MassMutual Global Funding II

USD 17,000,000,000
GLOBAL DEBT ISSUANCE PROGRAM

This base prospectus supplement dated March 6, 2018 (this "**Supplement**") is in addition to and must be read in conjunction with the base prospectus dated June 9, 2017, as supplemented by the base prospectus supplements dated August 30, 2017 and November 20, 2017 (collectively, the "**Base Prospectus**") prepared by MassMutual Global Funding II (the "**Issuer**") under the Issuer's Global Debt Issuance Program (the "**Program**"). Capitalized terms used herein and not otherwise defined shall have the meanings of such terms set forth in the Base Prospectus.

This Supplement comprises a supplement in accordance with Article 16 of the Directive 2003/71/EC. This Supplement has been approved by the Central Bank of Ireland, as competent authority under the Directive 2003/71/EC. The Central Bank of Ireland only approves this Supplement as meeting the requirements imposed under Irish and EU law pursuant to the Directive 2003/71/EC.

On March 6, 2018, Massachusetts Mutual Life Insurance Company ("**MassMutual**") published Management's Discussion and Analysis of the 2017 Financial Condition and Results of Operations, the consolidated text of which is set out in Annex 1 to this document. On February 16, 2018, MassMutual published its annual 2017 audited statutory statements (including any notes thereto, the "**2017 Statutory Financial Statements**"), the consolidated text of which is set out in Annex 2 to this document.

Except as disclosed in this Supplement, there has been no other significant new factor, material mistake or inaccuracy relating to the information included in the Base Prospectus since the publication of the 2017 Statutory Financial Statements. There has been no significant change in the financial or trading position of MassMutual which has occurred since the publication of the 2017 Statutory Financial Statements.

Where there is any inconsistency between this Supplement and the Base Prospectus, the language used in this Supplement shall prevail.

The Issuer accepts responsibility for the information contained in this Supplement. To the best of the knowledge and belief of the Issuer (which has taken all reasonable care to ensure that such is the case), the information contained in this Supplement is in accordance with the facts and does not omit anything likely to affect the import of such information.

Supplement dated March 6, 2018

The following language supplements the legends contained in the Base Prospectus, beginning on page (i).

FOR EUROPEAN ECONOMIC AREA RESIDENTS ONLY

PRIIPs Regulation / 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 European Economic Area ("**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 2002/92/EC, as amended (the "**Insurance Mediation 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 Final Terms 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 (the "**MiFID Product Governance Rules**"), any Initial Purchaser subscribing for any Notes is a manufacturer in respect of such Notes, but otherwise neither the Initial Purchasers nor any of their respective affiliates will be a manufacturer for the purpose of the MiFID Product Governance Rules.

The following language replaces the section "Plan of Distribution—European Economic Area" on page 184 of the Base Prospectus.

Each Initial Purchaser has represented and agreed, and each further Initial Purchase 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 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 Mediation Directive, where that customer would not qualify as a professional client as defined in point (10) of Article 4(1) of MiFID II.

In addition, for purposes of this provision, the expression an "offer" includes the communication in any forms and by any means of sufficient information on the terms of the offer and the Notes to be offered so as to enable an investor to decide to purchase or subscribe the Notes.

RECENT DEVELOPMENTS

The risk factor below is an addition to the risk factors set forth in the Base Prospectus under "Risk Factors—Risk Factors Related to the Notes and the Series Trusts."

Changes in Tax Laws or Interpretations of Such Laws, and Regulatory Consequences of Such Changes, Could Reduce MassMutual's Earnings and Materially Impact MassMutual's Operations and Cash Flows by Increasing MassMutual's Corporate Taxes, Making Some of MassMutual's Products Less Attractive to Consumers, or Reducing the Amounts Distributable by MassMutual's Insurance Subsidiaries.

Changes in domestic or foreign tax laws or interpretations of such laws could increase MassMutual's corporate taxes and reduce MassMutual's earnings.

On December 22, 2017, President Trump signed into law H.R. 1/Public Law 115-97, commonly known as the Tax Cuts and Jobs Act (the "**Tax Act**"). The Tax Act contains several key provisions that have significant financial statement effects. These provisions required the remeasurement of deferred tax assets and liabilities, imposed 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. The Tax Act required the remeasurement of deferred taxes, as it reduces the corporate tax rate to 21%, effective January 1, 2018. Accordingly, MassMutual remeasured its net admitted deferred taxes as of the enactment date and recognized a decrease in surplus of $507 million in 2017.

In addition, following the reduction in the federal corporate income tax rate, the National Association of Insurance Commissioners (the "**NAIC**") may revise the methodology for calculating the risk-based capital ("**RBC**") ratios of insurance companies and increase the amount of capital insurance companies are required to hold. If such potential revision of the NAIC's RBC ratio methodology would result 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 such potential revisions would 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 legislation is unclear in certain respects and will require interpretations and implementing regulations by 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 our 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 deferred tax assets.

Annex 1

Massachusetts Mutual Life Insurance Company
Management's Discussion and Analysis
Of the 2017 Financial Condition and Results of Operations

General

Management's Discussion and Analysis of the 2017 Financial Condition and Results of Operations should be read in conjunction with the Audited Statutory Financial Statements and Statutory Annual Statements of Massachusetts Mutual Life Insurance Company ("**MassMutual**"). This Management's Discussion and Analysis reviews the financial condition of MassMutual as of December 31, 2017 and 2016, MassMutual's results of operations for the past three years and, where appropriate, factors that may affect its future financial performance.

Overview

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 hopes to accomplish this by developing and distributing a broad and superior portfolio of innovative financial products and services, sophisticated asset/liability management, rigorous expense control, prudent underwriting standards, continued efforts to improve retention levels and continued commitment to the high credit quality and disciplined diversification in its investment portfolio.

MassMutual offers a wide range of products and services distributed through its career agency system, broker-dealers, insurance brokers, wire houses, consultants and other third-party distributors. Products include whole life insurance, universal life insurance, variable universal life insurance, term life insurance, group life insurance, individual annuities, group annuities, individual disability income insurance, individual long-term care insurance, retirement products and services for employer-sponsored retirement plans, funding agreements, investment management, mutual funds and trust services to individuals and institutional customers in all 50 states of the U.S. and the District of Columbia and Puerto Rico.

On July 1, 2016, MassMutual acquired the Premier Client Group ("**PCG**"). The advisor force includes more than 40 local sales and advisory operations and approximately 4,000 advisors across the country, which expands MassMutual's existing MM Financial Advisors ("**MMFA**") to more than 9,200 financial professionals. The purchase of MSI Financial Services ("**MSIFS**") was accounted for under the statutory purchase method, classified as investments in common stocks – subsidiaries and affiliates at a cost of $126 million and resulted in the recognition of statutory goodwill of $38 million. MassMutual also paid $162 million of cash to acquire the remaining PCG assets of $251 million and liabilities of $89 million. The remaining PCG assets include $208 million of assets that are nonadmitted. MassMutual recorded $4 million of goodwill amortization in 2017. In March 2017, MassMutual contributed MSIFS to MassMutual Holding LLC ("**MMHLLC**") at a carrying value of $115 million, which excluded the remaining unamortized statutory goodwill of $35 million. The remaining unamortized statutory goodwill was transferred from the 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.

On October 1, 2016, MassMutual purchased MassMutual International LLC ("**MMI**"), a wholly-owned subsidiary of MassMutual, from MMHLLC for approximately $3.9 billion, which represented MMHLLC's carrying value of MMI. In exchange for MMI, MassMutual transferred cash and assets with a carrying value of $3.8 billion, net of deferred tax. As the carrying value of the assets exchanged as consideration was less than the carrying value of the asset received, MMI, MassMutual recognized a deferred gain of $116 million. As this transaction was between related parties, no gain or loss was recorded. This purchase was part of MassMutual's execution of its operating strategy and segregated its foreign insurance subsidiaries from its asset manager subsidiaries.

In August 2017, MMI entered into an agreement to sell MassMutual Asia Limited ("**MM Asia**"), a wholly-owned Hong Kong based life insurance and wealth management subsidiary. The sale is expected to close in 2018, subject to regulatory approval and customary closing conditions. Under the terms of the agreement, MMI will receive consideration of approximately $1.7 billion in cash and stock. In addition, as part of the agreement to sell, MMI agreed to transfer MM Asia's interest in MassMutual Life Insurance Company ("**MM Japan**"). The stock is from an entity that is expected to own 60% of MM Asia. The agreement also requires, as a closing condition, that MM Asia has a solvency margin ratio at a certain level. This may require additional capital from MMI in order to meet this capital level. In the third quarter of 2017, MMI classified MM Asia as held for sale. Accordingly, the expected gain on disposal will be realized when the sale is finalized.

Effective December 31, 2016, MassMutual entered into a series of reinsurance agreements with an authorized third-party to reinsure approximately 100% of certain of MassMutual's inforce universal life, variable life, and 20-year term life policies. Under the terms of the agreements, MassMutual 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 modified coinsurance basis. Under the terms of the agreements, MassMutual will maintain responsibility for servicing the policies. MassMutual 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 Statement of Changes in Surplus in conjunction with these agreements.

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 the Statutory Statement of Financial Position and ceded premium of $4.0 billion and reduced changes in policyholder reserves of $4.0 billion in the Statutory Statement of Operations.

For the year ended December 31, 2017, statutory net gain was $52 million and net gain from operations was $474 million. As of December 31, 2017, MassMutual had $170.9 billion in statutory assets excluding separate accounts, $240.1 billion in total statutory assets, 2.4 million individual policies in force and $630 billion of life insurance in force. MassMutual's total adjusted capital, as defined by the NAIC, was $17.4 billion as of December 31, 2017 compared to $17.3 billion as of December 31, 2016.

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

	December 31, 2017	December 31, 2016
	(In Millions)	
Surplus [1]	$ 15,705	$ 15,423
AVR [2]	3,309	3,264
One-half of the apportioned dividend liability [2]	796	800
Foreign insurance subsidiaries deduction	(2,382)	(2,211)
Total adjusted capital [3]	**$ 17,428**	**$ 17,276**

[1] *Surplus as of December 31, 2017 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 consolidated Asset Valuation Reserve ("**AVR**"), one-half of the consolidated apportioned dividend liability and a deduction for applicable foreign insurance subsidiaries.*

As of December 31, 2017, there were no significant statutory or regulatory issues which 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 9,130 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 guaranteed minimum death benefits ("**GMDBs**") and offer an optional living benefit to protect the principal investment. This living benefit option is a guaranteed minimum accumulation benefit ("**GMABs**") 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, including 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 bank-owned life insurance ("**BOLI**") and corporate-owned life insurance ("**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

MassMutual's financial strength ratings are A++ (Superior, top rating) from A.M. Best Company, AA+ (Very Strong, second highest rating) from Fitch Ratings, Aa2 (Excellent, third highest rating) from Moody's Investors Service, and AA+ (Very Strong, second highest rating) from Standard & Poor's. 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, 2017, MassMutual had one group life insurance contract, certain municipal contracts, 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 RBC 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 Investors Service (P1). The program is supported by a $1.0 billion bank credit facility expiring September 26, 2019. If MassMutual's financial strength ratings fall to AA- (Standard & Poor's) or Aa3 (Moody's Investors Service), MassMutual will incur additional bank costs related to its bank credit facility.

