's qualified pension plan assets managed by the Company and its indirectly wholly owned subsidiaries are as follows:

	December 31, 2018	December 31, 2017
	(In Millions)	
General Investment Account	$ 248	$ 241
Separate Investment Accounts:		
Barings Long Duration Bond Fund	289	263
Oppenheimer International Growth Fund	119	147
Alternative Investment Separate Account	85	134
Oppenheimer Large Core Fund	79	115
MM Select Large Cap Value Fund	55	61
MM Select Blue Chip Growth Fund	38	51
MM Select Growth Opportunities Fund	39	48
MM Premier Strategic Emerging Markets Fund	46	53
Oppenheimer Small Capitalization Core Fund	32	50
MM Select Small Cap Value Fund	20	30
MM Select Small Cap Growth Fund	20	29
	$ 1,070	$ 1,222

The approximate amount of annual benefits to be paid to plan participants covered by a group annuity contract issued by the employer or related parties is $79 million for 2019.

The Company employs a total return investment approach whereby a mix of equities and fixed-income investments are used to maximize the long-term return of plan assets with a prudent level of risk. Risk tolerance is established through consideration of plan liabilities, plan funded status and the Company’s financial condition. The investment portfolio contains a diversified blend of equity and fixed-income investments. Alternative assets such as private equity funds, hedge funds, private real estate funds, equity index exchange traded funds and bond index exchange traded funds are used to improve portfolio diversification. Investment risk is measured and monitored on an ongoing basis through quarterly investment portfolio reviews, annual liability measurements and periodic asset and liability studies.

The target range allocations for the qualified pension plan assets are 13% to 23% domestic equity securities, 25% to 45% long duration bond securities, 5% to 15% GIA and aggregate bond assets, 13% to 23% international equity securities and 10% to 30% alternative investments. Domestic equities primarily include investments in large capitalization (large-cap) companies and small capitalization (small cap) companies. Long duration bond securities invest in several long-duration bond exchange traded funds. International equities include investments in American Depository Receipts and limited partnerships that trade primarily in foreign markets in Europe, Latin America and Asia. The pension plan assets invested in the GIA through the unallocated group annuity contract earn a fixed interest. These assets comprised approximately 10% of the plan assets as of December 31, 2018 and 10% as of December 31, 2017.

The following presents the change in fair value of plan assets:

	December 31,			
	2018	2017	2018	2017
	Pension Benefits		Other Postretirement Benefits	
	(In Millions)			
Fair value of plan assets, beginning of year	$ 2,485	$ 2,180	$ 4	$ 4
Actual return on plan assets	(148)	331	-	-
Employer contributions	208	120	13	15
Contributions by plan participants	-	-	1	-
Benefits paid	(142)	(146)	(14)	(15)
Fair value of plan assets, end of year	$ 2,403	$ 2,485	$ 4	$ 4

The *General Investment Account* is designed to provide stable, long-term investment growth. The account value is maintained at a stable value (generally referred to as “book value”) regardless of financial market fluctuations; however, if the plan sponsor initiates a full or partial termination, the amount liquidated is subject to an adjustment that could result in an increase or decrease in the book value of the plan's investment.

The following presents the GIA allocation by type of investment:

	December 31,	
	2018	2017
Bonds	61 %	59 %
Mortgage loans	15	15
Common stocks - subsidiaries and affiliates	6	10
Other investments	7	7
Partnerships and LLCs	7	5
Cash and cash equivalents	3	3
Real estate	1	1
	100 %	100 %

The majority of the assets of the qualified pension plan are invested in the following separate investment account options as well as certain private equity funds, hedge funds, private real estate funds and an all cap U.S. equity index exchange traded fund held in the MassMutual Pension Plan Trust (Pension Trust Assets):

Pacific Investment Management Company Long Duration Bond Fund is a separate investment account advised by Pacific Investment Management Company that invests in a diversified portfolio of fixed-income securities, including short-term, intermediate and long-term credit and government securities and cash. The specific performance objective is to outperform the total return of the Bloomberg Barclays U.S. Long Government/Credit Bond index.

Goldman Sachs Asset Management Long Duration Bond Fund is a separate investment account advised by Goldman Sachs Asset Management that invests in a diversified portfolio of fixed-income securities, including short-term, intermediate and long-term credit, government securities and cash. The specific performance objective is to outperform the total return of the Bloomberg Barclays U.S. Long Government/Credit Bond index.

Barings Long Duration Bond Fund is a separate investment account advised by Barings with a long duration bond strategy that invests in a diversified portfolio of fixed-income securities, including, short-term, intermediate and long-term credit, government securities and cash. The specific performance objective is to outperform the total return of the Bloomberg Barclays U.S. Long Government/Credit Bond index.

Oakmark International Collective Fund is a separate investment account advised by Harris Associates that invests primarily in developed market international large-cap equity securities, which may include common stocks, preferred stocks, securities that are convertible into common stocks, depositary receipts and rights and warrants to buy common stocks. This international equity strategy seeks out companies that it believes to be trading in the market at significant discounts to their underlying values.

Oppenheimer International Growth Fund is a separate investment account investing in a mutual fund sub-advised by OFI Institutional Asset Management that invests in international large-cap securities, primarily in the developed international markets. This international equity strategy focuses on well-positioned, well-managed businesses that have strong revenue growth, sustainable profit margins, capital efficiency and/or business integrity.

MassMutual Pension Plan Trust is a trust account with a strategy of investing in alternative investments as directed by the Company. These investments include private equity, hedge funds, and private real estate, with allocations temporarily awaiting investment held in an all cap U.S. equity index exchange traded fund.

Fair Value Measurements

The Company's fair value hierarchy is defined in *Note 4. "Fair value of financial instruments"*.

The following is a description of the valuation methodologies used to measure fair value for the investments in the qualified pension plan.

Separate Investment Accounts: There are two methods of determining unit value for the separate investment accounts. The portfolio method is used when the separate investment account invests in a portfolio of securities or two or more underlying mutual funds, bank collective trust funds or other investment vehicles (each an underlying fund). Under this method, the unit value of a separate investment account is determined by dividing the market value of such separate investment account on any valuation date by the total number of units in the separate investment account. The net investment factor method (NIF) is used when the separate investment account invests in shares or units of a single underlying fund. Under this method, the unit value of a separate investment account is determined by taking the unit value for the prior valuation day and multiplying it by the net investment factor for the current valuation day. Under both of these methods the separate investment accounts are therefore classified as Level 2. As of December 31, 2018, the Plan had no specific plans or intentions to sell investments at amounts other than NAV. These investments can be redeemed on a daily basis and have no lockups or funding commitments.

Corporate debt instruments: If Level 1 valuations are not available, the fair value is determined using models such as matrix pricing and therefore, is classified as Level 2, which uses quoted market prices of debt securities with similar characteristics. Valued using the closing price reported on the active market on which the individual securities are traded.

PIMCO bond funds: Valued using the closing price reported on the active market on which the individual securities are traded and therefore classified as Level 1.

Government securities: Marked to market daily based on values provided by third-party vendors or market makers to the extent available or based on model prices. Valuations furnished by a pricing service take into account factors such as institutional-size trading in similar securities, yield, quality, coupon rate, maturity, type of issue, trading characteristics, and other market data and are therefore classified as Level 2.

Common stocks: Valued using the closing price reported on the active market on which the individual securities are traded and therefore classified as Level 1.

Collective investment trust: Valued using the NAV per unit. The net asset value per unit of the Funds is calculated on each business day by dividing the total value of assets, less liabilities, by the number of units outstanding. Unit issuances and redemptions are based on the net asset value determined at the end of the current day and therefore classified as Level 2.

Limited partnerships: The Plan utilizes the practical expedient to calculate fair value of its investments based on the Plan's pro rata interest in net assets of each underlying partnership. All valuations utilize financial information supplied by the partnership, including income, expenses, gains and losses. The underlying investments of the partnership are accounted for at fair value as described in the partnership's audited financial statements. The multi-strategy hedge fund can be redeemed semi-annually with 95 days notice. The remaining funds can be redeemed periodically with notice that generally ranges from 45 to 90 days. There are no lockups or funding commitments. These limited partnership investments are classified as Level 3.

Registered investment companies: There are two methods of determining the unit value for the registered investment companies. For the registered investment company that is valued at an unaffiliated company the investment is valued using the closing price reported on the active market on which the funds are traded and is therefore classified as Level 1. For the registered investment company that is valued in-house on the unival system the NIF method is used which takes the unit value for the prior valuation day and multiplies it by the NIF for the current valuation day and is therefore classified as Level 2.

Other: Valued using the closing price reported on the active market on which the individual securities are traded. If Level 1 valuations are not available, the fair value is determined using models such as matrix pricing and therefore, is classified as Level 2, which uses quoted market prices with similar characteristics. Investments included in this category include short term investments, real estate investment trusts, asset backed securities, mortgage backed securities, swaps, derivatives, futures and options. Investments in multi-strategy hedge fund and real estate are based on the Plan's pro rata interest in the net assets of the partnership and have a redemption period and are reported in the Level 3 column. The multi-strategy hedge fund is comprised of two funds, one of which has a quarterly redemption period and the other with a monthly redemption period. They both require 45 days notice. The real estate fund does not have a specific redemption period, but is dependent upon the liquidation of underlying assets. None of the funds have a lock up period or funding commitment.

Cash: Stated at cost, which is equal to fair value, and held by an unaffiliated bank.

General Investment Account option: Liquidation value based on an actuarial formula as defined under the terms of the contract.

The following presents the fair value hierarchy of the Company's pension plan assets by asset class:

	December 31, 2018				
	Level 1	Level 2	Level 3	NAV Practical Expedient	Total
	(In Millions)				
Investments in the qualified pension plan:					
Separate investment accounts:					
Common stocks:					
U.S. large capitalization	$ 66	$ 222	$ -	$ -	$ 288
U.S. small capitalization	19	41	-	-	60
U.S. mid capitalization	21	-	-	-	21
International small/mid capitalization	4	-	-	-	4
International large capitalization	3	119	-	-	122
Total common stocks	113	382	-	-	495
Debt instruments:					
Corporate and other bonds	-	387	-	-	387
Long-term bond mutual fund	134	-	-	-	134
Short-term bond mutual funds	15	-	-	-	15
Total debt instruments	149	387	-	-	536
Registered investment companies:					
Emerging markets	-	59	-	-	59
U.S. large capitalization	16	-	-	-	16
Total registered investment companies	16	59	-	-	75
Limited partnerships:					
Private equity/venture capital	-	-	-	36	36
Total limited partnerships	-	-	-	36	36
Other:					
Government securities	-	353	-	-	353
Collective investment trust	-	160	-	-	160
Emerging markets	-	46	-	-	46
Real estate	-	-	-	33	33
Other	-	18	-	-	18
Total other	-	577	-	33	610
Total separate investment accounts	278	1,405	-	69	1,752
Pension trust assets:					
Common stocks:					
U.S. large capitalization	83	-	-	-	83
Collective investment trust	-	47	-	-	47
Hedge fund	-	-	-	39	39
Limited partnerships:					
Other	-	-	-	233	233
Other	-	2	-	-	2
Total pension trust assets	83	49	-	272	404
Total General Investment Account	-	-	247	-	247
Total	$ 361	$ 1,454	$ 247	$ 341	$ 2,403

	December 31, 2017				
	Level 1	Level 2	Level 3	NAV Practical Expedient	Total
	(In Millions)				
Investments in the qualified pension plan:					
Separate investment accounts:					
Common stocks:					
U.S. large capitalization	$ 83	$ 243	$ -	$ -	$ 326
U.S. small capitalization	35	59	-	-	94
U.S. mid capitalization	28	-	-	-	28
International small/mid capitalization	8	-	-	-	8
International large capitalization value	7	147	-	-	154
Total common stocks	161	449	-	-	610
Debt instruments:					
Corporate and other bonds	-	367	-	-	367
Long-term bond mutual fund	111	-	-	-	111
Short-term bond mutual funds	14	-	-	-	14
Total debt instruments	125	367	-	-	492
Registered investment companies:					
Emerging markets	-	86	-	-	86
Emerging markets	17	-	-	-	17
Total registered investment companies	17	86	-	-	103
Limited partnerships:					
Private equity/venture capital	-	-	-	43	43
Total limited partnerships	-	-	-	43	43
Other:					
Government securities	-	303	-	-	303
Collective investment trust	-	209	-	-	209
Real estate	-	-	-	53	53
Emerging markets	-	53	-	-	53
Other	-	42	-	19	61
Total other	-	607	-	72	679
Total separate investment accounts	303	1,509	-	115	1,927
Pension trust assets:					
Common stocks:					
U.S. large capitalization	125	-	-	-	125
Collective investment trust	-	44	-	-	44
Limited partnerships:					
Other	-	-	-	109	109
Other	-	1	-	38	39
Total pension trust assets	125	45	-	147	317
Total general investment account	-	-	241	-	241
Total	$ 428	$ 1,554	$ 241	$ 262	$ 2,485

The Company evaluated the significance of transfers between levels based upon the nature of the financial instrument and size of the transfer relative to total net assets available for benefits. Based on these criteria, there were no significant transfers into or out of Level 1, 2, or 3 for the years ended December 31, 2018 and 2017.

f. Amounts recognized in the Statutory Statements of Financial Position

Unrecognized prior service cost is the adjustment to the projected benefit obligation as a result of plan amendments. It represents the increase or decrease in benefits for service performed in prior periods. For pension benefits, this cost is amortized into net periodic benefit cost over the average remaining service years of active employees at the time of the amendment. For other postretirement benefits, this cost is amortized into net periodic benefit cost over the average remaining lifetime of eligible employees and retirees at the time of the amendment.

Unrecognized net actuarial (gains) losses are variances between assumptions used and actual experience. These assumptions include return on assets, discount rate, demographics and mortality. The unrecognized net actuarial (gains) losses are amortized if they exceed 10% of the projected benefit obligation and are amortized starting in the period after recognition. These are amortized for pension and other postretirement benefits into net periodic benefit cost over the remaining service-years of active employees.

The prepaid pension asset is a cumulative balance of employer contributions made to the plan netted against the plan's accumulated net periodic benefit costs. The prepaid pension asset is a nonadmitted asset.

The accrued benefit cost recognized is the funded status of the plan adjusted for the remaining balance of unrecognized prior service cost, unrecognized net actuarial loss and the nonadmitted prepaid pension asset.

The following sets forth the amounts amortized from net surplus in the Statutory Statements of Financial Position and recognized as components of net periodic benefit cost in 2018 and 2017 and the amounts expected to be recognized in 2019:

	December 31,					
	2019	2018	2017	2019	2018	2017
	Pension Benefits			Other Postretirement Benefits		
	(In Millions)					
Net prior service cost	$ -	$ 3	$ 3	$ (6)	$ (6)	$ (6)
Net recognized actuarial losses	56	55	65	-	2	2

The following sets forth the amounts to be amortized from net surplus in the Statutory Statements of Financial Position that have not yet been recognized as components of net periodic benefit cost:

	December 31,			
	2018	2017	2018	2017
	Pension Benefits		Other Postretirement Benefits	
	(In Millions)			
Net prior service cost	$ -	$ 3	$ (41)	$ (46)
Net actuarial losses	902	898	(2)	26
Unrecognized transition liability	-	3	-	-

The following sets forth the projected benefit obligation funded status of the plans:

	December 31,			
	2018	2017	2018	2017
	Pension Benefits		Other Postretirement Benefits	
	(In Millions)			
Projected benefit obligation	$ 2,850	$ 3,036	$ 341	$ 354
Less: fair value of plan assets	2,403	2,485	4	4
Projected benefit obligation funded status	$ (447)	$ (551)	$ (337)	$ (350)

The qualified pension plan was underfunded by $71 million as of December 31, 2018 and underfunded by $145 million as of December 31, 2017. The nonqualified pension plans are not funded and have total projected benefit obligations of $377 million as of December 31, 2018 and $406 million as of December 31, 2017.