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.

Results of Operations

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

	Years Ended December 31,				
	2017	2016	2015	% Change 17 vs. 16	% Change 16 vs. 15
	($ In Millions)				
Revenue:					
Premium income	$ 17,486	$ 21,432	$ 21,543	(18)%	(1)%
Net investment income	6,542	6,334	6,387	3	(1)
Fees and other income	1,425	1,283	797	11	61
Total revenue	25,453	29,049	28,727	(12)	1
Benefits and expenses:					
Policyholders' benefits	20,019	18,312	16,300	9	12
Change in policyholders' reserves	740	7,387	8,592	(90)	(14)
Change in group annuity reserves assumed	(887)	(1,510)	(942)	41	(60)
General insurance expenses	2,604	2,251	1,793	16	26
Commissions	1,009	938	869	8	8
State taxes, licenses and fees	245	237	187	3	27
Total benefits and expenses	23,730	27,615	26,799	(14)	3
Net gain from operations before dividends and federal income taxes	1,723	1,434	1,928	20	(26)
Dividends to policyholders	1,569	1,566	1,728	-	(9)
Net gain (loss) from operations before federal income taxes	154	(132)	200	217	(166)
Federal income tax (benefit) expense	(320)	(326)	(153)	2	(113)
Net gain from operations	474	194	353	144	(45)
Net realized capital (losses) gains	(422)	(208)	59	(103)	(453)
Net (loss) income	**$ 52**	**$ (14)**	**$ 412**	**471 %**	**(103)%**

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 reserve assumed of $623 million, an increase in general insurance expense of $353 million and an increase in commissions of $71 million.

The $426 million decrease in net income in 2016 was due to increased net realized capital losses of $267 million as well as a decrease in net gain from operations of $159 million. The major components of the decrease in net gain from operations included an increase in policyholders' benefits of $2.0 billion, an increase in general insurance expense of $458 million, an increase in commissions of $69 million, a decrease in premium income of $111 million, a decrease in net investment income of $53 million and an increase in state taxes, licenses and fees of $50 million, partially offset by a decrease in the change in policyholders' reserves of $1.2 billion, a decrease in the change in group annuity reserves assumed of $568 million, an increase in fees and other income of $486 million, an increase in federal income tax benefits of $173 million and a decrease in dividends to policyholders of $162 million.

Premium Income

Selected premium income information is presented below:

	Years Ended December 31,				
	2017	2016	2015	% Change 17 vs. 16	% Change 16 vs. 15
		($ In Millions)			
Premium income:					
Whole life	$ 5,795	$ 5,346	$ 4,765	8 %	12 %
Universal, variable and group life	(2,377)	1,327	1,740	(279)	(24)
Annuities and supplemental contracts.	2,252	2,452	2,249	(8)	9
Disability income	498	489	481	2	2
Group annuities	11,065	11,655	12,094	(5)	(4)
Other	253	163	214	55	(24)
Total	**$ 17,486**	**$ 21,432**	**$ 21,543**	**(18) %**	**(1) %**

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 and group annuities of $590 million and annuities and supplemental contracts of $200 million, partially offset by increases 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 defined contribution sales, partially offset by higher sales in defined benefit, investment-only and pension buyout 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.

Premium income decreased $111 million to $21.4 billion in 2016 primarily due to decreases in universal, variable and group life of $413 million and group annuities of $439 million, partially offset by increases in whole life of $581 million and annuities and supplemental contracts of $203 million. The decrease in group annuities was primarily due to a large pension buyout sale in the prior year, partially offset by three significant contract issuances to former Retirement Plan Group ("**RPG**") customers. The decrease in universal, variable and group life is primarily due to the ceding of certain inforce variable life, universal life and term life policies in December 2016 in connection with a series of reinsurance agreements with an authorized third party. The increase in whole life was primarily due to higher sales and renewal premium. The increase in annuities and supplemental contracts was primarily due to higher single premium and deferred income annuity sales, partially offset by lower variable annuity sales.

Net Investment Income

The components of net investment income are set forth below:

	Years Ended December 31,				
	2017	2016	2015	% Change 17 vs. 16	% Change 16 vs. 15
	($ In Millions)				
Net investment income:					
Bonds	$ 3,712	$ 3,583	$ 3,439	4 %	4 %
Preferred stocks	17	24	27	(29)	(11)
Common stocks - subsidiaries and affiliates	436	431	511	1	(16)
Common stocks - unaffiliated	39	59	48	(34)	23
Mortgage loans	928	1,009	976	(8)	3
Policy loans	797	757	709	5	7
Real estate	159	174	169	(9)	3
Partnerships and LLCs	658	460	639	43	(28)
Derivatives	305	343	292	(11)	17
Cash, cash equivalents and short-term investments	42	33	14	27	136
Other	2	-	13	NM	(100)
Total gross investment income	7,095	6,873	6,837	3	1
Amortization of the IMR	113	135	140	(16)	(4)
Less investment expenses	(666)	(674)	(590)	(1)	14
Net investment income	**$ 6,542**	**$ 6,334**	**$ 6,387**	**3 %**	**(1)%**

NM = not meaningful

Net investment income increased $208 million in 2017 primarily due to an increase in income distributions from partnerships and limited liability companies **("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.

Net investment income decreased $53 million in 2016 primarily due to a decrease in income distributions from partnerships and LLCs of $179 million, an increase in investment expenses of $84 million and a decrease of $70 million in the dividend received from MMHLLC, a wholly owned subsidiary. These items were partially offset by a $144 million increase in income from bonds, a $51 million increase in income from derivatives, a $48 million increase in income from policy loans and a $33 million increase in income from mortgage loans.

The net yield was 4.5% in 2017, 4.6% in 2016 and 5.0% in 2015. 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 $129 million in 2017 and $144 million in 2016 due to increased average asset balances, partially offset by lower new money rates. Average bond investments were $87.1 billion in 2017, $81.7 billion in 2016 and $77.1 billion in 2015. Yields were 4.3% in 2017, 4.3% in 2016 and 4.5% in 2015.

Income from common stocks of affiliates increased $5 million in 2017 and decreased $80 million in 2016, mainly reflecting changes in the dividends received from MMHLLC. The MMHLLC dividend was $425 million in 2017, $430 million in 2016 and $500 million in 2015.

Income from unaffiliated common stocks decreased $20 million in 2017 and increased $11 million in 2016. The decrease in 2017 and the increase in 2016 mainly reflect changes in the amount of dividends paid from mutual fund investments.

Mortgage loan gross investment income decreased $81 million in 2017 primarily due to a reduction in loan yields, partially offset by an increase in average assets. Mortgage loan gross investment income increased $33 million in 2016 primarily due to an increase in average assets, partially offset by a reduction in loan yields. Yields were 4.3% in 2017, 4.7% in 2016 and 4.9% in 2015. Average mortgage loan investments were $21.8 billion in 2017, $21.5 billion in 2016 and $20.7 billion in 2015.

Policy loan gross investment income increased $40 million in 2017 and $48 million in 2016 as a result of increased average loan balances. Average policy loans were $12.9 billion in 2017, $12.1 billion in 2016 and $11.5 billion in 2015.

Partnership and LLCs net investment income increased $198 million in 2017 and decreased $179 million in 2016 primarily due to fluctuations in income distributions related to earnings from various investments.

Derivative gross investment income decreased $38 million in 2017 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 increased $51 million in 2016 primarily due to additional notional related to ongoing portfolio asset/liability management during the year, partially offset by the change in LIBOR on interest rate swaps.

Amortization of the interest maintenance reserve ("**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. Amortization of IMR decreased $5 million in 2016 primarily due to the effect of a lower beginning reserve balance in the current year as a result of interest related losses in 2015, the ceding of IMR as part of the ceding of certain inforce variable life, universal life and term life policies in December 2016 in connection with a series of reinsurance agreements and higher interest related losses in 2016.

Investment expenses decreased $8 million in 2017 and increased $84 million in 2016. 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 an increase in interest rates and collateral on repurchase agreements. The increase in 2016 mainly reflects higher investment advisory fees which increase as the fair value of the assets under management increase, as well as higher interest expense due to a full year of interest on $500 million of outstanding surplus notes issued in April 2015 and higher interest rates on repurchase agreements.

Fees and Other Income

Fees and other income increased $142 million in 2017 primarily due to an increases 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.

Fees and other income increased $486 million in 2016 primarily due to ceding commissions for certain inforce variable life, universal life and term policies in December 2016 in connection with a series of reinsurance agreements, income from MSIFS and the prior year's cost of purchasing corporate owned life insurance that did not recur in 2016.

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 $1.7 billion in 2017. The increase was 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. Policyholders' benefits increased $2.0 billion in 2016, primarily due to higher surrenders of defined benefit and contribution contracts and ceding of certain inforce variable life, universal life and term life policies in December 2016 in connection with a series of reinsurance agreements.

The life insurance lapse rate, which is based on the amount of life insurance in force was 4.1% in 2017, 4.1% in 2016 and 4.0% in 2015.

The change in policyholders' reserves, which includes transfers to and from separate accounts, decreased $6.6 billion in 2017. The decrease was primarily due to the ceding of certain inforce universal life contracts under a new reinsurance agreement effective December 31, 2017 and higher surrenders and lower premium in defined contribution group annuity products. The change in policyholders' reserves decreased $1.2 billion in 2016, primarily due to lower pension buyout sales and the ceding of certain inforce variable life, universal life and term life policies in December 2016 in connection with a series of reinsurance agreements, partially offset by higher whole life first year and renewal premiums and BOLI sales.

The change in group annuity reserves assumed increased $623 million in 2017 and reflects the RPG modified coinsurance assumption contract. This increase in change in reserves was primarily due to a lower level of transfers from an RPG separate account to a MassMutual contract. The $568 million increase in 2016 reflects higher contract redemptions included in policyholders' benefits and lower contributions recorded as premium.

General insurance expenses increased $353 million in 2017 primarily due to impairment of previously capitalized software, additional operating costs related to the PCG acquisition and higher service, technology and administrative fees. General insurance expenses increased $458 million in 2016 primarily due to additional operating costs related to the PCG acquisition, higher compensation, technology and administrative fees.

Commissions, including commissions and expense allowances on reinsurance assumed, increased $71 million in 2017 and $69 million in 2016 primarily due to the growth of whole life sales.

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. Dividends to policyholders decreased $162 million in 2016, driven by a lower dividend scale, partially offset by the growth in whole life.

Federal income tax benefits increased $6 million in 2017. The increase is primarily due to $102 million of greater tax expense associated with the gain from operations, excluding intercompany distributions, primarily offset by a $45 million benefit associated with reinsurance transactions that created taxable income in the prior year, a $22 million benefit stemming from the impact of the enactment of the Tax Act on depreciation, foreign earnings repatriation and interest, and a $24 million benefit associated with the release of policyholder reserves relative to the prior year.

Net Realized Capital Gains (Losses)

Net realized capital gains (losses), including other-than-temporary impairments **("OTTI")**, were comprised of the following:

	Years Ended December 31,				
	2017	**2016**	**2015**	**% Change 17 vs. 16**	**% Change 16 vs. 15**
	($ In Millions)				
Net realized capital gains (losses):					
Bonds	$ (102)	$ (248)	$ (66)	59 %	(276)%
Preferred stocks	(6)	9	2	(167)	350
Common stocks - subsidiaries and affiliates	27	11	64	145	(83)
Common stocks - unaffiliated	(9)	(60)	(8)	85	(650)
Mortgage loans	(27)	(14)	(8)	(93)	(75)
Real estate	68	14	50	386	(72)
Partnerships and LLCs	(87)	(94)	(97)	7	3
Derivatives	(314)	(7)	(64)	NM	89
Other	(136)	(4)	216	NM	(102)
Net realized capital (losses) gains before federal and state taxes and deferral to the IMR	(586)	(393)	89	(49)	(542)
Net federal and state tax benefit (expense)	176	40	(151)	340	(126)
Net realized capital (losses) before deferral to the IMR	(410)	(353)	(62)	(16)	(469)
Net after tax (gains) losses deferred to the IMR	(12)	145	121	(108)	20
Net realized capital (losses) gains	**$ (422)**	**$ (208)**	**$ 59**	**(103)%**	**(453)%**

NM = not meaningful

Net realized capital losses increased $214 million in 2017 primarily due to increases in losses from derivatives of $307 million and other investments of $132 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.

Net realized capital losses increased $267 million in 2016 primarily due to the non-reoccurrence of 2015 net gains of other investments of $216 million, primarily recoveries of prior year losses, an increase in bond losses of $182 million and an increase in common stock losses of $105 million, partially offset by an increase in the federal and state tax benefit of $191 million and a decrease in losses from derivatives of $57 million.

Investments are written down when a decline in value is considered to be other-than-temporary. In 2017, MassMutual recognized $185 million of impairment losses compared to $188 million in 2016. Of the $185 million of OTTI in 2017, $68 million was related to common and preferred stock, $64 million was related to bonds, and $53 million was related to partnerships and LLCs.

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. In 2016, $145 million of net after-tax losses were deferred into the IMR including derivative net losses of $82 million and bond net losses of $63 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,				
	2017	2016	2015	% Change 17 vs. 16	% Change 16 vs. 15
	($ In Millions)				
Gross realized capital gains on sales....	$ 114	$ 132	$ 216	(14)%	(39)%
Gross realized capital losses on sales...	(153)	(248)	(74)	38	(235)
OTTI.....	(64)	(78)	(170)	18	54
Net realized capital (losses)	**$ (103)**	**$ (194)**	**$ (28)**	**47 %**	**(593)%**

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. Bond net realized capital losses increased $166 million in 2016 primarily driven by a higher sales volume, specifically losses on United States treasury securities which were mostly offset by gains on interest rate swaps and an increase in foreign currency losses as the U.S. dollar strengthened against most foreign currencies, primarily the British Pound and Euro. The bond net realized capital losses in 2016 were partially offset by a decrease in OTTI of $92 million.

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. Common stock net realized capital losses increased $105 million to a loss of $49 million in 2016, from a gain of $56 million in 2015. The change in 2016 reflects a lower sales volume, as 2015 had significant sales from seed money investments.

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. Mortgage loan net realized capital losses increased $6 million in 2016 primarily due to increased losses on foreign exchange of $5 million and an increase in OTTI of $2 million.

Real estate net realized capital gains increased $54 million to $68 million in 2017 from $14 million in 2016. The current year's gains of $54 million were primarily from the sales of four properties, partially offset by reserves for two properties held for sale. Real estate net realized capital gains decreased $36 million to $14 million in 2016 from $50 million in 2015. The 2016 gains of $14 million were primarily from the sales of two properties and the 2015 gain of $50 million was primarily from the sale of one property.

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. Partnership and LLCs net realized capital losses decreased $3 million in 2016 primarily due to a decrease in foreign exchange losses on distributions of $18 million and an increase in gains from sales and liquidations of $5 million, partially offset by an increase in OTTI of $21 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,			%	% Change
	2017	2016	2015	17 vs. 16	16 vs. 15
	(In Millions)				
Net realized capital gains (losses)	$ (314)	$ (7)	$ (64)	4,386 %	(89) %
Net change in unrealized capital gains	(1,102)	246	227	(548)	8
Net realized and change in unrealized capital gains	**$ (1,416)**	**$ 239**	**$ 163**	**(692)%**	**47 %**

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.

Derivative net realized capital losses decreased $57 million to a loss of $7 million in 2016 from a loss of $64 million in 2015, primarily due to decreased losses on interest rate swaps of $185 million, increased gains on currency forwards of $48 million, credit default swaps of $7 million, mortgage-backed security forwards of $5 million and currency swaps of $3 million, partially offset by increased losses on financial futures of $160 million and options of $32 million. These decreased losses primarily resulted from the termination of interest rate swaps and the greater increase in the swap curve rates, and the greater weakening of the British Pound relative to the U.S. Dollar, partially offset by the increase in interest rates and greater strengthening of equity markets, 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

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

	December 31, 2017	December 31, 2016	% Change
	($ In Millions)		
Assets:			
Bonds	$ 90,435	$ 83,821	8 %
Preferred stocks	768	465	65
Common stocks - subsidiaries and affiliates	14,424	14,244	1
Common stocks - unaffiliated	1,212	1,120	8
Mortgage loans	22,580	20,961	8
Policy loans	13,327	12,461	7
Real estate	857	977	(12)
Partnerships and limited liability companies	7,678	7,187	7
Derivatives	8,857	9,763	(9)
Cash, cash equivalents and short-term investments	3,580	3,726	(4)
Other invested assets	203	161	26
Total invested assets	163,921	154,886	6
Investment income due and accrued	2,199	1,914	15
Federal income taxes	544	44	NM
Deferred income taxes	761	1,606	(53)
Other than invested assets	3,476	3,016	15
Total assets excluding separate accounts	170,901	161,466	6
Separate account assets	69,162	62,204	11
Total assets	**$ 240,063**	**$ 223,670**	**7 %**
Liabilities and Surplus:			
Policyholders' reserves	$ 115,764	$ 112,186	3 %
Liabilities for deposit-type contracts	13,014	11,574	12
Contract claims and other benefits	513	402	28
Policyholders' dividends	1,601	1,609	-
General expenses due or accrued	1,074	1,121	(4)
Asset valuation reserve	3,207	3,178	1
Repurchase agreements	4,204	4,729	(11)
Commercial paper	250	250	NM
Collateral	2,661	2,839	(6)
Derivatives	5,979	6,014	(1)
Funds held under coinsurance	4,001	-	NM
Other liabilities	2,928	2,150	36
Total liabilities excluding separate accounts	155,196	146,052	6
Separate account liabilities	69,162	62,195	11
Total liabilities	**224,358**	**208,247**	8
Surplus	15,705	15,423	2
Total liabilities and surplus	**$ 240,063**	**$ 223,670**	**7 %**

NM = not meaningful

Assets

Total assets were $240.1 billion as of December 31, 2017, an increase of $16.4 billion, or 7%, from year-end 2016, primarily due to increases in invested assets of $9.0 billion and separate account assets of $7.0 billion.

Invested assets increased to $163.9 billion as of December 31, 2017 from $154.9 billion as of December 31, 2016, primarily due to increases in bonds of $6.6 billion, mortgage loans of $1.6 billion, policy loans of $866 million, partnerships and LLCs of $491 million and preferred stock of $303 million, partially offset by derivatives of $906 million.

Bonds increased $6.6 billion, or 8%, in 2017, including $26.3 billion of acquisitions, as well as unrealized foreign currency gains of $888 million that were partially offset by $20.7 billion of sales, paydowns and maturities. Bonds in NAIC Categories 1 and 2 were 50% of total invested assets as of December 31, 2017 and 2016. The percentage of total invested assets representing bond investments in NAIC Categories 3 through 6 was 5% as of December 31, 2017 and 2016. 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.

Asset-backed securities ("**ABS**") and mortgage-backed securities ("**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 collateralized debt obligations ("**CDO**") 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.

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, 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. As of December 31, 2016, RMBS had a total carrying value of $1.5 billion and a fair value of $1.7 billion, of which approximately 23%, based on carrying value, was classified as Alt-A. Alt-A and subprime RMBS had a total carrying value of $686 million and a fair value of $825 million.

During the year ended December 31, 2017, there were no significant credit downgrades of 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, 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. As of December 31, 2016, total leveraged loans and leveraged loan CDOs had a carrying value of $10.6 billion and a fair value of $10.6 billion, of which approximately 88%, 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 $1.8 billion as of December 31, 2017 and a carrying value and fair value of $2.0 billion as of December 31, 2016.

Preferred stocks increased $303 million, or 65%, primarily due to net acquisitions of $299 million and unrealized foreign currency gains of $10 million, partially offset by $6 million of OTTI.

Common stocks – subsidiaries and affiliates increased $180 million, or 1%, primarily due to an increase in the value of MMHLLC and MassMutual International due to earnings of subsidiaries, net of dividends paid to MassMutual of $425 million.

Common stocks – unaffiliated increased $92 million, or 8%, primarily due to net unrealized gains of $100 million and net acquisitions of $56 million, partially offset by OTTI of $62 million.