The qualified pension plan nonadmitted pension plan asset was $727 million as of December 31, 2018 and $599 million as of December 31, 2017.

The Company intends to fund $35 million in 2019 to meet its expected current obligations under its qualified and nonqualified pension plans and other postretirement benefit plans.

g. Net periodic cost

The net periodic cost represents the annual accounting income or expense recognized by the Company and is included in general insurance expenses in the Statutory Statements of Operations. The net periodic cost recognized is as follows:

	Years Ended December 31,					
	2018	2017	2016	2018	2017	2016
	Pension Benefits			Other Postretirement Benefits		
	(In Millions)					
Service cost	$ 113	$ 126	$ 100	$ 14	$ 12	$ 12
Interest cost	108	112	113	12	12	14
Expected return on plan assets	(172)	(147)	(144)	-	-	-
Amortization of unrecognized net actuarial and	55	65	70	2	2	3
Amortization of unrecognized prior service cost	3	3	3	(6)	(6)	(6)
Total net periodic cost	$ 107	$ 159	$ 142	$ 22	$ 20	$ 23

The expected future pension and other postretirement benefit payments, which reflect expected future service, are as follows:

	Pension Benefits	Other Postretirement Benefits
	(In Millions)	
2019	$ 97	$ 17
2020	103	18
2021	109	19
2022	114	19
2023	120	20
2024-2028	678	101

The net expense recognized in the Statutory Statements of Operations for all employee and agent benefit plans is as follows:

	Years Ended December 31,		
	2018	2017	2016
	(In Millions)		
Health	$ 113	$ 159	$ 142
Pension	107	131	103
Thrift	51	56	46
Postretirement	22	20	23
Disability	4	-	-
Life	4	4	4
Postemployment	(2)	4	4
Other benefits	23	10	10
Total	$ 322	$ 384	$ 332

h. Assumptions

The assumptions the Company used to calculate the benefit obligations and to determine the benefit costs are as follows:

	December 31,					
	2018	2017	2016	2018	2017	2016
	Pension Benefits			Other Postretirement Benefits		
Weighted-average assumptions used to determine:						
Benefit obligations:						
Discount rate	4.20 %	3.60 %	4.10 %	4.05 %	3.40 %	3.85 %
Expected long-term rate of return on plan assets	6.75 %	6.75 %	6.75 %	3.00 %	3.00 %	3.00 %
Expected rate of compensation increase	3.50 %	3.50 %	3.50 %	3.50 %	3.50 %	3.50 %
Net periodic benefit cost:						
Discount rate	3.60 %	4.10 %	4.30 %	3.40 %	3.85 %	3.95 %
Expected long-term rate of return on plan assets	6.75 %	6.75 %	7.00 %	3.00 %	3.00 %	3.00 %
Expected rate of compensation increase	3.50 %	3.50 %	3.50 %	3.50 %	3.50 %	3.50 %

The discount rate used to determine the benefit obligations as of year end is used to determine the expense in the next fiscal year.

The Company determines its assumptions for the expected rate of return on plan assets for its plans using a "building block" approach, which focuses on ranges of anticipated rates of return for each asset class. A weighted range of nominal rates is determined based on target allocations for each class of asset.

13. Employee compensation plans

The Company has a long-term incentive compensation plan under which certain employees of the Company and its subsidiaries may be issued phantom stock-based compensation awards. These awards include PSARs and PRS. These awards do not grant an equity or ownership interest in the Company.

A summary of the weighted average grant price of PSARs and PRS shares granted, the intrinsic value of PSARs shares exercised, the PRS liabilities paid and the fair value of shares vested during the year is as follows:

	December 31,		
	2018	2017	2016
Weighted average grant date fair value:			
PSARs granted during the year	$ 98.77	$ 79.47	$ 86.80
PRS granted during the year	99.75	80.09	86.67
Intrinsic value (in thousands):			
PSARs options exercised	33,532	4,794	5,220
PRS liabilities paid	21,922	19,802	25,931
Fair value of shares vested during the year	42,141	35,563	26,622

A summary of PSARs and PRS shares is as follows:

	PSARs			PRS		
		Weighted Average			Weighted Average	
	Number of Share Units	Price	Remaining Contract Terms	Number of Share Units	Price	Remaining Contract Terms
	(In Thousands)		(In Years)	(In Thousands)		(In Years)
Outstanding as of December 31, 2016	2,994	$ 87.35	3.2	1,082	$ 85.33	2.9
Granted	1,251	79.47		428	80.09	
Exercised	(512)	78.54		(246)	75.22	
Forfeited	(108)	90.33		(60)	87.19	
Outstanding as of December 31, 2017	3,625	85.78	3.1	1,204	85.46	3.0
Granted	1,898	98.77		337	99.75	
Exercised	(992)	87.73		(217)	85.12	
Forfeited	(133)	90.59		(12)	87.60	
Outstanding as of December 31, 2018	4,398	90.81	3.7	1,312	87.84	2.8
Exercisable as of December 31, 2018	341	$ 95.38	1.0	-	$ 123.15	0.8

The PSARs compensation was an expense of $103 million for the year ended December 31, 2018 and an expense of $23 million for the year ended December 31, 2017 and a benefit of $4 million for the year ended December 31, 2016. The PSARs accrued compensation liability was $89 million as of December 31, 2018 and $20 million as of December 31, 2017. The unrecognized compensation expense related to nonvested PSARs awards was $54 million for the year ended December 31, 2018 and $16 million for the year ended December 31, 2017 and there was no unrecognized compensation expense related to nonvested PSARs awards for the year ended December 31, 2016. The weighted average period over which the expense is expected to be recognized is 3.7 years. The PSARs unrecognized compensation expense represents the total intrinsic value of all shares issued if 100% vested at current stock price, minus current compensation liability.

The PRS compensation expense was $53 million for the year ended December 31, 2018 and $33 million for the year ended December 31, 2017 and $18 million for the year ended December 31, 2016. The PRS accrued compensation liability was $87 million for the year ended December 31, 2018 and $55 million for the year ended December 31, 2017. The Unrecognized compensation expense related to nonvested PRS awards was $69 million as of December 31, 2018, $53 million as of December 31, 2017 and $39 million as of December 31, 2016, respectively. The weighted average period over which the expense is expected to be recognized is 2.8 years. The PRS unrecognized compensation expense represents the total value of all shares issued if 100% vested at the current stock price, minus current compensation liability.

14. Surplus notes

The Company executed a tender offer in March 2017 for $440 million par value of surplus notes maturing in 2039. The Company paid $711 million of cash to settle the tender offer which resulted in a pre-tax loss of $271 million. This loss is included in net realized gains (losses) within the Statutory Statements of Operations and other costs of investments acquired within the Statutory Statements of Cash Flows and is net of a tax benefit of $95 million.

The following table summarizes the surplus notes issued and outstanding as of December 31, 2018:

Issue Date	Face Amount	Carrying Value	Interest Rate	Maturity Date	Scheduled Annual Interest Payment Dates
	($ In Millions)				
11/15/1993	$ 250	$ 250	7.625%	11/15/2023	May 15 & Nov 15
03/01/1994	100	100	7.500%	03/01/2024	Mar 1 & Sept 1
05/12/2003	250	249	5.625%	05/15/2033	May 15 & Nov 15
06/01/2009	310	307	8.875%	06/01/2039	Jun 1 & Dec 1
01/17/2012	400	399	5.375%	12/01/2041	Jun 1 & Dec 1
04/15/2015	500	492	4.500%	04/15/2065	Apr 15 & Oct 15
03/20/2017	475	471	4.900%	04/01/2077	Apr 1 & Oct 1
Total	$ 2,285	$ 2,268			

All payments of interest and principal are subject to the prior approval of the Division. Interest expense is not recorded until approval for payment is received from the Division. As of December 31, 2018, the unapproved interest was $21 million. Through December 31, 2018, the Company paid cumulative interest of $1,707 million on surplus notes. Interest of $135 million was approved and paid during the year ended December 31, 2018.

Anticipated sinking fund payments are due for the notes issued in 1993 and 1994 as follows: $62 million in 2021, $88 million in 2022, $150 million in 2023 and $50 million in 2024. There are no sinking fund requirements for the notes issued in 2003, 2009, 2012, 2015 or 2017.

These notes are unsecured and subordinate to all present and future indebtedness of the Company, all policy claims and all prior claims against the Company as provided by the Massachusetts General Laws. The surplus notes are all held by bank custodians for unaffiliated investors. All issuances were approved by the Division. Surplus notes are included in surplus on the Statutory Statements of Financial Position.

15. Presentation of the Statutory Statements of Cash Flows

The following table presents those transactions that have affected the Company's recognized assets or liabilities but have not resulted in cash receipts or payments during the years ended December 31, 2018, 2017 and 2016. Accordingly, the Company has excluded these non-cash activities from the Statutory Statements of Cash Flows for the years ended December 31, 2018, 2017 and 2016.

	Years Ended December 31,		
	2018	2017	2016
	(In Millions)		
Transfer of common stocks- affiliated to partnerships and LLCs	$ 1,334	$ -	$ -
Bond conversions and refinancing	1,058	796	419
Partnerships and LLCs contributed to Insurance Road LLC	476	743	-
Premium recognized as for a group annuity contract	292	490	905
Transfer of mortgage loans to partnerships and LLCs	244	-	-
Transfers from bonds to other invested assets	200	-	-
Stock conversion	128	331	22
Transfer of bonds to partnerships and LLCs	81	-	-
Bonds and stock contributed to EM Opportunities LLC	74	-	-
Partnerships and LLCs contributed to MassMutual Asset Finance LLC	-	350	-
Transfer of real estate to partnerships and LLCs	-	138	-
Transfer of affiliated common stock	-	103	-
Bond distribution from partnerships and LLCs	-	94	80
Stock to bond	-	74	-
Mortgage loans contributed to partnerships and LLCs	-	20	98
Stock distributions from partnerships and LLCs	-	2	106
Acquisition of affiliated common stock for bonds and mortgage loans			3,287
Partnerships and LLCs contributed to MMHLLC			682
Bonds converted from long-term to short-term			89
Bank loan rollovers			5
Bonds received as consideration for group annuity contracts	(292)	(490)	(905)
Funds held under coinsurance	-	(4,002)	
Other	144	151	93

16. Business risks, commitments and contingencies

a. Risks and uncertainties

The Company operates in a business environment subject to various risks and uncertainties. The principal risks include insurance and underwriting risks, investment and interest rate risks, currency exchange risk and credit risk.

Insurance and underwriting risks

The Company prices its products based on estimated benefit payments reflecting assumptions with respect to mortality, morbidity, longevity, persistency, interest rates and other factors. If actual policy experience emerges that is significantly and adversely different from assumptions used in product pricing, the effect could be material to the profitability of the Company. For participating whole life products, the Company's dividends to policyholders primarily reflect the difference between actual investment, mortality, expense and persistency experience and the experience embedded in the whole life premiums and guaranteed elements. The Company also reinsures certain life insurance and other LTC insurance policies to mitigate the impact of its underwriting risk.

Investment and interest rate risks

The fair value, cash flows and earnings of investments can be influenced by a variety of factors including changes in interest rates, credit spreads, equity markets, portfolio asset allocation and general economic conditions. The Company employs a rigorous asset/liability management process to help mitigate the economic impacts of various investment risks, in particular interest rate risk. By effectively matching the market sensitivity of assets with the liabilities they support, the impact of interest rate changes is addressed, on an economic basis, as the change in the value of the asset is offset by a corresponding change in the value of the supported liability. The Company uses derivatives, such as interest rate swaps and swaptions, as well as synthetic assets to reduce interest rate and duration imbalances determined in asset/liability analyses.

The levels of U.S. interest rates are influenced by U.S. monetary policies and by the relative attractiveness of U.S. markets to investors versus other global markets. As interest rates increase, certain debt securities may experience amortization or prepayment speeds that are slower than those assumed at purchase, impacting the expected maturity of these securities and the ability to reinvest the proceeds at the higher yields. Rising interest rates may also result in a decrease in the fair value of the investment portfolio. As interest rates decline, certain debt securities may experience accelerated amortization and prepayment speeds than what was assumed at purchase. During such periods, the Company is at risk of lower net investment income as it may not be able to reinvest the proceeds at comparable yields. Declining interest rates may also increase the fair value of the investment portfolio.

Interest rates also have an impact on the Company's products with guaranteed minimum payouts and on interest credited to account holders. As interest rates decrease, investment spreads may contract as crediting rates approach minimum guarantees, resulting in an increased liability.

In periods of increasing interest rates, policy loans, surrenders and withdrawals may increase as policyholders seek investments with higher perceived returns. This could result in cash outflows requiring the Company to sell invested assets at a time when the prices of those assets are adversely affected by the increase in market interest rates, which could cause the Company to realize investment losses.

Currency exchange risk

The Company has currency risk due to its non-U.S. dollar investments and medium-term notes along with its indirect international operations. The Company mitigates a portion of its currency risk through the use of cross-currency swaps and forward contracts. Cross-currency swaps are used to minimize currency risk for certain non-U.S. dollar assets and liabilities through a pre-specified exchange of interest and principal. Forward contracts are used to hedge movements in exchange rates.

Credit and other market risks

The Company manages its investments to limit credit and other market risks by diversifying its portfolio among various security types and industry sectors as well as purchasing credit default swaps to transfer some of the risk.

Stressed conditions, volatility and disruptions in global capital markets or in particular markets or financial asset classes can have an adverse effect on the Company, in part because the Company has a large investment portfolio and assets supporting the Company's insurance liabilities are sensitive to changing market factors. Global market factors, including interest rates, credit spread, equity prices, real estate markets, foreign currency exchange rates, consumer spending, business investment, government spending, the volatility and strength of the capital markets, deflation and inflation, all affect the business and economic environment and, ultimately, the profitability of the Company's business. Disruptions in one market or asset class can also spread to other markets or asset classes. Upheavals in the financial markets can also affect the Company's business through their effects on general levels of economic activity, employment and customer behavior.

Real estate markets are monitored continuously with attention on regional differences in price performance, absorption trends and supply and demand fundamentals that can impact the rate of foreclosures and delinquencies. Public sector strengths and weaknesses, job growth and macro-economic issues are factors that are closely monitored to identify any impact on the Company's real estate related investments.

The CMBS, RMBS and leveraged loan sectors are sensitive to evolving conditions that can impair the cash flows realized by investors and is subject to uncertainty. Management's judgment regarding OTTI and estimated fair value depends upon the evolving investment sector and economic conditions. It can also be affected by the market liquidity, a lack of which can make it difficult to obtain accurate market prices for RMBS and other investments, including CMBS and leveraged loans. Any deterioration in economic fundamentals, especially related to the housing sector could affect management's judgment regarding OTTI.

The Company has investments in structured products exposed primarily to the credit risk of corporate bank loans, corporate bonds or credit default swap contracts referencing corporate credit risk. Most of these structured investments are backed by corporate loans and are commonly known as collateralized loan obligations that are classified as CDO. The portfolios backing these investments are actively managed and diversified by industry and individual issuer concentrations. Due to the complex nature of CDO and the reduced level of transparency to the underlying collateral pools for many market participants, the recovery in CDO valuations generally lags the overall recovery in the underlying assets. Management believes its scenario analysis approach, based primarily on actual collateral data and forward looking assumptions, does capture the credit and most other risks in each pool. However, in a rapidly changing economic environment, the credit and other risks in each collateral pool will be more volatile and actual credit performance of CDO may differ from the Company's assumptions.

The Company continuously monitors its investments and assesses their liquidity and financial viability; however, the existence of the factors described above, as well as other market factors, could negatively impact the market value of the Company's investments. If the Company sells its investments prior to maturity or market recovery, these investments may yield a return that is less than the Company otherwise would have been able to realize.

Asset-based fees calculated as a percentage of the separate account assets are a source of revenue to the Company. Gains and losses in the investment markets may result in corresponding increases and decreases in the Company's separate account assets and related revenue.