Mortgage loans increased $1.6 billion, or 8%, in 2017 primarily due to $1.5 billion of net acquisitions, a $128 million net gain on foreign currency revaluation and a $3 million decrease in valuation allowance, partially offset by $23 million of transfers out of mortgage loans, including $20 million to partnerships and LLCs, and $3 million to a subsidiary.

Policy loans increased $866 million, or 7%, in 2017 primarily due to increases in policy loan values of $1.4 billion and interest capitalization of $308 million, partially offset by loan repayments of $359 million and the net settlement of policy loans in surrenders, lapses and deaths of $474 million.

Real estate decreased $120 million, or 12%, in 2017 primarily due to $221 million in net sales (including $86 million in realized gains and a $14 million increase in encumbrances), $128 million in transfers, $102 million of depreciation, and a $15 million increase in reserves, partially offset by $300 million of capital improvements and $46 million in purchases. As of December 31, 2017, commercial office buildings and hotels represented 30% and 47%, respectively, of MassMutual's real estate portfolio compared to 37% and 43% for the same property types as of December 31, 2016.

Partnerships and LLCs increased $491 million, or 7%, in 2017 primarily due to additional investments of $2.2 billion, earnings of $1.1 billion, net transfers of $156 million primarily from the transfer of hotels from real estate, unrealized foreign exchange valuation gains of $102 million and unrealized gains of $39 million, partially offset by returns of capital of $2.1 billion, income distributions of $544 million, sale and liquidation proceeds of $423 million and realized losses on sales of $27 million. As of December 31, 2017, MassMutual did not hold any partnerships or LLCs with significant subprime or Alt-A exposure.

Cash, cash equivalents and short-term investments decreased $146 million, or 4%, in 2017. Cash, cash equivalents and short-term investments decreased due to cash applied to investing activities of $8.5 billion, partially offset by cash from operations of $8.3 billion and net cash provided from financing and other sources of $43 million.

Derivative assets decreased $906 million, or 9%, in 2017. The decrease is primarily due to $550 million in currency swaps due to the strengthening of the British Pound and Euro relative to the U.S. Dollar and $400 million in interest rate swaps due to the increase in certain swap curve 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 $285 million to $2.2 billion as of December 31, 2017. The change is primarily due to increases in accrued bonds income of $249 million, accrued derivative income of $25 million, accrued mortgage loans income of $6 million, and accrued policy loans income of $3 million.

Federal income taxes increased $500 million to $544 million as of December 31, 2017 primarily due to the current period's tax benefit of $497 million and net tax payments of $3 million, including intercompany tax settlements.

Deferred income taxes decreased $845 million, or 53%, in 2017 primarily due to a $594 million decrease resulting from the reduction in the federal tax rate mandated by the Tax Act. An additional $241 million decrease resulted from greater limitations as a result of reductions in both the available inventory of deferred tax items and the tax planning realization support for those available deferred benefits.

Separate account assets increased $7.0 billion in 2017, primarily due to market value appreciation of $8.4 billion, partially offset by net customer cash outflows of $941 million and fees of $375 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 $16.1 billion, or 8%, in 2017 primarily due to increases in separate account liabilities of $7.0 billion, funds held under coinsurance of $4.0 billion, policyholders' reserves of $3.6 billion, liabilities for deposit-type contracts of $1.4 billion and other liabilities of $779 million, partially offset by a decrease in repurchase agreements of $525 million.

Policyholders' reserves increased $3.6 billion to $115.8 billion. 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 paid, policy fees and the ceding of certain universal life contracts under a new reinsurance agreement effective December 31, 2017. Increases were in whole life of $3.5 billion, pension buyout products, defined benefit and defined contribution reserves of $990 million, annuities and supplemental contracts of $632 million and universal life of $318 million. The decrease in group and variable life of $1.9 billion included the reduction of $4.0 billion that was recorded under a new reinsurance agreement, in funds held coinsurance, which was effective December 31, 2017.

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, 2016	$ 572
Incurred guarantee benefits	84
Paid guarantee benefits	(5)
Liability as of December 31, 2016	651
Incurred guarantee benefits	(131)
Paid guarantee benefits	(8)
Liability as of December 31, 2017	$ 512

MassMutual held reserves in accordance with the stochastic scenarios as of December 31, 2017 and 2016. As of December 31, 2017 and 2016, 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 2017 and 2016 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, 2017			December 31, 2016		
	Account Value	Net Amount at Risk	Weighted Average Attained Age	Account Value	Net Amount at Risk	Weighted Average Attained Age
	($ In Millions)					
GMDB	$ 20,118	$ 25	64	$ 18,800	$ 36	63
GMIB Basic	910	37	68	894	92	67
GMIB Plus	3,210	416	66	3,059	589	66
GMAB	3,233	1	59	3,158	22	58
GMWB	204	7	69	206	15	69

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. Liabilities for deposit-type contracts increased $1.1 billion in 2016 primarily due to the issuance of medium-term notes of $1.3 billion and the issuance of a funding agreement with the Federal Home Loan Bank of Boston (the "**FHLB**") of $250 million, partially offset by funding agreement maturities of $713 million.

A new liability, for funds held under coinsurance was recorded for certain universal life policies of $4.0 billion that were ceded under a new reinsurance agreement effective December 31, 2017.

AVR increased $29 million, or 1%, in 2017 due to increases in net unrealized capital gains of $647 million and changes in reserve contributions of $162 million partially offset by decreases in adjustment down to the maximum of $579 million and net realized capital losses of $201 million.

The liability for repurchase agreements decreased $525 million, or 11%, in 2017. 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 decreased $178 million, or 6%, to $2.7 billion as of December 31, 2017 from $2.8 billion as of December 31, 2016. The decrease in collateral liability is consistent with the decrease 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, 2017 and $3.3 billion as of December 31, 2016. MassMutual had the right to rehypothecate or repledge securities totaling $635 million of the $2.5 billion as of December 31, 2017 and $998 million of the $3.3 billion as of December 31, 2016 of net collateral pledged by counterparties. There were no securities rehypothecated to other counterparties as of December 31, 2017 or December 31, 2016.

Derivative liabilities decreased $35 million, or 1%, in 2017. The decrease is primarily due to $601 million in interest rate swaps due to the increase in certain swap curve rates, partially offset by $533 million in currency swaps due to the strengthening of the British Pound and Euro relative to the U.S. Dollar, and as well as changes in notional amounts related to the repositioning of the portfolio as part of ongoing asset-liability management activity.

Other liabilities increased $779 million, or 36%, in 2017 primarily due to the timing of policy activity in separate accounts of $728 million.

Commercial paper had a carrying value and face amount of $250 million as of December 31, 2017 and 2016. MassMutual issues commercial paper in the form of notes in minimum denominations of $250 thousand up to a total aggregation of $1 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 increased $282 million in 2017 to $15.7 billion as of December 31, 2017. The following table shows the change in surplus:

	December 31, 2017
	(In Millions)
Beginning surplus	$ 15,423
Net income	52
Change in net unrealized capital gains (losses), net of tax	368
Change in net unrealized foreign exchange capital gains (losses), net of tax	721
Change in other net deferred income taxes	(1,084)
Change in nonadmitted assets	124
Change in asset valuation reserve	(29)
Change in surplus notes	36
Prior period adjustments	45
Change in minimum pension liability	61
Other	(12)
Net increase	282
Ending surplus	**$ 15,705**

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, 2017 was approximately $38.1 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 $8.3 billion in 2017, $9.3 billion in 2016 and $7.8 billion in 2015. 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 $1.0 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 provided from operations increased $801 million, or 11%, to $7.8 billion in 2015. The increase was the result of an increase in premium and other income collected of $1.8 billion and a decrease in benefit payments of

$702 million, partially offset by lower net receipts from the RPG reinsurance agreement of $622 million and lower transfers from separate accounts of $533 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 $34.7 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 used to purchase investments decreased $4.4 billion in 2015 to $6.7 billion. Purchases of investments and the net increase in policy loans were $25.8 billion, while sales and maturities of investments and receipts from repayments of loans were $19.1 billion. Net purchases of investments in 2015 included bonds of $2.5 billion, mortgage loans of $2.7 billion and partnerships and LLCs of $883 million.

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 $451 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.

Net cash from financing activities and other sources decreased $1.7 billion in 2015, primarily due to the purchase of COLI of $1.9 billion and a reduction in repurchase agreements of $699 million, partially offset by an increase in net deposits on deposit-type contracts of $749 million and proceeds from a surplus note issuance of $491 million.

Institutional Investment Product Contract Terms

Assets received for funding agreements may be invested in the general account of MassMutual. 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. As of December 31, 2016, funding agreement balances in the general account totaled $7.1 billion, consisting of $4.7 billion in note programs, $1.1 billion in FHLB funding agreements, $831 million of municipal contracts and $445 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 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 $118 million outstanding as of December 31, 2017. Notes are currently issued from MassMutual's $17.0 billion Global Medium-Term Note Program.

Federal Home Loan Bank of Boston

MassMutual has funding agreements with the FHLB in an investment spread strategy, consistent with its other funding agreements. These funding agreements are collateralized by securities with estimated fair values of $982 million as of December 31, 2017. MassMutual's borrowing capacity with the FHLB 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 $946 million as of December 31, 2017. As a member of the FHLB, MassMutual held common stock of the FHLB with a statement value of $74 million as of December 31, 2017 and $75 million as of December 31, 2016.

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 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 $169 million as of December 31, 2017 and $176 million as of December 31, 2016. 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, 2017, the maturity schedule for funding agreement liabilities was as follows:

	Funding Agreements (In Millions)
2018	$ 959
2019	1,535
2020	1,407
2021	1,399
2022	1,017
Thereafter	2,518
Total	**$ 8,835**

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, 2017 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, 2017 and 2016, MassMutual's total adjusted capital, as defined by the NAIC, was $17.4 billion. 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, 2017 and 2016. 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. The facility has an upsize option for an additional $500 million. The terms of the credit facility 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, 2017 and 2016, MassMutual was in compliance with all covenants under the credit facility. For the years ended December 31, 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, 2017, 2016 and 2015.

Investments

General

As of December 31, 2017, approximately 29% 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 our separate account assets.

As of December 31, 2017, MassMutual had $163.9 billion of invested assets, an increase of $9.0 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,			
	2017		2016	
	Carrying Value	% of Total	Carrying Value	% of Total
	($ In Millions)			
Bonds	$ 90,435	55%	$ $83,821	54 %
Preferred stocks	768	-	465	-
Common stocks - subsidiaries and affiliates	14,424	9	14,244	9
Common stocks - unaffiliated	1,212	1	1,120	1
Mortgage loans	22,580	14	20,961	14
Policy loans	13,327	8	12,461	8
Real estate	857	1	977	1
Partnerships and LLCs	7,678	5	7,187	5
Derivatives	8,857	5	9,763	6
Cash, cash equivalents and short-term investments	3,580	2	3,726	2
Other invested assets	203	-	161	-
Total invested assets	**$ 163,921**	**100%**	**$ 154,886**	**100 %**

The following sets forth earnings yields by asset type:

	December 31,		
	2017	2016	2015
Long-term bonds	4.3 %	4.3 %	4.5 %
Preferred & common stocks	0.8	1.6	1.8
Mortgage loans	4.3	4.7	4.9
Policy loans	6.2	6.3	6.2
Real estate	(1.5)	0.3	0.9
Partnerships and LLCs	8.6	6.5	9.1
Derivatives	NM	NM	NM
Total portfolio	**4.5 %**	**4.6 %**	**5.0 %**

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 NAIC Securities Valuation Office ("**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 commercial mortgage-backed securities ("**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, 2017 and 2016. The following table consists of long-term bonds, short-term securities and cash equivalents.

Total Portfolio Credit Quality

		December 31,			
		2017		2016	
NAIC Class	Equivalent Rating Agency Designation	Carrying Value	% of Total	Carrying Value	% of Total
		($ In Millions)			
1	Aaa/Aa/A	$ 49,108	53%	$ 48,354	56 %
2	Baa	35,673	38	31,810	36
3	Ba	4,824	5	3,679	4
4	B	2,805	3	2,390	3
5	Caa and lower	999	1	1,049	1
6	In or near default	387	-	360	-
	Total	**$ 93,796**	**100 %**	**$ 87,642**	**100 %**

The following summarizes NAIC designations for RMBS and CMBS subject to modeling as of December 31, 2017 and 2016:

	December 31,							
	2017				2016			
	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	$ 672	100 %	$ 1,749	99 %	$ 793	100 %	$ 1,694	100 %
2	-	-	6	-	-	-	-	-
3	-	-	3	-	-	-	-	-
5	-	-	-	-	-	-	6	-
6	-	-	26	1	-	-	5	-
	$ 672	**100 %**	**$ 1,784**	**100 %**	**$ 793**	**100 %**	**$ 1,705**	**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,			
		2017		2016	
NAIC Class	Equivalent Rating Agency Designation	Carrying Value	% of Total	Carrying Value	% of Total
		($ In Millions)			
1	Aaa/Aa/A	$ 24,813	64 %	$ 25,021	66 %
2	Baa	12,380	31	10,747	29
3	Ba	1,278	3	636	2
4	B	895	2	573	2
5	Caa and lower	152	-	197	1
6	In or near default	40	-	19	-
	Total	**$ 39,558**	**100 %**	**$ 37,193**	**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,			
		2017		2016	
NAIC Class	Equivalent Rating Agency Designation	Carrying Value	% of Total	Carrying Value	% of Total
		($ In Millions)			
1	Aaa/Aa/A	$ 24,295	44%	$ 23,333	45%
2	Baa	23,293	42	21,063	42
3	Ba	3,546	7	3,043	6
4	B	1,910	4	1,817	4
5	Caa and lower	847	2	852	2
6	In or near default	347	1	341	1
	Total	**$ 54,238**	**100 %**	**$ 50,449**	**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, 2017:

	Bond Portfolio by Industry					
	December 31, 2017					
	Public		Private		Total	
Industry Category	Carrying Value	% of Total	Carrying Value	% of Total	Carrying Value	% of Total
	($ In Millions)					
Government Related	$ 13,840	34%	$ 1,401	3%	$ 15,241	15%
Financial Institutions	2,028	5	8,281	13	10,309	11
Utility	2,354	6	6,183	11	8,537	9
CDO	6	-	7,240	13	7,246	8
Energy	2,165	5	3,133	6	5,298	6
Capital Goods	2,236	6	3,061	6	5,297	6
Transportation	1,075	3	4,077	8	5,152	5
Consumer Non-Cyclical	1,561	4	3,235	6	4,796	5
ABS	895	2	3,181	6	4,076	5
Healthcare	2,639	7	1,423	3	4,062	4
Consumer Cyclical	1,409	4	2,456	5	3,865	4
REITS	1,029	3	2,828	5	3,857	4
Communications	1,988	5	1,531	3	3,519	4
Basic Industry	1,591	4	1,518	3	3,109	3
Other Industrial	416	1	2,577	5	2,993	3
Technology	1,205	3	964	2	2,169	2
CMBS	1,061	3	757	1	1,818	2
Insurance	963	2	296	1	1,259	1
CMO	708	2	95	-	803	1
MBS Pass-Through	389	1	1	-	390	-
Total	**$ 39,558**	**100 %**	**$ 54,238**	**100 %**	**$ 93,796**	**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,	
	2017	2016
	(In Millions)	
Performing:		
Public	$ 184	$ 214
Private	1,133	1,131
Total performing	1,317	1,345
Underperforming		
Public	8	1
Private	61	63
Total underperforming	69	64
Total	**$ 1,386**	**$ 1,409**

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, 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 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.

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, 2017					
	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	$ 11	$ -	$ 11	$ 7	$ -	$ 7
All other governments	-	1	1	2	1	3
States, territories and possessions	1	-	1	-	-	-
Special revenue	1	1	2	5	-	5
Industrial and miscellaneous	68	33	101	150	77	227
Parent, subsidiaries and affiliates	37	3	40	-	3	3
Total	**$ 118**	**$ 38**	**$ 156**	**$ 164**	**$ 81**	**$ 245**

Unrealized losses decreased $524 million from the prior year, mainly for industrial and miscellaneous bonds, due to the decrease in treasury rates and credit spreads in 2017.

As of December 31, 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 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, 2017. Mortgage loans consist of whole loans on commercial real estate and residential mortgage loan pools. Commercial mortgage loans were 92% of the mortgage loan portfolio as of December 31, 2017.

Commercial Mortgage Loans

MassMutual's commercial mortgage loan portfolio, which includes $48 million of mezzanine loans, consisted of fixed and variable rate loans.

As of December 31, 2017, 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 $1.1 billion of bullet loans scheduled to mature during 2017, of which 18 loans totaling $1.0 billion, or 94%, were paid in full, 2 loans totaling $54 million, or 5%, extended their maturity and 1 loan totaling $16 million, or 1%, transferred to partnerships and LLCs. In addition, $868 million of bullet loans were disposed in 2017, of which 4 loans totaling $467 million, or 54%, were paid in full and 8 loans totaling $401 million, or 46%, prepaid in full with yield maintenance. Bullet loans of $371 million are scheduled to mature in 2018.

As of December 31, 2017, MassMutual did not have any loans within its commercial mortgage loan portfolio with valuation allowances.

The maturities of MassMutual's 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,			
	2017		2016	
	Carrying Value	% of Total	Carrying Value	% of Total
	($ In Millions)			
United States:				
West	$ 6,571	32 %	$ 6,262	33 %
Northeast	3,275	16	3,346	17
Mid-Atlantic	3,028	14	2,478	13
Midwest	2,929	14	2,742	14
Southwest	2,196	11	2,268	12
Southeast	973	5	871	5
United Kingdom	1,554	7	982	5
Canada	251	1	244	1
Total	**$ 20,777**	**100 %**	**$ 19,193**	**100 %**

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

	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 %**

	December 31, 2016				
	Less than 81%	81% to 95%	Above 95%	Total	% of Total
	($ In Millions)				
Office	$ 6,125	$ -	$ 16	$ 6,141	32 %
Apartments	5,045	-	-	5,045	26
Industrial and other	3,109	-	-	3,109	16
Hotels	2,597	-	-	2,597	14
Retail	2,274	27	-	2,301	12
Total	**$ 19,150**	**$ 27**	**$ 16**	**$ 19,193**	**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, 2017 and 2016, 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 $1.8 billion as of December 31, 2017 and 2016, 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, 2017 and 2016. There were no commercial mortgage loans in the process of foreclosure or in default as of December 31, 2017. The AVR contains a mortgage loans component, which increased to $215 million as of December 31, 2017 from $93 million as of December 31, 2016. 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, 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. As of December 31, 2016, MassMutual's real estate portfolio consisted of 31 properties with a statement value of $977 million of which $158 million was occupied by MassMutual. The portfolio uses leverage to maximize return with $611 million and $710 million in third party non-recourse debt outstanding as of December 31, 2017 and 2016, respectively.

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,			
	2017		2016	
	Carrying	% of Total	Carrying	% of Total
	($ In Millions)			
Hotel	$ 405	47 %	$ 421	43 %
Office	261	30	359	37
Retail	105	12	107	11
Apartments	59	7	82	8
Industrial & Other	27	3	8	1
Total	**$ 857**	**100 %**	**$ 977**	**100 %**

	Real Estate by Geographic Distribution December 31,			
	2017		2016	
	Carrying	% of Total	Carrying	% of Total
	($ In Millions)			
Southeast	$ 374	44 %	$ 314	32 %
Northeast	262	31	222	23
Mid-Atlantic	156	18	243	25
West	55	6	149	15
Southwest	24	3	62	6
Midwest	(14)	(2)	(13)	(1)
Total	**$ 857**	**100 %**	**$ 977**	**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 2017, this consisted of 1 property, or 4% of the properties in the real estate portfolio. As of December 31, 2017, MassMutual's real estate and other invested asset AVR totaled $1.1 billion.

Partnerships and LLCs

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

	December 31,	
	2017	2016
	(In Millions)	
Common stocks	$4,188	$4,282
Real estate	1,531	1,203
Fixed maturities/preferred stocks	870	743
Low income housing tax credits	330	325
Mortgage loans	211	169
Surplus notes	246	194
Other	302	271
Total	**$7,678**	**$7,187**

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

	Years Ended December 31,		
	2017	2016	2015
	(In Millions)		
Gross realized capital (losses) gains on sales	$ (27)	$ 3	$ (2)
Gross realized capital losses on foreign currency	(7)	(6)	(25)
OTTI	(53)	(91)	(70)

Partnerships and LLCs, except for investments in 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. 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, 2017, MassMutual did not hold any partnerships or LLCs with significant subprime or Alt-A exposure.

MassMutual invests in partnerships that generate LIHTCs which 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 income during the period in which tax benefits are recognized. MassMutual had $330 million of partnerships and LLCs which generate LIHTCs as of December 31, 2017 and $325 million as of December 31, 2016. These investments currently have unexpired tax credits which range from one to thirteen years and have an initial fifteen year holding period requirement. For determining OTTI on partnerships which 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 1.8% for future benefits of two years to 2.4% for future benefits of ten or more years, and compares the result to its current carry value. The Tax Act reduced the statutory federal tax rate from 35% to 21%,

effective January 1, 2018. Due to this law change, impairments of $2 million to LIHTCs investments were recorded for the year ended December 31. 2017. Impairments were less than $1 million for the year ended December 31, 2016. There were no write-downs or reclassifications made during the years ended December 31, 2017 or 2016 due to forfeiture or ineligibility of tax credits.