Market risk arises within the Company's employee benefit plans to the extent that the obligations of the plans are not fully matched by assets with determinable cash flows. Pension and postretirement obligations are subject to change due to fluctuations in the discount rates used to measure the liabilities as well as factors such as changes in inflation, salary increases and participants living longer. The risks are that such fluctuations could result in assets that are insufficient over time to cover the level of projected benefit obligations. In addition, increases in inflation and members living longer could increase the pension and postretirement obligations. Management determines the level of this risk using reports prepared by independent actuaries and takes action, where appropriate, in terms of setting investment strategy and determining contribution levels. In the event that the pension obligations arising under the Company's employee benefit plans exceed the assets set aside to meet the obligations, the Company may be required to make additional contributions or increase its level of contributions to these plans.

Political Uncertainties

Political events, domestically or internationally, may directly or indirectly trigger or exacerbate the risk factors described above. Whether those underlying risk factors are driven by politics or not, the Company's dynamic approach to managing risks enables management to utilize the mitigating actions described above to attempt to reduce the potential impact of each underlying risk factor on the Company.

b. Leases

The Company leases office space and equipment in the normal course of business under various noncancelable operating lease agreements. Additionally, the Company, as lessee, has entered various sublease agreements with affiliates for office space, such as OppenheimerFunds, Inc. (OFI) and Barings. Total rental expense on net operating leases, recorded in general insurance expenses, was $164 million for the year ended December 31, 2018, $160 million for the year ended December 31, 2017. Net operating leases are net of sublease receipts of $11 million for the year ended December 31, 2018 and $10 million for the year ended December 31, 2017.

The Company has entered into two sale-leaseback transactions with unrelated parties to sell and leaseback certain fixed assets with book values of $110 million and $100 million, which resulted in no gain or loss. The leases have five year terms, which expire in 2020 and 2021 with annual lease payments of approximately $22 million and $20 million. At the end of the leases, the Company has the option to purchase the underlying assets at fair value.

Future minimum commitments for all lease obligations as of December 31, 2018 were as follows:

	Gross	Affiliated Subleases	Nonaffiliated Subleases	Net
	(In Millions)			
2019	$ 134	$ 9	$ 2	$ 123
2020	121	10	2	109
2021	82	8	1	73
2022	52	4	1	47
2023	37	3	1	33
Thereafter	50	1	-	49
Total	$ 476	$ 35	$ 7	$ 434

c. Guaranty funds

The Company is subject to state insurance guaranty fund laws. These laws assess insurance companies' amounts to be used to pay benefits to policyholders and policy claimants of insolvent insurance companies. Many states allow these assessments to be credited against future premium taxes. The Company believes such assessments in excess of amounts accrued will not materially impact its financial position, results of operations or liquidity.

d. Litigation and regulatory matters

In the normal course of business, the Company is involved in disputes, litigation and governmental or regulatory inquiries, administrative proceedings, examinations and investigations, both pending and threatened. These matters, if resolved adversely against the Company or settled, may result in monetary damages, fines and penalties or require changes in the Company's business practices. The resolution or settlement of these matters is inherently difficult to predict. Based upon the Company's assessment of these pending matters, the Company does not believe that the amount of any judgment, settlement or other action arising from any pending matter is likely to have a material adverse effect on the statement of financial position. However, an adverse outcome in certain matters could have a material adverse effect on the results of operations for the period in which such matter is resolved, or an accrual is determined to be required, on the financial statement financial position, or on our reputation.

The Company evaluates the need for accruals of loss contingencies for each matter. When a liability for a matter is probable and can be estimated, the Company accrues an estimate of the loss and any related insurance recoveries, if any. An accrual is subject to subsequent adjustment as a result of additional information and other developments. The resolution of matters are inherently difficult to predict, especially in the early stages of matter. Even if a loss is probable, due to many complex factors, such as speed of discovery and the timing of court decisions or rulings, a loss or range of loss may not be reasonably estimated until the later stages of the matter. For matters where a loss is material and it is either probable or reasonably possible then it is disclosed. For matters where a loss may be reasonably possible, but not probable, or is probable but not reasonably estimated, no accrual is established, but the matter, if material, is disclosed.

e. Commitments

In the normal course of business, the Company provides specified guarantees and funding to MMHLLC and certain of its subsidiaries. As of December 31, 2018, the Company had approximately $387 million of these unsecured funding commitments to its subsidiaries and $123 million as of December 31, 2017. The unsecured commitments are included in private placements in the table below. As of December 31, 2018 and 2017, the Company had not funded, nor had an outstanding balance due on, these commitments.

In the normal course of business, the Company enters into letter of credit arrangements. The Company had outstanding letter of credit arrangements of approximately $192 million as of December 31, 2018 and approximately $152 million as of December 31, 2017. As of December 31, 2018 and 2017, the Company did not have any funding requests attributable to these letter of credit arrangements.

In the normal course of business, the Company enters into commitments to purchase certain investments. The majority of these commitments have funding periods that extend between one and five years. The Company is not required to fund commitments once the commitment period expires.

As of December 31, 2018, the Company had the following outstanding commitments:

	2019	2020	2021	2022	2023	Thereafter	Total
	(In Millions)						
Private placements	$ 1,020	$ 1,797	$ 81	$ 68	$ 162	$ 601	$ 3,729
Mortgage loans	476	437	561	50	10	189	1,723
Real estate	5	204	-	-	-	-	209
Partnerships and LLC	350	196	141	218	947	737	2,589
LIHTCs (including equity contributions)	34	149	201	100	-	7	491
Total	$ 1,885	$ 2,783	$ 984	$ 436	$ 1,119	$ 1,534	$ 8,741

In the normal course of business the Company enters into commitments related to property lease arrangements, certain indemnities, investments and other business obligations. As of December 31, 2018 and 2017, the Company had no outstanding obligations attributable to these commitments.

f. Guarantees

In the normal course of business the Company enters into guarantees related to employee and retirement benefits, the maintenance of subsidiary regulatory capital, surplus levels and liquidity sufficient to meet certain obligations, and other property lease arrangements. If the Company were to recognize a liability, the financial statement impact would be to recognize either an expense or an investment in a subsidiary, controlled, or affiliated entity. The Company has no expectations for recoveries from third parties should these guarantees be triggered. As of December 31, 2018 and 2017, the Company had no outstanding obligations to any obligor attributable to these guarantees.

The following details contingent guarantees that are made on behalf of the Company's subsidiaries and affiliates as of December 31, 2018.

Type of guarantee	Nature of guarantee (including term) and events and circumstances that would require the guarantor to perform under guarantee	Carrying amount of liability	Maximum potential amount of future payments (undiscounted) required under the guarantee
Employee and Retirement Benefits	The Company guarantees the payment of certain employee and retirement benefits for specific wholly-owned subsidiaries (BREA and Barings), if the subsidiary is unable to pay.	-	The liabilities for these plans of $217 million have been recorded on the subsidiaries' books and represent the Company's maximum obligation.
Capital and Surplus Support of Subsidiaries	Certain guarantees of the Company provide for the maintenance of a subsidiary's regulatory capital, surplus levels and liquidity sufficient to meet certain obligations. These unlimited guarantees are made on behalf of certain wholly-owned subsidiaries. (C.M. Life, MML Bay State Life).	-	These guarantees are not limited and cannot be estimated.
Other Property Lease Arrangements	The Company guarantees the payment of various lease obligations on behalf of its subsidiaries and affiliates.	-	The future maximum potential obligations are immaterial to the Company.
Real Estate Development Completion Guarantee	The Company issued a construction loan for a real estate development project. The land on which the property is to be built is subject to a ground lease. In conjunction with issuing this construction loan, the Company has also issued a completion guarantee to the land owner that pays only in the event the project is not completed. The project is expected to be completed by June 2019.	-	$350 million
Secure Capital for Variable Annuity Separate Accounts	The Company guarantees the capital contributions required to be made by a variable annuity separate account contract holder in the event the contract holder fails to payoff a subscription line utilized to deploy capital for the separate account.	-	$45 million with the right to increase the line to $220 million.

17. Related party transactions

The Company has management and service contracts and cost-sharing arrangements with various subsidiaries and affiliates where the Company, for a fee, will furnish a subsidiary or affiliate, as required, operating facilities, human resources, computer software development and managerial services.

The Company has agreements with its subsidiaries and affiliates, including IRLLC, Copper Hill LLC (CHLLC), OFI, MML Investment Advisers LLC, The MassMutual Trust Company, FSB, MMI and Baring International Investment Limited, where the Company receives revenue for certain recordkeeping and other services that the Company provides to customers who select, as investment options, mutual funds managed by these affiliates.

The Company has agreements with its subsidiaries, Barings, Barings Real Estate Advisers LLC (BREA), MML Investment Advisers LLC, OFI and MassMutual Intellectual Property (MMIP), which provide investment advisory services and licensing agreements to the Company.

The following table summarizes the transactions between the Company and the related parties:

	Years Ended		
	2018	2017	2016
	(In Millions)		
Fee income:			
Management and service contracts and cost-sharing arrangements	$ 440	$ 341	$ 310
Investment advisory income	24	23	21
Recordkeeping and other services	22	23	23
Fee expense:			
Investment advisory services	270	248	303
Royalty and licensing fees	56	26	-

The Company reported amounts due from subsidiaries and affiliates of $82 million as of December 31, 2018 and $59 million as of December 31, 2017. The Company reported amounts due to subsidiaries and affiliates of ($17) million as of December 31, 2018 and ($7) million as of December 31, 2017. Terms generally require settlement of these amounts within 30 to 90 days.

MassMutual's wholly owned indirect subsidiaries, Barings and BREA, invest a portion of their nonqualified compensation plan in GICs. For the year ended December 31, 2018, MassMutual credited interest on deposits to Barings and BREA contracts were less than $1 million. For the year ended December 31, 2017, MassMutual credited interest on deposits of $2 million to the Barings contract and $1 million to the BREA contract.
The Company held debt issued by MMHLLC that amounted to $2,183 million as of December 31, 2018 and $1,769 million as of December 31, 2017. The Company recorded interest income on MMHLLC debt of $78 million in 2018 and $67 million in 2017. Notes maturing as of December 2018 and March 2019 were refinanced at 4.3% annual interest for $380 million.

MassMutual and C.M. Life together, approved financing for MassMutual Asset Finance, LLC (MMAF) of $4,475 million for 2018 and 2017, which can be used to finance ongoing asset purchases and refinance existing Company provided lines of credit. As of December 31, 2018 and 2017, the Company approved financing of $4,229 million. During 2018, MMAF borrowed $1,198 million and repaid $896 million under the credit facility. During 2017 MMAF borrowed $1,781 million and repaid $1,890 million under the credit facility. Outstanding borrowings under the facility with MassMutual were $3,479 million as of December 31, 2018 and $3,177 million as of December 31, 2017. Interest for these borrowings was $79 million for the year ended December 31, 2018 and $73 million for the year ended December 31, 2017. The interest of this facility adjusts monthly based on the 30-day LIBOR.

Together, MassMutual and C.M. Life, provide a credit facility to Jefferies Finance, LLC whereby Jefferies Finance, LLC (Jefferies) borrows cash through short-term approved financings to fund the purchase of loans for securitization. During 2018, Jefferies borrowed $361 million and repaid $586 million under the credit facility. During 2017, Jefferies borrowed $2,379 million and repaid $2,177 million under the credit facility. There were no outstanding borrowings under the facility as of December 31, 2018 and all outstanding interest had been paid. The interest of this facility is calculated based on a full pass through of interest accrued on the underlying loans purchased.

In 2018, the Company contributed $476 million in private equity investments and $81 million in bonds to its subsidiary Insurance Road LLC. In December 2018, IRLLC declared a distribution to the Company of $749 million.

In November 2017, MassMutual contributed certain receivables of $315 million to CHLLC, a wholly-owned subsidiary. The contribution was recorded at book value with no gain or loss recognized on the transaction. In December 2017, CHLLC paid a return of capital to the Company of $305 million.

In June 2017, MassMutual contributed certain intellectual property, with no carrying value, in an affiliated transaction with IRLLC, a wholly-owned subsidiary of MassMutual and therefore no gain or loss was recognized on the transaction. In June 2017, MassMutual became party to an agreement MMIP effective June 30, 2017, that gave MassMutual the right to use certain intellectual property in the operation of its business. MassMutual incurred an expense of $56 million in 2018 and $26 million in 2017 for these rights.

In June 2017, MassMutual contributed its ownership in certain partnerships and LLCs with a carrying value of approximately $743 million to IRLLC in an affiliated transaction and therefore no gain or loss was recognized on the transaction.

The Company has reinsurance agreements with its subsidiary, C.M. Life, and its indirect subsidiary, MML Bay State, including stop-loss, coinsurance, Modco and yearly renewable term agreements on life insurance products. The Company also has coinsurance agreements with C.M. Life where the Company assumes substantially all of the premium on certain universal life policies.

As of December 31, 2018, the net reinsurance amounts due to C.M. Life and MML Bay State were $40 million and as of December 31, 2017, the net reinsurance amounts due to C.M. Life and MML Bay State were $39 million. These outstanding balances are due and payable with terms ranging from monthly to annually, depending on the agreement in effect.

The following table summarizes the reinsurance transactions for these reinsurance agreements:

	Years Ended December 31,		
	2018	2017	2016
	(In Millions)		
Premium assumed	$ 49	$ 52	$ 53
Modco adjustments, included in fees and other income	12	14	9
Expense allowance on reinsurance assumed, included in commissions	(20)	(20)	(21)
Policyholders' benefits	(139)	(134)	(109)
Experience refunds (paid) received	(3)	1	-

For further information on common stocks - subsidiaries and affiliates, refer to *Note 5c. "Common stocks - subsidiaries and affiliates."*

In the normal course of business, the Company provides specified guarantees and funding to MMHLLC and certain of its subsidiaries. Refer to *Note 16e. "Commitments"* for information on the Company's accounting policies regarding these related party commitments and *Note 16f. "Guarantees"* for information on the guarantees.

18. Subsequent events

Management of the Company has evaluated subsequent events through March 19, 2019, the date the financial statements were available to be issued.

On March 7, 2019, the Company entered into a Contingent Capital Facility Agreement (the Facility) with an unaffiliated entity, Harborwalk Funding Trust (the Trust). Subject to regulatory approval, under the Facility MassMutual has the right, and in certain circumstances the obligation, to issue up to $800 million of surplus notes to the Trust in exchange for all or a pro rata portion of certain principal and interest strips of U.S. Treasury Securities held by the Trust. The Company is required to pay a facility fee of approximately 2.00% per year to the Trust on the undrawn portion of the Facility (totaling approximately $16 million per year if the Facility remains undrawn) and certain additional administrative fees and expenses.

No other events have occurred subsequent to the date of the Statements of Financial Position and before the date of evaluation that would require disclosure.

19. Subsidiaries and affiliated companies

A summary of ownership and relationship of the Company and its subsidiaries and affiliated companies as of December 31, 2018 is illustrated below. Subsidiaries are wholly owned, except as noted.