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 $13.1 billion as of December 31, 2017 and $12.1 billion as of December 31, 2016. These notional amounts included replicated asset transaction values of $11.5 billion as of December 31, 2017 and $10.7 billion as of December 31, 2016, 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, 2017 and $3.3 billion as of December 31, 2016. In the event of default, the full market value exposure at risk in a net gain position, net of offsets and collateral, was $115 million as of December 31, 2017 and $250 million as of December 31, 2016. The statutory net amount at risk, defined as net collateral pledged and statement values excluding accrued interest, was $595 million as of December 31, 2017 and $747 million as of December 31, 2016.

MassMutual also had the right to rehypothecate or repledge securities totaling $635 million of the $2.5 billion as of December 31, 2017 and $998 million of the $3.3 billion as of December 31, 2016 of net collateral pledged by counterparties. There were no securities rehypothecated to other counterparties as of December 31, 2017 or December 31, 2016.

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

	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**

	December 31, 2016			
	Assets		Liabilities	
	Carrying Value	Notional Amount	Carrying Value	Notional Amount
	(In Millions)			
Interest rate swaps…….	$ 8,084	$ 71,560	$ 5,915	$ 86,362
Options……..	653	6,677	6	5
Currency swaps……..	937	6,834	36	1,068
Forward contracts……..	51	3,320	56	2,817
Credit default swaps……..	38	2,435	1	207
Financial futures ……	-	3,196	-	-
Total……	**$ 9,763**	**$ 94,022**	**$ 6,014**	**$ 90,459**

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, 2017, the AVR totaled $3.2 billion, which represents a 1% increase from December 31, 2016. This increase was primarily due to current year net unrealized capital gains of $647 million and a $162 million increase in reserve contribution, partially offset by an adjustment down to the maximum of $579 million and current year net realized capital losses of $201 million.

The following represents the change in AVR for the years ended 2017 and 2016:

	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, 2015	$ 789	$ 139	$ 941	$ 948	$ 2,817
Change in reserve contributions [1]	69	68	(49)	44	132
Net realized capital (losses) gains [2]	39	(9)	(32)	(53)	(55)
Net unrealized capital gains [3]	(86)	(105)	590	(66)	333
Transfer among categories	-	-	(152)	152	-
Adjustment down to maximum	-	-	(49)	-	(49)
Net change to AVR [4]	22	(46)	308	77	361
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 gains (losses) [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**

[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, 2017, MassMutual estimates that a hypothetical immediate 10% increase in the 10-year treasury rate, approximately 24 basis points, would decrease the net fair value of its financial instruments by $2.6 billion. Whereas, a hypothetical immediate 10% decrease in the rate would increase the net fair value of MassMutual's financial instruments by $2.8 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 $20 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 $512 million as of December 31, 2017.

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, 2017, the net liability for guarantees on universal life and variable universal life type contracts, including GMDB reserves, was $3.5 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.

Significant volatility in the financial markets, and government actions taken in response, may exacerbate some of the risks MassMutual faces. MassMutual holds investments in energy and certain other commodity sectors, which have experienced similar overall market volatility and declines. With the continued weaker economic outlook in these sectors, there may be an increase in reported default rates or potential downgrades to the ratings of companies exposed to these sectors. In addition, concerns over the solvency of certain countries and sovereignties and the entities that have significant exposure to their debt have created market volatility. This volatility may continue to affect the performance of various asset classes until there is an ultimate resolution of the sovereign debt related concerns.

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 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 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 European Union, 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 help mitigate the economic impacts of such risks.

Annex 2

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY

STATUTORY FINANCIAL STATEMENTS

As of December 31, 2017 and 2016 and
for the years ended December 31, 2017, 2016 and 2015

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
STATUTORY FINANCIAL STATEMENTS

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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, 2017 and 2016, and the related statutory statements of operations, changes in surplus, and cash flows for the three-year period ended December 31, 2017, 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 described in note 2 and U.S. generally accepted accounting principles, although not reasonably determinable, are presumed to be material.

KPMG LLP is a Delaware limited liability partnership and the U.S. member firm of the KPMG network of independent member firms affiliated with KPMG International Cooperative ("KPMG International"), a Swiss entity.

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, 2017 and 2016, or the results of its operations or its cash flows for the three-year period ended December 31, 2017.

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, 2017 and 2016, and the results of its operations and its cash flows for the three-year period ended December 31, 2017, in accordance with statutory accounting practices prescribed or permitted by the Commonwealth of Massachusetts Division of Insurance described in note 2.

KPMG LLP

February 16, 2018

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
STATUTORY STATEMENTS OF FINANCIAL POSITION

	December 31, 2017	December 31, 2016
	(In Millions)	
Assets:		
Bonds	$ 90,435	$ 83,821
Preferred stocks	768	465
Common stocks – subsidiaries and affiliates	14,424	14,244
Common stocks – unaffiliated	1,212	1,120
Mortgage loans	22,580	20,961
Policy loans	13,327	12,461
Real estate	857	977
Partnerships and limited liability companies	7,678	7,187
Derivatives	8,857	9,763
Cash, cash equivalents and short-term investments	3,580	3,726
Other invested assets	203	161
Total invested assets	163,921	154,886
Investment income due and accrued	2,199	1,914
Federal income taxes	544	44
Deferred income taxes	761	1,606
Other than invested assets	3,476	3,016
Total assets excluding separate accounts	170,901	161,466
Separate account assets	69,162	62,204
Total assets	$ 240,063	$ 223,670
Liabilities and Surplus:		
Policyholders' reserves	$ 115,764	$ 112,186
Liabilities for deposit-type contracts	13,014	11,574
Contract claims and other benefits	513	402
Policyholders' dividends	1,601	1,609
General expenses due or accrued	1,074	1,121
Asset valuation reserve	3,207	3,178
Repurchase agreements	4,204	4,729
Commercial paper	250	250
Collateral	2,661	2,839
Derivatives	5,979	6,014
Funds held under coinsurance	4,001	-
Other liabilities	2,928	2,150
Total liabilities excluding separate accounts	155,196	146,052
Separate account liabilities	69,162	62,195
Total liabilities	224,358	208,247
Surplus	15,705	15,423
Total liabilities and surplus	$ 240,063	$ 223,670

See notes to statutory financial statements

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
STATUTORY STATEMENTS OF OPERATIONS

	Years Ended December 31,		
	2017	2016	2015
	(In Millions)		
Revenue:			
Premium income	$ 17,486	$ 21,432	$ 21,543
Net investment income	6,542	6,334	6,387
Fees and other income	1,425	1,283	797
Total revenue	25,453	29,049	28,727
Benefits and expenses:			
Policyholders' benefits	20,019	18,312	16,300
Change in policyholders' reserves	740	7,387	8,592
Change in group annuity reserves assumed	(887)	(1,510)	(942)
General insurance expenses	2,604	2,251	1,793
Commissions	1,009	938	869
State taxes, licenses and fees	245	237	187
Total benefits and expenses	23,730	27,615	26,799
Net gain from operations before dividends and federal income taxes	1,723	1,434	1,928
Dividends to policyholders	1,569	1,566	1,728
Net gain (loss) from operations before federal income taxes	154	(132)	200
Federal income tax benefit	(320)	(326)	(153)
Net gain from operations	474	194	353
Net realized capital (losses) gains	(422)	(208)	59
Net income (loss)	$ 52	$ (14)	$ 412

See notes to statutory financial statements

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
STATUTORY STATEMENTS OF CHANGES IN SURPLUS

	Years Ended December 31,		
	2017	2016	2015
	(In Millions)		
Surplus, beginning of year	$ 15,423	$ 14,983	$ 14,231
Increase (decrease) due to:			
Net income (loss)	52	(14)	412
Change in net unrealized capital gains (losses), net of tax	368	1,105	195
Change in net unrealized foreign exchange capital gains (losses), net of tax	721	(441)	(226)
Change in other net deferred income taxes	(1,084)	247	231
Change in nonadmitted assets	124	(326)	(16)
Change in asset valuation reserve	(29)	(361)	(197)
Change in surplus notes	36	-	491
Cumulative effect of accounting changes	-	-	3
Prior period adjustments	45	34	9
Change in minimum pension liability	61	6	(150)
Other	(12)	190	-
Net increase	282	440	752
Surplus, end of period	$ 15,705	$ 15,423	$ 14,983

See notes to statutory financial statements

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
STATUTORY STATEMENTS OF CASH FLOWS

	Years Ended December 31,		
	2017	2016	2015
	(In Millions)		
Cash from operations:			
Premium and other income collected	$ 22,194	$ 21,685	$ 20,842
Net investment income	6,542	6,394	6,213
Benefit payments	(19,718)	(17,832)	(16,261)
Net transfers from separate accounts	3,510	2,282	770
Net receipts from group annuity reserves assumed	887	1,510	942
Commissions and other expenses	(3,523)	(3,355)	(2,907)
Dividends paid to policyholders	(1,577)	(1,698)	(1,565)
Federal and foreign income taxes (paid) recovered	(3)	353	(234)
Net cash from operations	8,312	9,339	7,800
Cash from investments:			
Proceeds from investments sold, matured or repaid:			
Bonds	19,838	14,660	12,496
Preferred and common stocks – unaffiliated	516	577	444
Common stocks – affiliated	346	75	767
Mortgage loans	3,062	3,847	2,575
Real estate	226	59	110
Partnerships and limited liability companies	1,972	908	2,560
Derivatives	54	545	278
Other	(273)	(122)	(114)
Total investment proceeds	25,741	20,549	19,116
Cost of investments acquired:			
Bonds	(24,910)	(21,393)	(15,012)
Preferred and common stocks – unaffiliated	(887)	(379)	(576)
Common stocks – affiliated	(230)	(1,499)	(539)
Mortgage loans	(4,543)	(3,505)	(5,296)
Real estate	(267)	(201)	(283)
Partnerships and limited liability companies	(1,851)	(1,568)	(3,443)
Derivatives	(598)	(627)	(438)
Other	(89)	115	409
Total investments acquired	(33,375)	(29,057)	(25,178)
Net increase in policy loans	(867)	(648)	(658)
Net cash from investing activities	(8,501)	(9,156)	(6,720)
Cash from financing and miscellaneous sources:			
Net deposits on deposit-type contracts	1,360	755	831
Cash provided by surplus note issuance	36	-	491
Change in repurchase agreements	(525)	(401)	472
Change in collateral	(180)	712	726
Corporate-owned life insurance purchased	-	-	(1,937)
Other cash used	(648)	(572)	(494)
Net cash from financing and miscellaneous sources	43	494	89
Net change in cash, cash equivalents and short-term investments	(146)	677	1,169
Cash, cash equivalents and short-term investments:			
Beginning of year	3,726	3,049	1,880
End of year	$ 3,580	$ 3,726	$ 3,049

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 (GICs) 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 GICs 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 (LTC) 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; and (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 asset valuation reserve, 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.

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 (DTAs), 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 2bb. "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 2bb. "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, MML Bay State Life Insurance Company, MassMutual Holding LLC (MMHLLC) and MassMutual International LLC (MMI), are accounted for using the statutory equity method. The Company 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) 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 $2,703 million as of December 31, 2017 and $2,675 million as of December 31, 2016. Operating results, less dividends declared, for MMHLLC are 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.

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 2bb. "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 2bb. "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, 2017 and 2016. 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 2bb. "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.

Refer to *Note 2bb. "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, results 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, 2017 and 54% as of December 31, 2016.

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. Other liabilities

Other liabilities primarily consist of the derivative interest expense liability, liability for employee benefits, pending security settlements, unearned income and remittances and items not allocated.

aa. 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.

bb. 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 April 2016, the NAIC adopted modifications to the Statements of Statutory Accounting Principles (SSAP) No. 41R, *Surplus Notes*, which were effective January 1, 2017. These modifications required that the surplus notes with a designation equivalent to NAIC 3 through 6 be reported at the lesser of amortized cost or fair value. Prior to 2017, these surplus notes are reported at amortized cost. The modifications also incorporate guidance to clarify when surplus notes shall be nonadmitted, an unrealized loss should be recognized, and an OTTI assessment should be performed. These modifications did not have an impact on the Company's financial statements.

In June 2016, the NAIC adopted modifications to SSAP No. 26R, *Bonds* and SSAP No. 43R, *Loan-backed and Structured Securities*, which were effective January 1, 2017 and should be prospectively applied. These modifications clarified that the amount of prepayment penalties or acceleration fees reported as investment income should equal the total proceeds received less the par value of the investment; and any difference between the carrying value and the par value at the time of disposal will be reported as realized capital gains and losses. These modifications also added specific disclosures related to securities sold, redeemed or otherwise disposed of as a result of a callable feature. These modifications did not have a significant impact on the Company's financial statements.

In June 2016, the NAIC adopted substantive revisions to SSAP No. 51R, *Life Contracts*, to incorporate references to the Valuation Manual (VM) 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. 51 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 Company is currently assessing the impact of these modifications on the Company's financial statements.

In August 2016, the NAIC adopted modifications to SSAP No. 51R, *Life Contracts*, which were effective January 1, 2017. These modifications clarified that annual assumption changes from reserving methods used in PBR would not qualify as a change in valuation basis. Changes in valuation basis are recorded directly to surplus instead of through income. These modifications were made to accommodate PBR which became effective January 1, 2017. These modifications are not expected to have an impact on the Company's financial statements.

In December 2016, the NAIC adopted modifications to SSAP No. 35R, *Guaranty Fund and Other Assessments*, which became effective March 16, 2017. The modification allows insurers to consider expected renewals of short-term health contracts in determining the assets recognized from accrued guaranty fund liability assessments from insolvencies of entities that write long-term care. Also, in August 2017, the NAIC made an additional modification to SSAP No. 35R to require discounting guaranty fund assessments and the related recoverable tax credit in excess of one year to payment or recovery at the whole life discount rate in effect as of the reporting date. The Company has adopted these modifications, which did not have a significant impact on its financial statements.

In April 2017, the NAIC adopted modifications to SSAP No. 26R, *Bonds*, which is effective December 31, 2017. These modifications are part of an ongoing investment classification project. These modifications (a) provide a definition of a security, (b) update the description of bonds included in scope of the guidance, (c) require fair value accounting for certain SVO identified investments, such as bond exchange traded funds, unless a systematic value has been elected, and (d) clarify the scope of the standard to specifically include bank loans acquired through organization, participation, syndication or assignment. The adoption of these modifications did not have an impact on the Company's financial statements in 2017.

In June 2017, the NAIC adopted modifications to SSAP No. 30, *Unaffiliated Common Stock*, SSAP No. 48, *Joint Ventures, Partnerships and Limited Liability Companies*, and SSAP No. 97, *Investments in Subsidiary, Controlled and Affiliated Entities* as they relate to ASU 2016-07, *Simplifying the Transition to the Equity Method of Accounting* which were effective January 1, 2017. These modifications included the definition of control and provided guidance as to when an investment qualified (or no longer qualifies) for the equity method of accounting. These modifications further specified that when the level of investment in a subsidiary, controlled or affiliated (SCA) entity fell below the level of control, defined as the possession, directly or indirectly, of the power to direct or cause the direction of the management and policies of the investee in SSAP No. 97, the reporting entity should discontinue the use of the equity method of accounting. When an entity becomes qualified to use the equity method of accounting, the entity should add the cost of acquiring the additional interest in the investee to the current basis of the previously held interest and apply the equity method of accounting, prospectively. The Company has adopted these modifications.

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.

Future adoption of new accounting standards

In January 2017, the NAIC adopted modifications to SSAP No. 86, *Derivatives*, which will be effective January 1, 2018. The modifications maintain gross reporting of derivative variation margin as a separate unit of account, rather than characterizing as legal settlement with mark-to-market changes recorded in surplus. Regarding exchange traded futures, these modifications further clarify that variation margin and mark-to-market changes should be recorded in the same manner as all other derivative instruments. The Company will record mark-to-market gains and losses from exchange traded futures as unrealized gains or losses instead of realized gains or losses and gross up the derivatives and collateral line items on its financial statements. The modifications will not impact total surplus and the Company anticipates an immaterial impact on its financial statements.

In April 2017, the NAIC adopted modifications to SSAP No. 69, *Statement of Cash Flow: Classification of Certain Cash Receipts and Cash Payments*, to adopt ASU No. 2016-15, *Classification of Certain Cash Receipts and Cash*

Payments, in its entirety, which will be effective January 1, 2018 on a retrospective basis. In June 2017, the NAIC adopted additional modifications to SSAP No. 69 to incorporate portions of ASU No. 2016-18, *Restricted Cash*, which will be effective December 31, 2019 with early adoption permitted. The initial modifications address the classification and disclosure of certain items within the statements of cash flows. Upon adoption, proceeds from the settlement of corporate owned life insurance policies owned by the Company will be classified as investing activities instead of operating activities. Additionally, the Company will apply the nature of distribution approach to SCA 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. Effective January 1, 2018, the Company will early adopt on a retrospective basis, the second modification that adds restricted cash, cash equivalents and short-term investments to the existing statutory disclosure requirements in SSAP No.1, *Accounting Policies, Risks & Uncertainties, and Other Disclosures*. Although the adoption of these modifications will require reclassification between investing and operating cash flows, they will 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 will be effective January 1, 2018. These modifications adopt, with modification, applicable U.S. GAAP, allowing greater consistency with FASB's allowable use of NAV. These modifications also include 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. Previously, statutory guidance only allowed NAV as a practical expedient for money market mutual funds and SVO-identified bond exchange traded funds. As a result of these modifications, the NAIC issued SSAP No. 100R, *Fair Value*. The adoption of these modifications is not expected to have a significant impact on the Company's 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, 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.

	December 31, 2016				
	Carrying Value	Fair Value	Level 1	Level 2	Level 3
	(In Millions)				
Financial assets:					
Bonds:					
U. S. government and agencies	$ 6,819	$ 7,327	$ -	$ 7,323	$ 4
All other governments	924	934	-	863	71
States, territories and possessions	676	723	-	723	-
Political subdivisions	483	514	-	514	-
Special revenue	5,605	6,167	-	6,134	33
Industrial and miscellaneous	62,806	64,478	-	39,231	25,247
Parent, subsidiaries and affiliates	6,508	6,604	-	615	5,989
Preferred stocks	465	482	1	30	451
Common stocks - subsidiaries and affiliates	573	573	487	23	63
Common stocks - unaffiliated	1,120	1,120	582	349	189
Mortgage loans - commercial	19,193	19,660	-	-	19,660
Mortgage loans - residential	1,768	1,728	-	-	1,728
Derivatives:					
Interest rate swaps	8,084	8,633	-	8,633	-
Options	653	653	-	653	-
Currency swaps	937	937	-	937	-
Forward contracts	51	51	-	51	-
Credit default swaps	38	40	-	40	-
Cash, cash equivalents and short-term investments	3,726	3,726	(95)	3,821	-
Separate account assets	62,204	62,204	39,641	21,825	738
Financial liabilities:					
Guaranteed interest contracts	7,086	7,028	-	-	7,028
Group annuity contracts and other deposits	19,097	19,661	-	-	19,661
Individual annuity contracts	6,715	8,272	-	-	8,272
Supplementary contracts	1,152	1,153	-	-	1,153
Repurchase agreements	4,729	4,729	-	4,729	-
Commercial paper	250	250	-	250	-
Derivatives:					
Interest rate swaps	5,915	5,960	-	5,960	-
Options	6	6	-	6	-
Currency swaps	36	36	-	36	-
Forward contracts	56	56	-	56	-
Credit default swaps	1	1	-	1	-

Common stocks – subsidiaries and affiliates do not include unconsolidated subsidiaries, which had a statutory carrying value of $13,671 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, 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 period ended December 31, 2017, $298 million of unaffiliated common stock were transferred from Level 2 to Level 1.

The following presents the Company's fair value hierarchy for assets and liabilities that are carried at fair value:

	December 31, 2016			
	Level 1	Level 2	Level 3	Total
	(In Millions)			
Financial assets:				
Bonds:				
States, territories and possessions	$ -	$ 8	$ -	$ 8
Special revenue	-	1	-	1
Industrial and miscellaneous	-	3	57	60
Parent, subsidiaries and affiliates	-	58	52	110
Preferred stocks	-	-	3	3
Common stocks - subsidiaries and affiliates	487	23	63	573
Common stocks - unaffiliated	582	349	189	1,120
Derivatives:				
Interest rate swaps	-	8,084	-	8,084
Options	-	653	-	653
Currency swaps	-	937	-	937
Forward contracts	-	51	-	51
Credit default swaps	-	4	-	4
Separate account assets	39,641	21,825	738	62,204
Total financial assets carried at fair value	$ 40,710	$ 31,996	$ 1,102	$ 73,808
Financial liabilities:				
Derivatives:				
Interest rate swaps	$ -	$ 5,915	$ -	$ 5,915
Options	-	6	-	6
Currency swaps	-	36	-	36
Forward contracts	-	56	-	56
Credit default swaps	-	1	-	1
Total financial liabilities carried at fair value	$ -	$ 6,014	$ -	$ 6,014

For the year ended December 31, 2016, there were no significant transfers between Level 1 and Level 2.