<u>Subsidiaries of Massachusetts Mutual Life Insurance Company</u>
C.M. Life Insurance Company
MML Mezzanine Investor L, LLC
Berkshire Way LLC
MML Special Situations Investor LLC
Timberland Forest Holding LLC
WP – SC, LLC – 81% (remaining 19% owned by C.M. Life Insurance Company)
MSP – SC, LLC
Country Club Office Plaza LLC – 88% (remaining 12% owned by C.M. Life Insurance Company)
Insurance Road LLC
MM Copper Hill Road LLC
Jefferies Finance LLC– 50% (remaining 50% owned by Jefferies Group, Inc.)
MassMutual Retirement Services, LLC
MML Distributors LLC – 99% (remaining 1% owned by MassMutual Holding LLC)
MML Investment Advisers, LLC
MML Mezzanine Investor, LLC
Pioneers Gate LLC
MML Strategic Distributors, LLC
The MassMutual Trust Company, FSB
MassMutual Asset Finance LLC
MassMutual Mortgage Lending LLC
MML Private Placement Investment Company I, LLC
MML Private Equity Fund Investor LLC
MM Private Equity Intercontinental LLC
MassMutual Holding LLC
MassMutual International, LLC
MML Management Corporation
MML Mezzanine Investor II, LLC
MML Mezzanine Investor III, LLC
MassMutual External Benefits Group LLC
EM Opportunities LLC

Subsidiaries of C.M. Life Insurance Company
MML Bay State Life Insurance Company
CML Mezzanine Investor, LLC
CML Mezzanine Investor L, LLC
CML Mezzanine Investor III, LLC
CML Special Situations Investor LLC

Subsidiaries of MML Bay State Life Insurance Company
(No subsidiaries)

Subsidiaries of Timberland Forest Holding LLC
Lyme Adirondack Forest Company, LLC

Subsidiaries of Insurance Road LLC
MassMutual Trad Private Equity LLC
MassMutual Intellectual Property LLC
Trad Investments LLC

MML Investment Advisers, LLC
(No Subsidiaries)

Subsidiaries of MassMutual Asset Finance LLC
MMAF Equipment Finance LLC 2009-A
MMAF Equipment Finance LLC 2011-A

Pioneers Gate LLC
(No subsidiaries)

Subsidiaries of MassMutual Holding LLC
Fern Street LLC
Haven Life Insurance Agency, LLC
MassMutual Assignment Company
MassMutual Capital Partners LLC
MassMutual Ventures Holding LLC
MM Rothesay Holdco US LLC
MML Investors Services, LLC
LifeScore Labs, LLC
MM Asset Management Holding LLC

Subsidiaries of MassMutual International LLC
Yunfeng Financial Group Limited
MassMutual Life Insurance Company – 15%

Subsidiaries of MML Management Corporation
MassMutual Holding MSC, Inc.
MassMutual International Holding MSC, Inc.

Subsidiaries of MassMutual Ventures Holding LLC
MassMutual Ventures US I LLC
MassMutual Ventures US II LLC
MassMutual Ventures UK LLC
MassMutual Ventures Southeast Asia I LLC
MassMutual Ventures Management LLC
MassMutual Ventures SEA Management Private Limited (an indirect subsidiary of Subsidiary of MassMutual Ventures Holding LLC)

MML Investors Services, LLC
MMLISI Financial Alliances, LLC
MML Insurance agency, LLC

Subsidiaries of Barings LLC (a subsidiary of MM Asset Management Holding LLC)
Barings Finance LLC
Barings Securities LLC
Barings Guernsey Limited
Barings Asset Management (Asia) Holdings Limited
Barings Multifamily Capital Holdings LLC
Barings Real Estate Advisers Inc.
MassMutual Baring Holding, LLC

Subsidiaries of OppenheimerFunds, Inc. (an indirect subsidiary of MM Asset Management Holding LLC)
OppenheimerFunds Distributor, Inc.
Oppenheimer Real Asset Management, Inc.
OFI Global Institutional, Inc.
OFI SteelPath, Inc.
Shareholder Services, Inc.
OFI Advisors, LLC
OFI Global Asset Management, Inc.
OFI Private Investments, Inc.

Subsidiaries of OppenheimerFunds Distributor, Inc.
(No subsidiaries)

Subsidiaries of Tremont Group Holdings, Inc. (an indirect subsidiary of MM Asset Management Holding LLC)
Tremont Partners LLC
Tremont GP, LLC
Settlement Agent LLC (an indirect subsidiary of Subsidiary of Tremont Group Holdings, Inc)
Tremont (Bermuda), Limited

Subsidiaries of Baring Asset Management Limited (an indirect subsidiary of MassMutual Baring Holding LLC)
Baring International Investment Limited
Baring International Investment Management Holdings Limited
Baring Fund Managers Limited
Baring Pension Trustees Limited
Baring Investment Services Limited
Barings Global Advisers Limited

Subsidiaries of Baring International Investment Limited
(No subsidiaries)

Information regarding filings of Subsidiaries and Controlled Affiliates

The following presents certain information regarding the Company's valuation filings for controlled affiliates of the Company:

		As of December 31, 2018						
	CUSIP	Gross Value	Non-admitted	Admitted	Latest Filing	2017 Approved Valuation	Filing Code	Valuation Method Disallowed?
		($ in Millions)						
MassMutual Holding LLC	57543#-11-8	$ 9,338	$ -	$ 9,338	7/31/2018	$ 9,116	Sub-2	No
The MassMutual Trust Co, FSB	57631@-10-5	27	-	27	7/31/2018	22	Sub-2	No
Cornerstone Global REIT Corp	21926@-10-5	-	-	-	7/31/2018	-	Sub-2	No
MML Management Corporation	55338@-10-5	1,012	-	1,012	8/30/2018	956	Sub-2	No
Aggregate Total:		$ 10,377	$ -	$ 10,377		$ 10,094		

20. Impairment listing for loan-backed and structured securities

The following are the total cumulative adjustments and impairments for loan-backed and structured securities since July 1, 2009:

Period Ended	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
December 31, 2018	$ 4,550,173	$ -	$ 4,550,173	$ 3,815,559	$ (734,614)	$ 3,815,559	$ 4,014,514
September 30, 2018	4,320,826	-	4,320,826	3,663,181	(657,645)	3,663,181	3,687,297
June 30, 2018	634,235	-	634,235	279,221	(355,014)	279,221	386,752
March 31, 2018	645,690	-	645,690	488,181	(157,509)	488,181	448,494
December 31, 2017	3,949,513	-	3,949,513	1,958,759	(1,990,754)	1,958,759	2,023,952
September 30, 2017	4,436,542	-	4,436,542	876,942	(3,559,600)	876,942	4,647,683
June 30, 2017	40,538,551	-	40,538,551	39,808,956	(729,595)	39,808,956	60,990,732
March 31, 2017	41,788,380	-	41,788,380	41,391,889	(396,491)	41,391,889	56,156,936
December 31, 2016	42,175,938	-	42,175,938	42,045,721	(130,217)	42,045,721	54,619,477
September 30, 2016	44,266,478	-	44,266,478	41,890,535	(2,375,942)	41,890,535	61,300,066
June 30, 2016	49,097,217	-	49,097,217	48,202,703	(894,514)	48,202,703	63,207,410
March 31, 2016	57,985,071	-	57,985,071	55,783,979	(2,201,092)	55,783,979	70,578,397
December 31, 2015	4,881,394	-	4,881,394	4,783,194	(98,200)	4,783,194	4,728,736
September 30, 2015	50,531,382	-	50,531,382	45,665,859	(4,865,524)	45,665,859	58,523,652
June 30, 2015	66,924,927	-	66,924,927	65,240,585	(1,684,341)	65,240,585	72,953,475
March 31, 2015	17,856,447	-	17,856,447	17,681,510	(174,937)	17,681,510	17,553,999
December 31, 2014	69,225,743	-	69,225,743	68,301,291	(924,452)	68,301,291	79,410,553
September 30, 2014	645,721	-	645,721	604,437	(41,284)	604,437	627,381
June 30, 2014	57,012,606	-	57,012,606	55,422,168	(1,590,438)	55,422,168	75,253,388
March 31, 2014	91,702,041	-	91,702,041	80,744,074	(10,957,967)	80,744,074	97,672,071
December 31, 2013	113,707,951	-	113,707,951	108,815,640	(4,892,311)	108,815,640	111,783,052
September 30, 2013	81,945,730	-	81,945,730	80,589,482	(1,356,248)	80,589,482	77,049,314
June 30, 2013	147,215,936	-	147,215,936	142,140,572	(5,075,365)	142,140,572	130,973,023
March 31, 2013	194,772,025	-	194,772,025	188,372,089	(6,399,936)	188,372,089	176,678,910
December 31, 2012	378,096,660	-	378,096,660	366,323,110	(11,773,550)	366,323,110	333,086,073
September 30, 2012	816,573,456	-	816,573,456	788,350,823	(28,222,633)	788,350,823	697,683,289
June 30, 2012	912,025,937	-	912,025,937	890,494,221	(21,531,716)	890,494,221	708,872,106
March 31, 2012	1,095,018,529	-	1,095,018,529	1,058,132,041	(36,886,488)	1,058,132,041	841,095,013
December 31, 2011	1,090,904,993	-	1,090,904,993	1,056,761,288	(34,143,705)	1,056,761,288	754,310,838
September 30, 2011	762,320,632	-	762,320,632	738,510,048	(23,810,584)	738,510,048	546,494,232
June 30, 2011	1,130,732,656	-	1,130,732,656	1,078,535,670	(52,196,986)	1,078,535,670	839,143,290
March 31, 2011	1,097,705,351	-	1,097,705,351	1,068,852,204	(28,853,147)	1,068,852,204	816,688,348
December 31, 2010	968,742,508	-	968,742,508	950,111,417	(18,631,091)	950,111,417	708,895,637
September 30, 2010	915,728,030	-	915,728,030	889,896,058	(25,831,972)	889,896,058	673,462,493
June 30, 2010	1,362,887,892	-	1,362,887,892	1,335,628,212	(27,259,681)	1,335,628,212	975,241,506
March 31, 2010	1,471,905,696	-	1,471,905,696	1,391,337,543	(80,568,153)	1,391,337,543	1,015,645,802
December 31, 2009	1,349,124,214	-	1,349,124,214	1,290,817,168	(58,307,046)	1,290,817,168	852,088,739
September 30, 2009	2,953,442,689	(106,853,708)	2,846,588,981	2,700,948,264	(145,640,716)	2,700,948,264	1,692,409,640
Totals		$ (106,853,708)			$ (645,901,457)		

The following is the impairment listing for loan-backed and structured securities for the three months ended December 31, 2018:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
65106FAG7	$ 205,885	$ -	$ 205,885	$ 17,668	$ (188,218)	$ 17,668	$ 21,031
18974BAA7	306,428	-	306,428	295,291	(11,137)	295,291	294,986
22541QQR6	28,742	-	28,742	(9,704)	(38,446)	(9,704)	1
32051GCF0	32,493	-	32,493	20,481	(12,012)	20,481	20,063
17309FAE8	203,743	-	203,743	202,326	(1,417)	202,326	201,875

57643QAE5	3,657,695	-	3,657,695	3,177,611	(480,084)	3,177,611	3,365,017
92990GAE3	115,186	-	115,186	111,886	(3,300)	111,886	111,541
Totals	$ 4,550,173	$ -	$ 4,550,173	$ 3,815,559	$ (734,614)	$ 3,815,559	$ 4,014,514

The following is the impairment listing for loan-backed and structured securities for the three months ended September 30, 2018:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
05535DCF9	$ 3,454,425	$ -	$ 3,454,425	$ 3,141,048	$ (313,377)	$ 3,141,048	$ 3,134,409
07384YPP5	321,829	-	321,829	148,884	(172,945)	148,884	132,968
07386HCP4	2,164	-	2,164	(6,255)	(8,418)	(6,255)	320
76110H4M8	1,715	-	1,715	(3,719)	(5,434)	(3,719)	641
79548KXQ6	423,086	-	423,086	383,222	(39,864)	383,222	292,015
939336Z48	117,607	-	117,607	-	(117,607)	-	126,945
Totals	$ 4,320,826	$ -	$ 4,320,826	$ 3,663,181	$ (657,645)	$ 3,663,181	$ 3,687,297

The following is the impairment listing for loan-backed and structured securities for the three months ended June 30, 2018:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
59020UW43	$ 337,732	$ -	$ 337,732	$ 271,686	$ (66,046)	$ 271,686	$ 354,508
76110H4M8	6,848	-	6,848	1,969	(4,879)	1,969	1,713
863579DV7	289,655	-	289,655	5,567	(284,089)	5,567	30,531
Totals	$ 634,235	$ -	$ 634,235	$ 279,221	$ (355,014)	$ 279,221	$ 386,752

The following is the impairment listing for loan-backed and structured securities for the three months ended March 31, 2018:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
07386HEN7	$ 43,711	$ -	$ 43,711	$ 2,334	$ (41,377)	$ 2,334	$ 1,609
79548KXQ6	520,764	-	520,764	476,293	(44,471)	476,293	365,994
45660NZY4	81,215	-	81,215	9,554	(71,661)	9,554	80,891
Totals	$ 645,690	$ -	$ 645,690	$ 488,181	$ (157,509)	$ 488,181	$ 448,494

21. Structured Notes

A structured note is a direct debt issuance by a corporation, municipality, or government entity, ranking pari-passu with the issuer's other debt issuance of equal seniority where either: (a) the coupon and/or principal payments are linked, in whole or in part, to prices or payment streams from index or indices, or assets deriving their value from other than the issuer's credit quality, or (b) the coupon and/or principal payments are leveraged by a formula that is different from either a fixed coupon, or a non-leveraged floating rate coupon linked to an interest rate index, including but not limited to LIBOR or the prime rate. As structured notes are issuer obligations without a trust, they are within the scope of SSAP No. 26R, *Bonds, Excluding Loan-backed and Structured Securities*. Structured notes are different than the asset backed structured securities, which are accounted for under SSAP No. 43R, *Loan-Backed and Structured Securities*, as they lack either a trust or assets backing them. The disclosure below allows regulators to assess the volume of activity in structured notes and to determine whether additional accounting or reporting revisions, such as valuation and risk-based capital, are needed. To satisfy this request, the Company is required to separately identify structured notes, on a CUSIP basis and provide information by CUSIP for actual cost, fair value, book/adjusted carrying value, and whether the structured note is a mortgage-referenced security. The following sets forth the actual cost, fair value and carrying value of structured notes as of December 31, 2018:

CUSIP Identification	Actual Cost	Fair Value	Book / Adjusted Carrying Value	Mortgage-Referenced Security (YES/NO)
30711XDK7	$ 223,984	$ 218,225	$ 223,324	YES
391164AF7	8,467,560	7,945,553	8,215,311	NO
5262720	1,262,834	1,275,462	1,270,692	NO
912810FR4	4,944,283	6,121,357	5,723,654	NO
912810PS1	1,874,118	2,630,205	2,370,614	NO
BYZK109	9,327,385	9,606,875	9,361,838	NO
Total	$ 26,100,164	$ 27,797,677	$ 27,165,433	

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
CONDENSED STATUTORY FINANCIAL STATEMENTS
(UNAUDITED)

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MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
CONDENSED STATUTORY STATEMENTS OF FINANCIAL POSITION
(UNAUDITED)

	March 31, 2019	December 31, 2018	$ Change	% Change
	($ In Millions)			
Assets:				
Bonds	$ 98,271	$ 97,079	$ 1,192	1 %
Preferred stocks	748	744	4	1
Common stocks – subsidiaries and affiliates	13,224	12,327	897	7
Common stocks – unaffiliated	477	500	(23)	(5)
Mortgage loans	24,402	23,624	778	3
Policy loans	13,985	13,873	112	1
Real estate	469	488	(19)	(4)
Partnerships and limited liability companies	8,644	8,599	45	1
Derivatives	8,898	8,741	157	2
Cash, cash equivalents and short-term investments	3,416	4,318	(902)	(21)
Other invested assets	1,331	943	388	41
Total invested assets	173,865	171,236	2,629	2
Investment income due and accrued	2,448	3,018	(570)	(19)
Federal income taxes	239	612	(373)	(61)
Deferred income taxes	1,087	983	104	11
Other than invested assets	3,233	3,320	(87)	(3)
Total assets excluding separate accounts	180,872	179,169	1,703	1
Separate account assets	69,073	64,478	4,595	7
Total assets	$ 249,945	$ 243,647	$ 6,298	3 %
Liabilities and Surplus:				
Policyholders' reserves	$ 122,971	$ 121,978	$ 993	1 %
Liabilities for deposit-type contracts	15,255	14,370	885	6
Contract claims and other benefits	591	479	112	23
Policyholders' dividends	1,726	1,713	13	1
General expenses due or accrued	920	1,096	(176)	(16)
Asset valuation reserve	3,370	3,307	63	2
Repurchase agreements	4,391	4,768	(377)	(8)
Commercial paper	250	250	-	-
Collateral	2,379	2,946	(567)	(19)
Derivatives	5,688	4,912	776	16
Funds held under coinsurance	4,124	4,099	25	1
Other liabilities	3,508	3,641	(133)	(4)
Total liabilities excluding separate accounts	165,173	163,559	1,614	1
Separate account liabilities	69,073	64,478	4,595	7
Total liabilities	234,246	228,037	6,209	3
Surplus	15,699	15,610	89	1
Total liabilities and surplus	$ 249,945	$ 243,647	$ 6,298	3 %

See notes to condensed statutory financial statements

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
CONDENSED STATUTORY STATEMENTS OF OPERATIONS
(UNAUDITED)

	Three Months Ended March 31, 2019	Three Months Ended March 31, 2018	$ Change	% Change
	($ In Millions)			
Revenue:				
Premium income	$ 4,927	$ 6,001	$ (1,074)	(18) %
Net investment income	1,681	1,735	(54)	(3)
Fees and other income	336	159	177	111
Total revenue	6,944	7,895	(951)	(12)
Benefits and expenses:				
Policyholders' benefits	5,613	5,933	(320)	(5)
Change in policyholders' reserves	242	1,190	(948)	(80)
Change in group annuity reserves assumed	(223)	(458)	235	51
General insurance expenses	559	565	(6)	(1)
Commissions	258	257	1	NM
State taxes, licenses and fees	78	68	10	15
Total benefits and expenses	6,527	7,555	(1,028)	(14)
Net gain from operations before dividends and federal income taxes	417	340	77	23
Dividends to policyholders	393	364	29	8
Net gain (loss) from operations before federal income taxes	24	(24)	48	200
Federal income tax expense (benefit)	69	71	(2)	(3)
Net loss from operations	(45)	(95)	50	53
Net realized capital gains (losses)	39	(1,441)	1,480	103
Net loss	$ (6)	$ (1,536)	$ 1,530	100 %

NM = not meaningful

See notes to condensed statutory financial statements

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
CONDENSED STATUTORY STATEMENTS OF CHANGES IN SURPLUS
(UNAUDITED)

	Three Months Ended March 31, 2019	Three Months Ended March 31, 2018	$ Change	% Change
	($ In Millions)			
Surplus, beginning of year	$ 15,610	$ 15,705	$ (95)	(1) %
Decrease due to:				-
Net loss	(6)	(1,536)	1,530	100
Change in net unrealized capital gains (losses), net of tax	(108)	(221)	113	51
Change in net unrealized foreign exchange capital				-
(losses) gains, net of tax	47	277	(230)	(83)
Change in other net deferred income taxes	12	219	(207)	(95)
Change in nonadmitted assets	245	(203)	448	221
Change in asset valuation reserve	(64)	951	(1,015)	(107)
Prior period adjustments	(34)	(67)	33	49
Other	(3)	(4)	1	25
Net increase (decrease)	89	(584)	673	115
Surplus, end of period	$ 15,699	$ 15,121	$ 578	4 %

See notes to condensed statutory financial statements

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
CONDENSED STATUTORY STATEMENTS OF CASH FLOWS
(UNAUDITED)

	Three Months Ended March 31, 2019	Three Months Ended March 31, 2018	$ Change	% Change
	($ In Millions)			
Cash from operations:				
Premium and other income collected	$ 5,317	$ 6,219	$ (902)	-15%
Net investment income	2,378	1,443	935	65
Benefit payments	(5,421)	(5,898)	477	8
Net transfers from separate accounts	717	223	494	222
Net receipts from group annuity reserves assumed	223	458	(235)	(51)
Commissions and other expenses	(1,013)	(1,002)	(11)	(1)
Dividends paid to policyholders	(380)	(353)	(27)	(8)
Federal and foreign income taxes recovered	330	164	166	101
Net cash from operations	2,151	1,254	897	72
Cash from investments:				
Proceeds from investments sold, matured or repaid:				
Bonds	4,584	3,518	1,066	30
Preferred and common stocks – unaffiliated	94	102	(8)	(8)
Common stocks – affiliated	7	-	7	NM
Mortgage loans	307	512	(205)	(40)
Real estate	28	261	(233)	(89)
Partnerships and limited liability companies	287	587	(300)	(51)
Derivatives	304	(394)	698	177
Other	(473)	(179)	(294)	(164)
Total investment proceeds	5,138	4,407	731	17
Cost of investments acquired:				
Bonds	(5,758)	(3,844)	(1,914)	(50)
Preferred and common stocks – unaffiliated	(68)	(90)	22	24
Common stocks – affiliated	(551)	(206)	(345)	(167)
Mortgage loans	(1,066)	(961)	(105)	(11)
Real estate	(24)	34	(58)	(171)
Partnerships and limited liability companies	(293)	(392)	99	25
Derivatives	(70)	(224)	154	-
Other	241	386	(145)	(38)
Total investments acquired	(7,589)	(5,297)	(2,292)	(43)
Net increase in policy loans	(111)	(145)	34	23
Net cash from investing activities	(2,562)	(1,035)	(1,527)	(148)
Cash from financing and miscellaneous sources:				
Net deposits on deposit-type contracts	43	598	(555)	(93)
Change in repurchase agreements	(377)	(103)	(274)	(266)
Change in collateral	(483)	(705)	222	31
Other cash provided (used)	326	(147)	473	322
Net cash from financing and miscellaneous sources	(491)	(357)	(134)	(38)
Net change in cash, cash equivalents and short-term investments	(902)	(138)	(764)	(554)
Cash, cash equivalents and short-term investments:				
Beginning of year	4,318	3,580	738	21
End of period	$ 3,416	$ 3,442	$ (26)	(1)%

See notes to condensed statutory financial statements

1. Nature of operations

Massachusetts Mutual Life Insurance Company (the Company), a mutual life insurance company domiciled in the Commonwealth of Massachusetts, and its domestic life insurance subsidiaries provide individual and group life insurance, disability insurance, individual and group annuities and guaranteed interest contracts (GIC) to individual and institutional customers in all 50 states of the United States of America (U.S.), the District of Columbia and Puerto Rico. Products and services are offered primarily through the Company's MassMutual Financial Advisors (MMFA), Direct to Consumer (DTC), Institutional Solutions (IS) and Workplace Solutions (WS) distribution channels.

MMFA is a sales force that includes financial advisors that operate in the U.S. MMFA sells individual life, individual annuities and disability insurance. The Company's DTC distribution channel sells individual life and supplemental health insurance primarily through direct response television advertising, digital media, search engine optimization and search engine marketing. The Company's IS distribution channel sells group annuities, group life and GIC primarily through retirement advisory firms, actuarial consulting firms, investment banks, insurance benefit advisors and investment management companies. The Company's WS distribution channel sells group life insurance and annuity products as well as individual life insurance, critical illness and long term care products distributed through investment advisors.

2. Summary of significant accounting policies

a. Basis of presentation

The condensed statutory financial statements have been prepared in conformity with the statutory accounting practices of the National Association of Insurance Commissioners (NAIC) and the accounting practices prescribed or permitted by the Commonwealth of Massachusetts Division of Insurance (the Division).

The condensed statutory financial statements and notes as of March 31, 2019 and December 31, 2018, and for the three months ended March 31, 2019 and 2018, are unaudited. These condensed statutory financial statements, in the opinion of management, reflect the fair presentation of the financial position, results of operations, changes in surplus and cash flows for the interim periods. These condensed statutory financial statements and notes should be read in conjunction with the statutory financial statements and notes thereto included in the Company's 2018 audited yearend financial statements as these condensed statutory financial statements disclose only significant changes from yearend 2018. The results of operations for the interim periods should not be considered indicative of results to be expected for the full year. The Condensed Statutory Statements of Financial Position as of December 31, 2018 have been derived from the audited financial statements at that date, but do not include all of the information and footnotes required by statutory accounting practices for complete financial statements.

For the full description of accounting policies, see *Note 2. "Summary of significant accounting policies"* of Notes to Statutory Financial Statements included in the Company's 2018 audited yearend financial statements

b. Common stocks – subsidiaries and affiliates

Common stocks of unconsolidated subsidiaries, primarily C.M. Life Insurance Company (C.M. Life), MML Bay State Life Insurance Company (MML Bay State), and MassMutual Holding LLC (MMHLLC), are accounted for using the statutory equity method. The Company accounts for the value of MMHLLC at its underlying U.S. generally accepted accounting principles (U.S GAAP) equity value, adjusted by a portion of its noncontrolling interests (NCI) after consideration of MMHLLC's fair value and the Company's capital levels. The Division has affirmed the statutory recognition of the Company's application of the NCI guidelines in MMHLLC's statutory carrying value. However, the Company has limited this recognition to $3,022 million as of March 31, 2019 and $2,749 million as of December 31, 2018. Operating results, less dividends declared, for MMHLLC is reflected as net unrealized capital gains (losses) in the Statutory Statements of Changes in Surplus. Dividends declared from MMHLLC are recorded in net investment income when declared and are limited to MMHLLC's U.S. GAAP retained earnings. The cost basis of common stocks – subsidiaries and affiliates is adjusted for impairments deemed to be other than temporary.

MassMutual International LLC (MMI) was classified as common stocks – subsidiaries and affiliates as of December 31, 2017 and as partnerships and LLCs as of December 31, 2018. MMI was accounted for using the statutory equity method in both years. Prior to December 31, 2018, the Company accounted for the value of MMI at its underlying U.S. GAAP equity value adjusted to remove certain nonadmitted and intangible assets. Beginning on December 31, 2018, the value of MMI is recorded at its underlying U.S. GAAP equity value. The change in the value of MMI is reflected as net unrealized capital gains (losses) in the Statutory Statements of Changes in Surplus.

Refer to *Note 5b. "Common stocks – subsidiaries and affiliates"* for further information on the valuation of MMHLLC and MMI.

3. New accounting standards

Adoption of new accounting standards

In June 2016, the NAIC adopted substantive revisions to Statements of Statutory Accounting Principles (SSAP) No. 51R, *Life Contracts*, to incorporate references to the Valuation Manual and to facilitate the implementation of principles-based reserving (PBR), which were effective on January 1, 2017. The adoption of PBR only applies to new life insurance policies issued after January 1, 2017, however the Company plans to adopt these revisions to SSAP No. 51R using the 3-year phased in approach by no later than January 1, 2020. The Company currently uses formulas and assumptions to determine reserves as prescribed by state laws and regulations. Under PBR, the Company will be required to hold the higher of (a) the reserve using prescribed factors and (b) the PBR reserve which considers a wide range of future economic conditions, computed using justified company experience factors, such as mortality, policyholder behavior and expenses. The modifications are not expected to have a material effect on the Company’s total life reserves and surplus in the financial statements.

In October 2018, the NAIC issued SSAP No. 86, *Benchmark Interest Rates*, effective January 1, 2019. This guidance permits the use of the Overnight Index Swap (OIS) rate based on Secured Overnight Financing Rate as a U.S. benchmark interest rate for hedge accounting purposes under ASC Topic 815 in addition to the U.S. Treasury rate, the LIBOR swap rate, the OIS rate based on the Fed Funds Effective Rate, and the SIFMA Municipal Swap Rate. The Company has not elected to apply hedge accounting, therefore adoption of this guidance did not have an impact on the Company’s financial statements.

In November 2018, the NAIC issued SSAP No. 30R, *Unaffiliated Common Stock*, effective January 1, 2019. These clarifications applies to unaffiliated common stock including Securities Exchange Commission registered investment companies, such as closed-end mutual funds and unit investments trusts. The modification also includes public stock warrants, while nonpublic stock warrants would be classified as derivative instruments. The modifications did not have a material effect on the Company’s financial statements.

Future adoption of new accounting standards

In November 2018, the NAIC adopted modifications to the liquidity risk disclosure requirements of SSAP No. 51R, *Life Contracts*, No. 52, *Deposit-Type Contracts*, and No. 61R, *Life, Deposit-Type and Accident and Health Reinsurance*, effective December 31, 2019. The modifications will require the Company to provide additional liquidity risk information such as current surrender charges, amount of account value, cash value and reserves breakouts by withdrawal characteristics for certain general and separate account products and groups of products. Additionally, a reconciliation of amounts of total reserves disclosed to the applicable annual statement exhibits, and the corresponding financial statement line items will be required. The Company is currently evaluating the impact of the modifications to the liquidity risk disclosures in its financial statements.

In November 2018, the NAIC issued SSAP No. 108, *Derivatives Hedging Variable Annuity Guarantees*, to provide special accounting guidance for limited derivatives hedging variable annuity guarantee benefits that are subject to fluctuations from interest rates, effective January 1, 2020 with early adoption permitted as of January 1, 2019. This modification applies to variable annuity contracts and other contracts involving certain guaranteed benefits that are valued under principles-based reserving. This modification permits an insurer to use macro-hedging by designating as the host contract, an entire book of business or subsection consisting of interest sensitive variable annuity guarantee benefits, in a fair value hedge. The Company is required to record at fair value the interest rate sensitive variable annuity guarantee (that is, the hedged item) and the related derivative hedging instrument. Changes in the fair value of the derivatives attributable to the hedged item are recorded in realized gains and losses to offset the changes in the fair value of the hedged item. The excess or deficiency of the change in fair value of the derivative compared to the change in the fair value of the hedged item should be recorded as an admitted deferred asset or deferred liability, and amortized through realized capital gains and losses over the remaining term of the interest rate sensitive variable annuity, not to exceed 10 years. The Company is also required to record a special surplus allocation of an amount equal to the deferred asset and deferred liability from unassigned surplus. Changes in the fair value of the derivative that is not attributable to the hedge risk should be recorded in unrealized gains and losses. The Company will be required to disclose information about the derivative and related hedged items. The Company is currently evaluating this guidance to determine the potential impact on its financial statements.

4. Fair value of financial instruments

The following presents a summary of the carrying values and fair values of the Company's financial instruments:

	March 31, 2019				
	Carrying Value	Fair Value	Level 1	Level 2	Level 3
	(In Millions)				
Financial assets:					
Bonds:					
U. S. government and agencies	$ 5,411	$ 5,840	$ -	$ 5,840	$ -
All other governments	1,643	1,710	-	1,642	68
States, territories and possessions	613	658	-	658	-
Political subdivisions	545	583	-	583	-
Special revenue	5,993	6,621	-	6,611	10
Industrial and miscellaneous	77,082	78,963	10	45,575	33,378
Parent, subsidiaries and affiliates	6,984	7,106	-	1,237	5,869
Preferred stocks	748	756	11	-	745
Common stocks - subsidiaries and affiliates	925	925	808	-	117
Common stocks - unaffiliated	477	477	243	-	234
Mortgage loans - commercial	23,123	23,872	-	-	23,872
Mortgage loans - residential	1,279	1,239	-	-	1,239
Derivatives:					
Interest rate swaps	7,230	7,712	-	7,712	-
Options	743	743	-	743	-
Currency swaps	708	708	-	708	-
Forward contracts	68	68	-	68	-
Credit default swaps	19	20	-	20	-
Financial futures	130	130	-	130	-
Cash, cash equivalents and short-term investments	3,416	3,416	214	3,202	-
Separate account assets	69,073	69,073	45,375	23,278	420
Financial liabilities:					
Guaranteed interest contracts	9,663	9,657	-	-	9,657
Group annuity contracts and other deposits	17,821	17,906	-	-	17,906
Individual annuity contracts	8,112	9,000	-	-	9,000
Supplementary contracts	1,176	1,178	-	-	1,178
Repurchase agreements	4,391	4,391	-	4,391	-
Commercial paper	250	250	-	250	-
Derivatives:					
Interest rate swaps	5,398	5,398	-	5,398	-
Options	2	2	-	2	-
Currency swaps	229	229	-	229	-
Forward contracts	36	36	-	36	-
Credit default swaps	1	1	-	1	-
Financial futures	22	22	-	22	-

Common stocks – subsidiaries and affiliates do not include unconsolidated subsidiaries, which had statutory carrying values of $12,299 million.

	December 31, 2018				
	Carrying Value	Fair Value	Level 1	Level 2	Level 3
	(In Millions)				
Financial assets:					
Bonds:					
U. S. government and agencies	$ 5,854	$ 6,193	$ -	$ 6,193	$ -
All other governments	1,487	1,481	-	1,415	66
States, territories and possessions	614	647	-	647	-
Political subdivisions	547	571	-	571	-
Special revenue	5,927	6,421	-	6,412	9
Industrial and miscellaneous	75,124	74,538	10	42,695	31,833
Parent, subsidiaries and affiliates	7,526	7,570	-	1,172	6,398
Preferred stocks	744	734	12	-	722
Common stocks - subsidiaries and affiliates	398	398	233	-	165
Common stocks - unaffiliated	500	500	194	-	306
Mortgage loans - commercial	22,357	22,794	-	-	22,794
Mortgage loans - residential	1,267	1,211	-	-	1,211
Derivatives:					
Interest rate swaps	6,629	6,858	-	6,858	-
Options	911	910	-	910	-
Currency swaps	843	844	-	844	-
Forward contracts	106	113	-	113	-
Credit default swaps	18	6	-	6	-
Interest rate caps and floors	18	18	-	18	-
Financial futures - short positions	216	216	-	216	-
Cash, cash equivalents and short-term investments	4,318	4,318	175	4,143	-
Separate account assets	64,478	64,478	41,358	22,569	551
Financial liabilities:					
Guaranteed interest contracts	8,825	8,729	-	-	8,729
Group annuity contracts and other deposits	17,863	17,951	-	-	17,951
Individual annuity contracts	8,131	8,925	-	-	8,925
Supplementary contracts	1,178	1,179	-	-	1,179
Repurchase agreements	4,768	4,768	-	4,768	-
Commercial paper	250	250	-	250	-
Derivatives:					
Interest rate swaps	4,647	5,111	-	5,112	-
Options	5	5	-	4	-
Currency swaps	232	232	-	224	-
Forward contracts	12	28	-	29	-
Credit default swaps	2	3	-	3	-
Financial futures - short positions	14	14	-	13	-

Common stocks – subsidiaries and affiliates do not include unconsolidated subsidiaries, which had statutory carrying values of $11,929 million.

The use of different assumptions or valuation methodologies may have a material impact on the estimated fair value amounts.

The following presents the Company's fair value hierarchy for assets and liabilities that are carried at fair value:

	March 31, 2019			
	Level 1	Level 2	Level 3	Total
	(In Millions)			
Financial assets:				
Bonds:				
Industrial and miscellaneous	$ 10	$ 102	$ 41	$ 153
Parent, subsidiaries and affiliates	-	74	57	131
Preferred stocks	-	-	11	11
Common stocks - subsidiaries and affiliates	808	-	117	925
Common stocks - unaffiliated	243	-	234	477
Derivatives:				
Interest rate swaps	-	7,230	-	7,230
Options	-	743	-	743
Currency swaps	-	708	-	708
Forward contracts	-	68	-	68
Financial futures	-	130	-	130
Separate account assets	45,375	23,278	420	69,073
Total financial assets carried at fair value	$ 46,436	$ 32,333	$ 880	$ 79,649
Financial liabilities:				
Derivatives:				
Interest rate swaps	$ -	$ 5,398	$ -	$ 5,398
Options	-	2	-	2
Currency swaps	-	229	-	229
Forward contracts	-	36	-	36
Financial futures	-	22	-	22
Total financial liabilities carried at fair value	$ -	$ 5,687	$ -	$ 5,687

For the three months ended March 31, 2019, there were no significant transfers between Level 1 and Level 2 and the Company does not have any financial instruments that were carried at NAV as a practical expedient.

The following presents the Company's fair value hierarchy for assets and liabilities that are carried at fair value:

	December 31, 2018			
	Level 1	Level 2	Level 3	Total
	(In Millions)			
Financial assets:				
Bonds:				
Industrial and miscellaneous	10	30	64	104
Parent, subsidiaries and affiliates	-	82	66	148
Common stocks - subsidiaries and affiliates	233	-	165	398
Common stocks - unaffiliated	194	-	306	500
Derivatives:				
Interest rate swaps	-	6,629	-	6,629
Options	-	911	-	911
Currency swaps	-	843	-	843
Forward contracts	-	106	-	106
Interest rate caps and floors	-	18	-	18
Financial futures	-	216	-	216
Separate account assets	41,358	22,569	551	64,478
Total financial assets carried at fair value	$ 41,795	$ 31,404	$ 1,152	$ 74,351
Financial liabilities:				
Derivatives:				
Interest rate swaps	$ -	$ 4,647	$ -	$ 4,647
Options	-	5	-	5
Currency swaps	-	232	-	232
Forward contracts	-	12	-	12
Financial futures - short positions	-	14	-	14
Financial futures - long positions	-	1	-	1
Total financial liabilities carried at fair value	$ -	$ 4,911	$ -	$ 4,911

The Company reviews the fair value hierarchy classifications each reporting period. Changes in the observability of the valuation attributes and the level of market activity may result in a reclassification of certain financial assets or liabilities between fair value hierarchy classifications. Such reclassifications are reported as transfers between levels at the beginning fair value for the reporting period in which the changes occur. For the year ended December 31, 2018, there were no significant transfers from Level 2 to Level 1.

The following presents changes in the Company's Level 3 assets carried at fair value:

	Balance as of 1/1/19	Gains (Losses) in Net Income	Gains (Losses) in Surplus	Purchases	Issuances	Sales	Settlements	Transfers In	Transfers Out	Other	Balance as of 3/31/19
	(In Millions)										
Financial assets:											
Bonds:											
Industrial and miscellaneous	$ 64	$ 1	$ (1)	$ -	$ -	$ -	$ (13)	$ 2	$ -	$ (12)	$ 41
Parent, subsidiaries, and affiliates	66	-	(1)	-	-	-	-	-	(8)	-	57
Preferred stocks	-	-	-	-	1	-	-	-	-	10	11
Common stocks - subsidiaries and affiliates	165	1	(46)	-	-	-	(3)	-	-	-	117
Common stocks - unaffiliated	306	11	(24)	2	-	(61)	-	-	-	-	234
Derivatives:											
Separate account assets	551	12	-	-	-	(143)	-	-	-	-	420
Total financial assets	$ 1,153	$ 25	$ (72)	$ 2	$ 1	$ (204)	$ (16)	$ 2	$ (8)	$ (2)	$ 880

Other transfers include assets that are either no longer carried at fair value, or have just begun to be carried at fair value, such as assets with no level changes but a change in the lower of cost or market carrying basis. Industrial and miscellaneous bonds in other contain assets that are now carried at fair value due to ratings changes and assets are no longer carried at fair value where the fair value is now higher than the book value.

	Balance as of 1/1/18	Gains (Losses) in Net Income	Gains (Losses) in Surplus	Purchases	Issuances	Sales	Settlements	Transfers In	Transfers Out	Other	Balance as of 12/31/18
	(In Millions)										
Financial assets:											
Bonds:											
Industrial and miscellaneous	$ 55	$ (4)	$ (5)	$ -	$ 1	$ -	$ (9)	$ -	$ -	$ 26	$ 64
Parent, subsidiaries, and affiliates	61	4	(7)	9	-	-	(6)	5	-	-	66
Preferred stocks	2	-	-	-	-	-	-	-	-	(2)	-
Common stocks - subsidiaries and affiliates	110	-	41	5	6	-	(10)	9	-	4	165
Common stocks - unaffiliated	311	6	14	16	3	-	(44)	-	-	-	306
Derivatives:											
Currency swaps	1	-	-	-	-	-	-	-	(1)	-	-
Separate account assets	709	7	1	112	-	(278)	-	-	-	-	551
Total financial assets	$ 1,249	$ 13	$ 44	$ 142	$ 10	$ (278)	$ (69)	$ 14	$ (1)	$ 28	$ 1,152
Financial liabilities											
Derivatives:											
Currency swaps	$ 8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (8)	$ -	$ -

Level 3 transfers in are assets that are consistently carried at fair value but have had a level change. Common stocks unaffiliated assets were transferred from Level 2 to Level 3 due to a change in the observability of pricing inputs, at the beginning fair value for the reporting period.

5. *Investments*

The Company maintains a diversified investment portfolio. Investment policies limit concentration in any asset class, geographic region, industry group, economic characteristic, investment quality or individual investment.

a. Bonds

As of March 31, 2019, investments in structured and loan-backed securities that had unrealized losses, which were not recognized in earnings, had a fair value of $9,028 million. Securities in an unrealized loss position for less than 12 months had a fair value of $6,130 million and unrealized losses of $70 million. Securities in an unrealized loss position for greater than 12 months had a fair value of $2,898 million and unrealized losses of $74 million. These securities were primarily categorized as industrial and miscellaneous or parent, subsidiaries and affiliates.

As of December 31, 2018, investments in structured and loan-backed securities that had unrealized losses, which were not recognized in earnings, had a fair value of $9,992 million. Securities in an unrealized loss position for less than 12 months had a fair value of $7,859 million and unrealized losses of $141 million. Securities in an unrealized loss position for greater than 12 months had a fair value of $2,133 million and unrealized losses of $78 million. These securities were primarily categorized as industrial and miscellaneous or parent, subsidiaries and affiliates.

In the course of the Company's investment management activities, securities may be sold and reacquired within 30 days to enhance the Company's yield on its investment portfolio. The Company did not sell any securities with the NAIC Designation 3 or below for the three months ended March 31, 2019 or 2018, that were reacquired within 30 days of the sale date.

Residential mortgage-backed exposure

Residential mortgage-backed securities (RMBS) are included in the U.S. government and agencies, special revenue, and industrial and miscellaneous bond categories. The Alt-A category includes option adjustable-rate mortgages and the subprime category includes 'scratch and dent' or reperforming pools, high loan-to-value pools, and pools where the borrowers have very impaired credit but the average loan-to-value is low, typically 70% or below. In identifying Alt-A and subprime exposure, management used a combination of qualitative and quantitative factors, including FICO scores and loan-to-value ratios.

As of March 31, 2019, RMBS had a total carrying value of $1,242 million and a fair value of $1,357 million, of which approximately 20%, based on carrying value, was classified as Alt-A. Alt-A and subprime RMBS had a total carrying value of $451 million and a fair value of $528 million. As of December 31, 2018, RMBS had a total carrying value of $1,287 million and a fair value of $1,395 million, of which approximately 20%, based on carrying value, was classified as Alt-A. Alt-A and subprime RMBS had a total carrying value of $472 million and a fair value of $553 million.

b. Common stocks – subsidiaries and affiliates

MMHLLC paid $650 million in dividends for the period ended March 31, 2019, which were declared in December 2018, and recorded no dividends for the period ended March 31, 2018.

MassMutual contributed additional capital of $10 million to MMHLLC for the period ended March 31, 2019 and $141 million for the period ended March 31, 2018.

In October 2018, MassMutual announced a transaction in which Invesco Ltd. (Invesco), a global asset manager, will acquire MassMutual's retail asset management affiliate, OppenheimerFunds, Inc (OFI). In turn, MassMutual is expected to receive an approximate 15.5% common equity interest in the combined company. Under the terms of the agreement, MassMutual and OFI employee shareholders will receive 81.9 million shares of Invesco common equity and $4.0 billion in perpetual, noncumulative preferred shares with a fixed dividend rate of 5.9%. As part of this transaction, Invesco and MassMutual will enter into a shareholder agreement in which MassMutual will have customary minority shareholder rights, including appointment of a director to Invesco's board of directors. Pending regulatory and other customary approvals, the transaction is expected to close in the second quarter of 2019.

In February 2019, MassMutual purchased approximately $570 million of OFI seed capital investments, primarily in the form of common stocks – affiliated and novated the associated derivatives at fair market value.

c. Mortgage loans

Mortgage loans comprised commercial mortgage loans and residential mortgage loans. The Company’s commercial mortgage loans primarily finance various types of real estate properties throughout the U.S., the United Kingdom and Canada. The Company holds commercial mortgage loans for which it is the primary lender or a participant or co-lender in a mortgage loan agreement and mezzanine loans that are subordinate to senior secured first liens. Residential mortgage loans are primarily seasoned pools of homogeneous residential mortgage loans substantially backed by Federal Housing Administration (FHA) and Veterans Administration (VA) guarantees.

The carrying value and fair value of the Company's mortgage loans were as follows:

	March 31, 2019		December 31, 2018	
	Carrying Value	Fair Value	Carrying Value	Fair Value
	(In Millions)			
Commercial mortgage loans:				
Primary lender	$ 23,106	$ 23,854	$ 22,287	$ 22,723
Mezzanine loans	17	18	70	71
Total commercial mortgage loans	23,123	23,872	22,357	22,794
Residential mortgage loans:				
FHA insured and VA guaranteed	1,163	1,123	1,263	1,207
Other residential loans	116	116	4	4
Total residential mortgage loans	1,279	1,239	1,267	1,211
Total mortgage loans	$ 24,402	$ 25,111	$ 23,624	$ 24,005

As of March 31, 2019 and December 31, 2018, the loan-to-value ratios of 99% of the Company's commercial mortgage loans were less than 81%.

As of March 31, 2019 and December 31, 2018, the Company had no impaired mortgage loans with or without a valuation allowance or mortgage loans derecognized as a result of foreclosure, including mortgage loans subject to a participant or co-lender mortgage loan agreement with a unilateral mortgage loan foreclosure restriction or mortgage loan derecognized as a result of a foreclosure.

As of and for the three months ended March 31, 2019 and 2018, the Company had no valuation allowance recorded for commercial mortgage loans.

d. Derivatives

The Company uses derivative financial instruments in the normal course of business to manage risks, primarily to reduce currency, interest rate and duration imbalances determined in asset/liability analyses. The Company also uses a combination of derivatives and fixed income investments to create synthetic investments. These synthetic investments are created when they are economically more attractive than the actual instrument or when similar instruments are unavailable. Synthetic investments are created either to hedge and reduce the Company's credit and foreign currency exposure or to create an investment in a particular asset. The Company held synthetic investments with a notional amount of $16,341 million as of March 31, 2019 and $15,522 million as of December 31, 2018. These notional amounts included replicated asset transaction values of $14,401 million as of March 31, 2019 and $13,582 million as of December 31, 2018, as defined under statutory accounting practices as the result of pairing of a long derivative contract with cash instruments.

The Company’s principal derivative exposures to market risk are interest rate risk, which includes inflation and credit risk. Interest rate risk pertains to the change in fair value of the derivative instruments as a result of changes in market interest rates. The Company is exposed to credit-related losses in the event of nonperformance by counterparties to derivative financial instruments. The Company regularly monitors counterparty credit ratings, derivative positions, valuations and the value of collateral posted to ensure counterparties are credit-worthy and the concentration of exposure is minimized, and monitors its derivative credit exposure as part of its overall risk management program.

The Company enters derivative transactions through bilateral derivative agreements with counterparties, or through over the counter cleared derivatives with a counterparty and the use of a clearinghouse. To minimize credit risk for bilateral transactions, the Company and its counterparties generally enter into master netting agreements based on agreed upon requirements that outline the framework for how collateral is to be posted in the amount owed under each transaction, subject to certain minimums. For over the counter cleared derivative transactions between The Company and a counterparty, the parties enter into a series of master netting and other agreements that govern, among other things, clearing and collateral requirements. These transactions are cleared through a clearinghouse and each derivative counterparty is only exposed to the default risk of the clearinghouse. Certain interest rate swaps and credit default swaps are considered cleared transactions. These cleared transactions require initial and daily variation margin collateral postings. These agreements allow for contracts in a positive position, in which amounts are due to the Company, to be offset by contracts in a negative position. This right of offset, combined with collateral obtained from counterparties, reduces the Company’s credit exposure.

Net collateral pledged by the counterparties was $2,049 million as of March 31, 2019 and $2,491 million as of December 31, 2018. In the event of default, the full market value exposure at risk in a net gain position, net of offsets and collateral, was $163 million as of March 31, 2019 and $146 million as of December 31, 2018. The statutory net amount at risk, defined as net collateral pledged and statement values excluding accrued interest, was $753 million as of March 31, 2019 and $695 million as of December 31, 2018.

The Company had the right to rehypothecate or repledge securities totaling $1,185 million of the $2,049 million as of March 31, 2019 and $709 million of the $2,491 million as of December 31, 2018 of net collateral pledged by counterparties. There were no securities rehypothecated to other counterparties as of March 31, 2019 or December 31, 2018.

The following summarizes the carrying values and notional amounts of the Company’s derivative financial instruments:

	March 31, 2019			
	Assets		Liabilities	
	Carrying Value	Notional Amount	Carrying Value	Notional Amount
	(In Millions)			
Interest rate swaps	$ 7,230	$ 84,583	$ 5,398	$ 96,695
Options	743	19,639	2	3
Currency swaps	708	8,389	229	5,302
Forward contracts	68	5,662	36	3,858
Credit default swaps	19	1,115	1	104
Financial futures	130	2,978	22	291
Total	$ 8,898	$ 122,366	$ 5,688	$ 106,253

	December 31, 2018			
	Assets		Liabilities	
	Carrying Value	Notional Amount	Carrying Value	Notional Amount
	(In Millions)			
Interest rate swaps	$ 6,629	$ 88,214	$ 4,647	$ 86,096
Options	911	19,657	5	3
Currency swaps	843	8,976	232	4,022
Interest rate caps and floors	18	8,465	-	-
Forward contracts	106	6,642	12	3,633
Credit default swaps	18	1,135	2	104
Financial futures	216	3,036	14	291
Total	$ 8,741	$ 136,125	$ 4,912	$ 94,149

The average fair value of outstanding derivative assets was $8,528 million for the three months ended March 31, 2019 and $8,329 million for the three months ended March 31, 2018. The average fair value of outstanding derivative liabilities was $5,361 million for the three months ended March 31, 2019 and $5,875 million for the three months ended March 31, 2018.

The following summarizes the notional amounts of the Company's credit default swaps by contractual maturity:

	March 31, 2019	December 31, 2018
	(In Millions)	
Due in one year or less	$ -	$ 20
Due after one year through five years	9	1,219
Due after five years through ten years	1,210	-
Total	$ 1,219	$ 1,239

The following summarizes the Company's net realized gains (losses) on closed contracts and change in net unrealized gains (losses) related to market fluctuations on open contracts by derivative type:

	Three Months Ended March 31,			
	2019		2018	
	Net Realized Gains on Closed Contracts	Change In Net Unrealized Gains (Losses) on Open Contracts	Net Realized Gains (Losses) on Closed Contracts	Change In Net Unrealized Gains (Losses) on Open Contracts
	(In Millions)			
Interest rate swaps	$ (26)	$ (133)	$ (31)	$ (32)
Currency swaps	2	(132)	(2)	(486)
Options	(26)	(135)	(43)	39
Credit default swaps	5	-	7	-
Interest rate caps and floors	-	(6)	-	-
Forward contracts	76	(63)	(185)	68
Financial futures	142	(91)	(284)	125
Total	$ 173	$ (560)	$ (538)	$ (286)

The following summarizes gross and net information of derivative assets and liabilities, along with collateral posted in connection with master netting agreements:

	March 31, 2019			December 31, 2018		
	Derivative Assets	Derivative Liabilities	Net	Derivative Assets	Derivative Liabilities	Net
	(In Millions)					
Gross	$ 8,898	$ 5,688	$ 3,210	$ 8,741	$ 4,912	$ 3,829
Due and accrued	784	2,051	(1,267)	839	1,899	(1,060)
Gross amounts offset	(6,484)	(6,484)	-	(6,034)	(6,034)	-
Net asset	3,198	1,255	1,943	3,546	777	2,769
Collateral posted	(3,545)	(1,496)	(2,049)	(3,657)	(1,166)	(2,491)
Net	$ (347)	$ (241)	$ (106)	$ (111)	$ (389)	$ 278

e. Net investment income

Net investment income, including interest maintenance reserve (IMR) amortization, comprised the following:

	Three Months Ended March 31, 2019	Three Months Ended March 31, 2018
	(In Millions)	
Bonds	$ 1,086	$ 974
Preferred stocks	6	4
Common stocks - subsidiaries and affiliates	2	5
Common stocks - unaffiliated	7	8
Mortgage loans	265	242
Policy loans	221	206
Real estate	40	30
Partnerships and LLCs	103	312
Derivatives	92	75
Cash, cash equivalents and short-term investments	25	18
Other	17	(2)
Subtotal investment income	1,864	1,872
Amortization of the IMR	4	18
Investment expenses	(187)	(155)
Net investment income	$ 1,681	$ 1,735

f. Net realized capital (losses) gains

Net realized capital gains (losses), which include other-than-temporary impairments (OTTI) and are net of deferral to the IMR, comprised the following:

	Three Months Ended March 31, 2019	Three Months Ended March 31, 2018
	(In Millions)	
Bonds	$ (11)	$ (19)
Common stocks - subsidiaries and affiliates	-	(1,257)
Common stocks - unaffiliated	10	20
Mortgage loans	1	1
Real estate	8	164
Partnerships and LLCs	(5)	(19)
Derivatives	173	(538)
Other	2	10
Net realized capital gains (losses) before federal and state taxes and deferral to the IMR	178	(1,638)
Net federal and state tax benefit	17	1
Net realized capital gains (losses) before deferral to the IMR	195	(1,637)
Net after tax (gains) losses deferred to the IMR	(156)	196
Net realized capital gains (losses)	$ 39	$ (1,441)

IMR had an asset balance of $409 million as of March 31, 2019 and $563 million as of December 31, 2018, which was nonadmitted.

OTTI, included in the realized capital losses, consisted of the following:

	Three Months Ended March 31, 2019	Three Months Ended March 31, 2018
	(In Millions)	
Bonds	$ (10)	$ (34)
Common stocks- subsidiaries and affiliates	-	(1,258)
Common stocks - unaffiliated	(7)	-
Partnerships and LLCs	(11)	(27)
Total OTTI	$ (28)	$ (1,319)

The Company recognized OTTI less than $1 million for the year ended March 31, 2019 and $2 million for the year ended March 31, 2018 on structured and loan-backed securities, which are included in bonds, primarily due to the present value of expected cash flows being less than the amortized cost.

6. Federal income taxes

No significant changes

7. Other than invested assets

No significant changes.

8. Policyholders' liabilities

a. Liabilities for deposit-type contracts

On March 8, 2019, MassMutual issued a $650 million funding agreement, which supports a series of medium-term notes with 3.4% fixed rate coupons and 7-year maturities.

On March 13, 2019, MassMutual issued a $200 million funding agreement, which supports a series of medium-term notes with 2.7% rate coupons and 2-year maturities.

b. Additional liability for annuity contracts

Certain variable annuity contracts include additional death or other insurance benefit features, such as guaranteed minimum death benefits (GMDB), guaranteed minimum income benefits (GMIB), guaranteed minimum accumulation benefits (GMAB) and guaranteed minimum withdrawal benefits (GMWB). In general, living benefit guarantees require the contract holder or policyholder to adhere to a company approved asset allocation strategy. Election of these benefits guarantees is generally only available at contract issue.

The following shows the changes in the liabilities for GMDBs, GMIBs, GMABs and GMWBs (in millions):

Liability as of January 1, 2018	$ 512
Incurred guarantee benefits	250
Paid guarantee benefits	(6)
Liability as of December 31, 2018	756
Incurred guarantee benefits	(130)
Paid guarantee benefits	(2)
Liability as of March 31, 2019	$ 624

The Company held reserves in accordance with the stochastic scenarios as of March 31, 2019 and December 31, 2018. As of March 31, 2019 and December 31, 2018, the Company held additional reserves above those indicated based on the stochastic scenarios in order to maintain a prudent level of reserve adequacy.

The following summarizes the account values, net amount at risk and weighted average attained age for variable annuity contracts with GMDBs, GMIBs, GMABs and GMWBs classified as policyholders' reserves and separate account liabilities. The net amount at risk is defined as the minimum guarantee less the account value calculated on a policy-by-policy basis, but not less than zero.

	March 31, 2019			December 31, 2018		
	Account Value	Net Amount at Risk	Weighted Average Attained Age	Account Value	Net Amount at Risk	Weighted Average Attained Age
	($ In Millions)					
GMDB	$ 18,086	$ 46	64	$ 17,392	$ 132	64
GMIB Basic	744	52	69	700	97	69
GMIB Plus	2,866	619	67	2,687	813	67
GMAB	2,681	9	60	2,573	74	60
GMWB	163	16	71	160	23	70

As of March 31, 2019, the GMDB account value above consists of $3.9 billion within the general account and $14.2 billion within separate accounts that includes $3.9 billion of modified coinsurance assumed. As of December 31, 2018, the GMDB account value above consists of $3.9 billion within the general account and $13.5 billion within separate accounts that includes $3.8 billion of modified coinsurance assumed.

9. Reinsurance

No significant changes.

10. Withdrawal characteristics

No significant changes.

11. Debt

No significant changes.

12. *Employee benefit plans*

The Company sponsors multiple employee benefit plans, providing retirement, life, health and other benefits to employees, certain employees of unconsolidated subsidiaries, agents, general agents and retirees who meet plan eligibility requirements.

Net periodic cost

The net periodic cost represents the annual accounting income or expense recognized by the Company and is included in general insurance expenses in the Condensed Statutory Statements of Operations. The net periodic cost recognized is as follows:

	Three Months Ended March 31,			
	2019	2018	2019	2018
	Pension Benefits		Other Postretirement Benefits	
	(In Millions)			
Service cost	$ 28	$ 28	$ 3	$ 3
Interest cost	29	27	3	3
Expected return on plan assets	(40)	(43)	-	-
Amortization of unrecognized net actuarial and other losses	14	14	-	1
Amortization of unrecognized prior service cost	-	1	(1)	(2)
Total net periodic cost	$ 31	$ 27	$ 5	$ 5

13. *Employee compensation plans*

No significant changes.

14. *Surplus notes*

No significant changes.

15. *Presentation of the Statutory Statements of Cash Flows*

The following table presents those transactions that have affected the Company's recognized assets or liabilities but have not resulted in cash receipts or payments during the three months ended March 31, 2019 and 2018. Accordingly, the Company has excluded these non-cash activities from the Statutory Statements of Cash Flows for the three months ended March 31, 2019 and 2018.

	Three Months Ended March 31,	
	2019	2018
	(In Millions)	
Bond conversions and refinancing	$ 215	$ 89
Transfer of mortgage loans to partnerships and LLCs	39	-
Stock conversion	34	14
Dividend declared from Insurance Road LLC	-	59
Bank loan rollovers	-	19
Other	66	13

16. Business risks, commitments and contingencies

a. Risks and uncertainties

The Company operates in a business environment subject to various risks and uncertainties. The principal risks include insurance and underwriting risks, investment and interest rate risks, currency exchange risk and credit risk. The combined impact of these risks could have a material, adverse effect on the Company's financial statements or result in operating losses in future periods. The Company employs the use of reinsurance, portfolio diversification, asset/liability management processes and other risk management techniques to mitigate the impact of these risks. This condensed risks and uncertainties disclosure should be read in conjunction with the statutory disclosure in the Company's 2018 audited yearend financial statements.

Insurance and underwriting risks

The Company prices its products based on estimated benefit payments reflecting assumptions with respect to mortality, morbidity, longevity, persistency, interest rates and other factors. If actual policy experience emerges that is significantly and adversely different from assumptions used in product pricing, the effect could be material to the profitability of the Company. For participating whole life products, the Company's dividends to policyholders primarily reflect the difference between actual investment, mortality, expense and persistency experience and the experience embedded in the whole life premiums and guaranteed elements. The Company also reinsures certain life insurance and other long-term care insurance policies to mitigate the impact of its underwriting risk.

Investment and interest rate risks

The fair value, cash flows and earnings of investments can be influenced by a variety of factors including changes in interest rates, credit spreads, equity markets, portfolio asset allocation and general economic conditions. The Company employs a rigorous asset/liability management process to help mitigate the economic impacts of various investment risks, in particular, interest rate risk. By effectively matching the market sensitivity of assets with the liabilities they support, the impact of interest rate changes is addressed, on an economic basis, as the change in the value of the asset is offset by a corresponding change in the value of the supported liability. The Company uses derivatives, such as interest rate swaps and swaptions, as well as synthetic assets to reduce interest rate and duration imbalances determined in asset/liability analyses.

The levels of U.S. interest rates are influenced by U.S. monetary policies and by the relative attractiveness of U.S. markets to investors versus other global markets. As interest rates increase, certain debt securities may experience amortization or prepayment speeds that are slower than those assumed at purchase, impacting the expected maturity of these securities and the ability to reinvest the proceeds at the higher yields. Rising interest rates may also result in a decrease in the fair value of the investment portfolio. As interest rates decline, certain debt securities may experience accelerated amortization and prepayment speeds than what was assumed at purchase. During such periods, the Company is at risk of lower net investment income as it may not be able to reinvest the proceeds at comparable yields. Declining interest rates may also increase the fair value of the investment portfolio.

Interest rates also have an impact on the Company's products with guaranteed minimum payouts and on interest credited to account holders. As interest rates decrease, investment spreads may contract as crediting rates approach minimum guarantees, resulting in an increased liability.

In periods of increasing interest rates, policy loans, surrenders and withdrawals may increase as policyholders seek investments with higher perceived returns. This could result in cash outflows requiring the Company to sell invested assets at a time when the prices of those assets are adversely affected by the increase in market interest rates, which could cause the Company to realize investment losses.

Currency exchange risk

The Company has currency risk due to its non-U.S. dollar investments and medium-term notes along with its indirect international operations. The Company mitigates a portion of its currency risk through the use of cross-currency swaps and forward contracts. Cross-currency swaps are used to minimize currency risk for certain non-U.S. dollar assets and liabilities through a pre-specified exchange of interest and principal. Forward contracts are used to hedge movements in exchange rates.

Credit and other market risks

The Company manages its investments to limit credit and other market risks by diversifying its portfolio among various security types and industry sectors as well as purchasing credit default swaps to transfer some of the risk.

Stressed conditions, volatility and disruptions in global capital markets or in particular markets or financial asset classes can have an adverse effect on the Company, in part because the Company has a large investment portfolio and assets supporting the Company's insurance liabilities are sensitive to changing market factors. Global market factors, including interest rates, credit spread, equity prices, real estate markets, foreign currency exchange rates, consumer spending, business investment, government spending, the volatility and strength of the capital markets, deflation and inflation, all affect the business and economic environment and, ultimately, the profitability of the Company's business. Disruptions in one market or asset class can also spread to other markets or asset classes. Upheavals in the financial markets can also affect the Company's business through their effects on general levels of economic activity, employment and customer behavior.

Asset-based fees calculated as a percentage of the separate account assets are a source of revenue to the Company. Gains and losses in the investment markets may result in corresponding increases and decreases in the Company's separate account assets and related revenue.

Political Uncertainties

Political events, domestically or internationally, may directly or indirectly trigger or exacerbate the risk factors described above. Whether those underlying risk factors are driven by politics or not, the Company's dynamic approach to managing risks enables management to utilize the mitigating actions described above to attempt to reduce the potential impact of each underlying risk factor on the Company.

b. Litigation and regulatory matters

In the normal course of business, the Company is involved in disputes, litigation and governmental or regulatory inquiries, administrative proceedings, examinations and investigations, both pending and threatened. These matters, if resolved adversely against the Company or settled, may result in monetary damages, fines and penalties or require changes in the Company's business practices. The resolution or settlement of these matters is inherently difficult to predict. Based upon the Company's assessment of these pending matters, the Company does not believe that the amount of any judgment, settlement or other action arising from any pending matter is likely to have a material adverse effect on the statement of financial position. However, an adverse outcome in certain matters could have a material adverse effect on the results of operations for the period in which such matter is resolved, or an accrual is determined to be required, on the financial statement financial position, or on our reputation.

The Company evaluates the need for accruals of loss contingencies for each matter. When a liability for a matter is probable and can be estimated, the Company accrues an estimate of the loss and any related insurance recoveries, if any. An accrual is subject to subsequent adjustment as a result of additional information and other developments. The resolution of matters are inherently difficult to predict, especially in the early stages of matter. Even if a loss is probable, due to many complex factors, such as speed of discovery and the timing of court decisions or rulings, a loss or range of loss may not be reasonably estimated until the later stages of the matter. For matters where a loss is material and it is either probable or reasonably possible then it is disclosed. For matters where a loss may be reasonably possible, but not probable, or is probable but not reasonably estimated, no accrual is established, but the matter, if material, is disclosed.

c. Commitments

In March 2019, MassMutual entered into a Contingent Capital Facility Agreement (the Facility) with an unaffiliated entity (the Trust). Under the Facility, subject to regulatory approval in certain circumstances, MassMutual has the right, and upon the occurrence of certain events has an obligation, to issue up to $800 million of surplus notes to the Trust in exchange for all or a pro rata portion of certain principal and interest strips of U.S. Treasury Securities held by the Trust. MassMutual is required to pay a facility fee of approximately 2.00% per year to the Trust on the undrawn portion of the Facility, totaling approximately $16 million per year if the Facility remains undrawn, and certain additional administrative fees and expenses.

17. Related party transactions

No significant changes.

18. Subsequent events

Management of the Company has evaluated subsequent events through May 13, 2019, the date the financial statements were available to be issued to state regulators and subsequently on the Company's website. No events have occurred subsequent to the date of the Statements of Financial Position and before the date of evaluation that would require disclosure.

19. Impairment listing for loan-backed and structured securities

The following are the total cumulative adjustments and impairments for loan-backed and structured securities since July 1, 2009:

Period Ended	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
March 31, 2019	$ 7,728,041	$ -	$ 7,728,041	$ 7,592,730	$ (135,311)	$ 7,592,730	$ 7,624,610
December 31, 2018	4,550,173	-	4,550,173	3,815,559	(734,614)	3,815,559	4,014,514
September 30, 2018	4,320,826	-	4,320,826	3,663,181	(657,645)	3,663,181	3,687,297
June 30, 2018	634,235	-	634,235	279,221	(355,014)	279,221	386,752
March 31, 2018	645,690	-	645,690	488,181	(157,509)	488,181	448,494
December 31, 2017	3,949,513	-	3,949,513	1,958,759	(1,990,754)	1,958,759	2,023,952
September 30, 2017	4,436,542	-	4,436,542	876,942	(3,559,600)	876,942	4,647,683
June 30, 2017	40,538,551	-	40,538,551	39,808,956	(729,595)	39,808,956	60,990,732
March 31, 2017	41,788,380	-	41,788,380	41,391,889	(396,491)	41,391,889	56,156,936
December 31, 2016	42,175,938	-	42,175,938	42,045,721	(130,217)	42,045,721	54,619,477
September 30, 2016	44,266,478	-	44,266,478	41,890,535	(2,375,942)	41,890,535	61,300,066
June 30, 2016	49,097,217	-	49,097,217	48,202,703	(894,514)	48,202,703	63,207,410
March 31, 2016	57,985,071	-	57,985,071	55,783,979	(2,201,092)	55,783,979	70,578,397
December 31, 2015	4,881,394	-	4,881,394	4,783,194	(98,200)	4,783,194	4,728,736
September 30, 2015	50,531,382	-	50,531,382	45,665,859	(4,865,524)	45,665,859	58,523,652
June 30, 2015	66,924,927	-	66,924,927	65,240,585	(1,684,341)	65,240,585	72,953,475
March 31, 2015	17,856,447	-	17,856,447	17,681,510	(174,937)	17,681,510	17,553,999
December 31, 2014	69,225,743	-	69,225,743	68,301,291	(924,452)	68,301,291	79,410,553
September 30, 2014	645,721	-	645,721	604,437	(41,284)	604,437	627,381
June 30, 2014	57,012,606	-	57,012,606	55,422,168	(1,590,438)	55,422,168	75,253,388
March 31, 2014	91,702,041	-	91,702,041	80,744,074	(10,957,967)	80,744,074	97,672,071
December 31, 2013	113,707,951	-	113,707,951	108,815,640	(4,892,311)	108,815,640	111,783,052
September 30, 2013	81,945,730	-	81,945,730	80,589,482	(1,356,248)	80,589,482	77,049,314
June 30, 2013	147,215,936	-	147,215,936	142,140,572	(5,075,365)	142,140,572	130,973,023
March 31, 2013	194,772,025	-	194,772,025	188,372,089	(6,399,936)	188,372,089	176,678,910
December 31, 2012	378,096,660	-	378,096,660	366,323,110	(11,773,550)	366,323,110	333,086,073
September 30, 2012	816,573,456	-	816,573,456	788,350,823	(28,222,633)	788,350,823	697,683,289
June 30, 2012	912,025,937	-	912,025,937	890,494,221	(21,531,716)	890,494,221	708,872,106
March 31, 2012	1,095,018,529	-	1,095,018,529	1,058,132,041	(36,886,488)	1,058,132,041	841,095,013
December 31, 2011	1,090,904,993	-	1,090,904,993	1,056,761,288	(34,143,705)	1,056,761,288	754,310,838
September 30, 2011	762,320,632	-	762,320,632	738,510,048	(23,810,584)	738,510,048	546,494,232
June 30, 2011	1,130,732,656	-	1,130,732,656	1,078,535,670	(52,196,986)	1,078,535,670	839,143,290
March 31, 2011	1,097,705,351	-	1,097,705,351	1,068,852,204	(28,853,147)	1,068,852,204	816,688,348
December 31, 2010	968,742,508	-	968,742,508	950,111,417	(18,631,091)	950,111,417	708,895,637
September 30, 2010	915,728,030	-	915,728,030	889,896,058	(25,831,972)	889,896,058	673,462,493
June 30, 2010	1,362,887,892	-	1,362,887,892	1,335,628,212	(27,259,681)	1,335,628,212	975,241,506
March 31, 2010	1,471,905,696	-	1,471,905,696	1,391,337,543	(80,568,153)	1,391,337,543	1,015,645,802
December 31, 2009	1,349,124,214	-	1,349,124,214	1,290,817,168	(58,307,047)	1,290,817,168	852,088,739
September 30, 2009	2,953,442,689	(106,853,708)	2,846,588,981	2,700,948,264	(145,640,717)	2,700,948,264	1,692,409,640
Totals		$ (106,853,708)			$ (646,036,769)		

The following is the impairment listing for loan-backed and structured securities for the three months ended March 31, 2019:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
61750MAB1	$ 5,275	-	5,275	4,933	(341.08)	4,933	4,989
65106FAG7	232,843	-	232,843	215,726	(17,117.74)	215,726	6,316
18974BAA7	285,889	-	285,889	270,801	(15,087.72)	270,801	278,616
18974BAN9	149,774	-	149,774	139,333	(10,440.84)	139,333	148,234
22541QQR6	(10,378)	-	(10,378)	(11,947)	(1,568.63)	(11,947)	1
32051GCF0	22,786	-	22,786	(6,720)	(29,506.60)	(6,720)	17,553
761118FM5	3,259,303	-	3,259,303	3,218,368	(40,934.87)	3,218,368	3,244,154
17309FAE8	200,512	-	200,512	200,501	(10.61)	200,501	208,828
466247UG6	467,713	-	467,713	452,359	(15,353.77)	452,359	459,812
57643QAE5	3,114,325	-	3,114,325	3,109,376	(4,949.11)	3,109,376	3,256,107
Totals	$ 7,728,041	-	7,728,041	7,592,730	(135,311)	7,592,730	7,624,610

The following is the impairment listing for loan-backed and structured securities for the three months ended December 31, 2018:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
65106FAG7	$ 205,885	$ -	$ 205,885	$ 17,668	$ (188,218)	$ 17,668	$ 21,031
18974BAA7	306,428	-	306,428	295,291	(11,137)	295,291	294,986
22541QQR6	28,742	-	28,742	(9,704)	(38,446)	(9,704)	1
32051GCF0	32,493	-	32,493	20,481	(12,012)	20,481	20,063
17309FAE8	203,743	-	203,743	202,326	(1,417)	202,326	201,875
57643QAE5	3,657,695	-	3,657,695	3,177,611	(480,084)	3,177,611	3,365,017
92990GAE3	115,186	-	115,186	111,886	(3,300)	111,886	111,541
Totals	$ 4,550,173	$ -	$ 4,550,173	$ 3,815,559	$ (734,614)	$ 3,815,559	$ 4,014,514

The following is the impairment listing for loan-backed and structured securities for the three months ended September 30, 2018:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
05535DCF9	$ 3,454,425	$ -	$ 3,454,425	$ 3,141,048	$ (313,377)	$ 3,141,048	$ 3,134,409
07384YPP5	321,829	-	321,829	148,884	(172,945)	148,884	132,968
07386HCP4	2,164	-	2,164	(6,255)	(8,418)	(6,255)	320
76110H4M8	1,715	-	1,715	(3,719)	(5,434)	(3,719)	641
79548KXQ6	423,086	-	423,086	383,222	(39,864)	383,222	292,015
939336Z48	117,607	-	117,607	-	(117,607)	-	126,945
Totals	$ 4,320,826	$ -	$ 4,320,826	$ 3,663,181	$ (657,645)	$ 3,663,181	$ 3,687,297

The following is the impairment listing for loan-backed and structured securities for the three months ended June 30, 2018:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
59020UW43	$ 337,732	$ -	$ 337,732	$ 271,686	$ (66,046)	$ 271,686	$ 354,508
76110H4M8	6,848	-	6,848	1,969	(4,879)	1,969	1,713
863579DV7	289,655	-	289,655	5,567	(284,089)	5,567	30,531
Totals	$ 634,235	$ -	$ 634,235	$ 279,221	$ (355,014)	$ 279,221	$ 386,752

The following is the impairment listing for loan-backed and structured securities for the three months ended March 31, 2018:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
07386HEN7	$ 43,711	$ -	$ 43,711	$ 2,334	$ (41,377)	$ 2,334	$ 1,609
79548KXQ6	520,764	-	520,764	476,293	(44,471)	476,293	365,994
45660NZY4	81,215	-	81,215	9,554	(71,661)	9,554	80,891
Totals	$ 645,690	$ -	$ 645,690	$ 488,181	$ (157,509)	$ 488,181	$ 448,494

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ANNEX A – SUMMARY OF PRINCIPAL DIFFERENCES BETWEEN STATUTORY ACCOUNTING PRACTICES AND INTERNATIONAL FINANCIAL REPORTING STANDARDS

Financial statements prepared in accordance with SAP are different in some respects from financial statements prepared in accordance with IFRS as promulgated by the International Accounting Standards Board ("**IASB**"). IFRS was formerly known as International Accounting Standards ("**IAS**") and the terms IFRS and IAS are used interchangeably.

U.S. Insurance Regulators review the implication of insurance contracts using financial statements prepared under SAP. Insurance accounting guidance under SAP generally require more conservative reserving assumptions compared to U.S. GAAP, which uses best estimate reserving assumptions. Where specific guidance for insurance accounting does not exist, IFRS currently allows certain national accounting standards, such as U.S. GAAP, to be used. The discussion below does not address differences between SAP and U.S. GAAP in instances where IFRS are silent. *See* "Financial and Accounting Matters–Summary of Principal Differences Between SAP and U.S. GAAP" for further details.

Moreover, in April 2001, IASB issued IFRS 4, *Insurance Contracts* to improve the measurement, recognition and disclosures on insurance contracts in phase 1 of its project on insurance. However, IFRS 4 was expected to be an interim standard on insurance as it did not fully address all areas of insurance accounting (*e.g*., reinsurance). In phase II, the IASB worked jointly with the Financial Accounting Standards Board ("**FASB**") to develop a converged insurance accounting exposure document for public comments. In May 2017, the IASB issued IFRS 17, *Insurance Contracts* to be effective on January 1, 2021. Alternatively, the FASB is pursuing targeted improvements to existing U.S. GAAP on insurance accounting. FASB issued final guidance on insurance in August 2018. For certain new products issued on or after January 1, 2017, the NAIC has modified its guidance to incorporate principles-based reserving ("**PBR**"), which requires companies to record the higher of (a) the reserve using prescribed factors and (b) the PBR reserve which considers a wide range of future economic conditions, computed using justified company experience factors, such as mortality, policyholder behavior and expenses. PBR will be adopted on January 1, 2020. MassMutual expects to see significant differences between SAP and IFRS 17, as well as, FASB's targeted improvements on accounting for long duration insurance contracts.

The IASB has issued IFRS 9, *Financial Instruments,* which became effective on January 1, 2018, but insurance entities can elect to adopt the guidance on January 1, 2021. IFRS 9 replaced IAS 39, *Financial Instruments: Recognition and* Measurement and it addresses the recognition, measurement and impairment of financial instruments. Similarly, the FASB also issued ASU No. 2016-01, *Financial Instruments* - Overall (Subtopic 825-10): *Recognition and Measurement of Financial Assets and Financial Liabilities,* which became effective on January 1, 2018, and ASU No. 2016-13, Financial Instruments: *Credit Losses* which will be effective on January 1, 2020. If SAP adopted the new U.S. GAAP accounting changes relating to classification and measurement and impairments, it could have significant impact on MassMutual's financial statements. However, the NAIC rejected ASU No. 2016-01 and is currently discussing ASU No. 2016-13.

Currently, the more significant differences between SAP and IFRS are as follows: (a) bonds are generally carried at amortized cost under SAP, but at fair value or amortized cost under IFRS. Additionally, IFRS allows an entity to make an irrevocable election to designate certain financial instruments to be measured at fair value through profit or loss on initial recognition; (b) changes in the balances of deferred income taxes, which provide for book versus tax temporary differences, are subject to limitation and are recorded in surplus, whereas IFRS would include the change in deferred taxes as a component of net income or other comprehensive income; (c) majority-owned noninsurance subsidiaries, variable interest entities where MassMutual is the primary beneficiary and certain other controlled entities are accounted for using the equity method, whereas IFRS would consolidate certain of these entities; (d) surplus notes are reported in surplus, whereas IFRS would report these notes as liabilities; (e) assets are reported at admitted asset value and assets designated as nonadmitted are excluded through a charge against surplus, whereas IFRS allows assets to be recorded at historical cost or fair value; (f) reinsurance reserves ceded are netted against policyholders' reserves and liabilities for deposit-type contracts with the net change reported as a change in policyholders' reserves, whereas under IFRS, the reinsurance reserves ceded are reported as an asset with the changes in the asset reported separately; (g) an AVR is reported as a contingency reserve to stabilize surplus against fluctuations in the statement value of common stocks, real estate investments, partnerships and LLCs as well as credit-related declines in the value of bonds, mortgage loans and certain derivatives to the extent AVR is greater than zero for the appropriate asset category, whereas IFRS does not require or allow this reserve; (h) after-tax realized capital gains and losses, which result from changes in the overall level of interest rates for all types of fixed- income investments and interest-related hedging activities are deferred into the IMR and amortized into income, whereas IFRS reports these gains and losses as income; (i) changes in the fair value of derivative financial instruments are recorded as changes in surplus, whereas IFRS generally reports these changes in income unless deemed an effective hedge; (j) embedded derivatives are recorded as part of the underlying contract, whereas IFRS uses the solely payments of principal and interest condition to determine whether or not there are risks other than a basic lending arrangement. If the asset fails this condition, it is fair value through net income rather than amortized cost or fair value through other comprehensive income; (k) valuation of structured securities for impairments is at discounted cash flows whereas IFRS requires the three-stage expected credit loss model rather than an incurred loss model .

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