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 1/1/17	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. The common stock unaffiliated assets were transferred from Level 2 to Level 3 due to a change in the observability of pricing inputs.

	Balance as of 1/1/16	Gains (Losses) in Net Income	Losses (Gains) in Surplus	Purchases	Issuances	Sales	Settlements	Transfers In	Transfers Out	Other	Balance as of 12/31/16
	(In Millions)										
Financial assets:											
Bonds:											
Industrial and miscellaneous	$ 22	$ (12)	$ (13)	$ -	$ 4	$ -	$ (6)	$ -	$ -	$ 62	$ 57
Parent, subsidiaries, and affiliates	45	1	7	2	11	(3)	(20)	-	-	9	52
Preferred stocks	2	-	-	2	-	-	-	-	-	(1)	3
Common stocks - subsidiaries and affiliates	40	-	7	-	1	-	(1)	-	-	16	63
Common stocks - unaffiliated	180	(1)	(5)	12	1	(2)	(1)	-	-	5	189
Separate account assets	725	22	-	149	-	(153)	(10)	5	-	-	738
Total financial assets	$ 1,014	$ 10	$ (4)	$ 165	$ 17	$ (158)	$ (38)	$ 5	$ -	$ 91	$ 1,102

Level 3 transfers in are assets that are consistently carried at fair value but have had a level change. The separate account assets were transferred from Level 2 to Level 3 due to a change in the observability of pricing inputs.

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 were transferred from Level 2 to Level 3 due to a change in the observability of pricing inputs.

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, 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.

	December 31, 2016			
	Carrying Value	Gross Unrealized Gains	Gross Unrealized Losses	Fair Value
	(In Millions)			
U.S. government and agencies	$ 6,819	$ 562	$ 54	$ 7,327
All other governments	924	37	27	934
States, territories and possessions	676	52	5	723
Political subdivisions	483	33	2	514
Special revenue	5,605	588	26	6,167
Industrial and miscellaneous	62,806	2,427	755	64,478
Parent, subsidiaries and affiliates	6,508	128	32	6,604
Total	$ 83,821	$ 3,827	$ 901	$ 86,747

The December 31, 2016 gross unrealized losses exclude $23 million of losses included in the carrying value. These losses include $19 million from NAIC Class 6 bonds and $4 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,			
		2017		2016	
NAIC Class	Equivalent Rating Agency Designation	Carrying Value	% of Total	Carrying Value	% of Total
		($ In Millions)			
1	Aaa/ Aa/ A	$ 48,770	54 %	$ 47,693	57 %
2	Baa	33,221	37	29,069	35
3	Ba	4,253	5	3,256	4
4	B	2,809	3	2,390	3
5	Caa and lower	995	1	1,049	1
6	In or near default	387	-	364	-
	Total	$ 90,435	100 %	$ 83,821	100 %

The following summarizes NAIC ratings for RMBS and CMBS investments subject to NAIC modeling:

	December 31,							
	2017				2016			
	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	$ 672	100 %	$ 1,749	99 %	$ 793	100 %	$ 1,694	100 %
2	-	-	6	-	-	-	-	-
3	-	-	3	-	-	-	-	-
5	-	-	-	-	-	-	6	-
6	-	-	26	1	-	-	5	-
	$ 672	100 %	$ 1,784	100 %	$ 793	100 %	$ 1,705	100 %

The following is a summary of the carrying value and fair value of bonds as of December 31, 2017 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	$ 1,762	$ 1,779
Due after one year through five years	21,922	22,471
Due after five years through ten years	25,079	25,984
Due after ten years	41,672	44,952
Total	$ 90,435	$ 95,186

Sales proceeds and related gross realized capital gains (losses) from bonds were as follows:

	Years Ended December 31,		
	2017	2016	2015
	(In Millions)		
Proceeds from sales	$ 6,669	$ 6,097	$ 4,267
Gross realized capital gains from sales	114	132	216
Gross realized capital losses from sales	(153)	(248)	(74)

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, 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.

	December 31, 2016					
	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	$ 757	$ 51	13	$ 87	$ 3	4
All other governments	451	24	47	20	1	8
States, territories and possessions	63	1	5	42	4	2
Political subdivisions	55	2	13	-	-	-
Special revenue	779	24	172	41	2	138
Industrial and miscellaneous	15,535	452	1,257	7,330	324	666
Parent, subsidiaries and affiliates	3,878	29	8	409	7	20
Total	$ 21,518	$ 583	1,515	$ 7,929	$ 341	838

The December 31, 2016 gross unrealized losses include $23 million of losses included in the carrying value. These losses include $19 million from NAIC Class 6 bonds and $4 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, 2017 and 2016, 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, 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.

As of December 31, 2016, investments in structured and loan-backed securities that had unrealized losses, which were not recognized in earnings, had a fair value of $7,939 million. Securities in an unrealized loss position for less than 12 months had a fair value of $3,270 million and unrealized losses of $62 million. Securities in an unrealized loss position for greater than 12 months had a fair value of $4,669 million and unrealized losses of $103 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, 2017 or 2016, 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, 2017 and 2016.

Residential mortgage-backed exposure

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, 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. As of December 31, 2016, RMBS had a total carrying value of $1,516 million and a fair value of $1,728 million, of which approximately 23%, based on carrying value, was classified as Alt-A. Alt-A and subprime RMBS had a total carrying value of $686 million and a fair value of $825 million.

During the year ended December 31, 2017, 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, 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. As of December 31, 2016, total leveraged loans and leveraged loan CDOs had a carrying value of $10,550 million and a fair value of $10,556 million, of which approximately 88%, 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 $1,818 million and fair value of $1,835 million as of December 31, 2017 and a carrying value of $1,982 million and fair value of $2,000 million as of December 31, 2016.

b. Preferred stocks

The carrying value and fair value of preferred stocks were as follows:

	December 31,	
	2017	2016
	(In Millions)	
Carrying value	$ 768	$ 465
Gross unrealized gains	29	43
Gross unrealized losses	(11)	(26)
Fair value	$ 786	$ 482

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. As of December 31, 2016, investments in preferred stocks in an unrealized loss position included holdings with a fair value of $125 million in four issuers, all of which were in an unrealized loss position for more than 12 months. Based upon the Company's impairment review process discussed in *Note 2bb. "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, 2017 or 2016.

The Company held preferred stocks for which the transfer of ownership was restricted by contractual requirements with carrying values of $688 million as of December 31, 2017 and $304 million as of December 31, 2016.

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,		
	2017	2016	2015
	(In Billions)		
Total revenue	$ 0.7	$ 0.5	$ 0.8
Net income	0.1	0.1	0.1
Assets	13.3	13.0	13.3
Liabilities	11.7	11.5	11.9
Shareholder's equity	1.6	1.5	1.4

MMHLLC is the parent of subsidiaries that include Oppenheimer Acquisition Corp. (OAC) and Barings LLC (Barings) and for 2015, includes investments in international life insurance operations in Japan and Hong Kong. These subsidiaries deal in markets that include retail and institutional asset management entities, registered broker dealers, and international life and annuity operations.

On October 1, 2016, MassMutual purchased MMI from MMHLLC for $3,904 million, which represented MMHLLC's carrying value of MMI. MassMutual purchased MMI with cash and invested assets with a carrying value of $3,788 million, net of deferred tax, and deferred a $116 million gain on the transfer of these assets, as this transaction was considered a related party transaction. This purchase was part of MassMutual's execution of its' operating strategy and segregated its foreign insurance subsidiaries from its asset manager subsidiaries.

Summarized below is certain U.S. GAAP financial information for MMHLLC. MMI was included in this information for the years ended December 31, 2015 and for the nine month 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,		
	2017	2016	2015
	(In Billions)		
Total revenue	$ 4.7	$ 8.8	$ 8.7
Net income	0.8	1.6	0.8
Assets	17.1	16.7	50.1
Liabilities	6.6	6.1	40.4
Member's equity	10.5	10.6	9.7

The MMHLLC statutory carrying value was $9,083 million as of December 31, 2017 and $8,870 million as of December 31, 2016. The current fair value of MMHLLC remains greater than its statutory carrying value.

The Company recorded dividends in net investment income from MMHLLC of $425 million through the year ended December 31, 2017, $430 million through the year ended December 31, 2016 and $500 million through the year ended December 31, 2015.

The Company contributed additional capital of $145 million to MMHLLC through the year ended December 31, 2017 and $889 million through 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.

On July 1, 2016, the Company’s purchase of MSI Financial Services (MSIFS) was accounted for under the statutory purchase method, classified as investments in common stocks – subsidiaries and affiliates at a cost of $126 million, which included the recognition of statutory goodwill of $38 million. In March 2017, the Company contributed 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 the Company’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.

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.

Summarized below is certain U.S. GAAP financial information for MMI. This information prior to October 1, 2016 was also included in the operations of MMHLLC:

	As of and for the Years Ended December 31,		
	2017	2016	2015
	(In Billions)		
Total revenue	$ 3.3	$ 4.8	$ 4.5
Net income	-	0.6	0.4
Assets	32.7	30.8	26.2
Liabilities	29.6	27.7	24.0
Member's equity	3.1	3.1	2.2

The current fair value of MMI remains greater than its statutory carrying value.

In August 2017, MMI, a wholly-owned subsidiary of the Company, entered into an agreement to sell MassMutual Asia Limited (MM Asia), a wholly-owned Hong Kong based life insurance and wealth management subsidiary. The sale is expected to close in 2018, subject to regulatory approval and customary closing conditions. Under the terms of the agreement, MMI will receive consideration of approximately $1.7 billion in cash and stock, and MM Asia's $182 million investment in MassMutual Life Insurance Company (MM Japan). The stock is from an entity that is expected to own 60% of MM Asia. On the transaction date, the agreement also requires MM Asia to have a Solvency Margin Ratio (SMR) at a certain level. This may require additional capital from MMI in order to meet this capital level. In the third quarter of 2017, MMI classified MM Asia as held for sale. Accordingly, the expected gain on disposal will be realized when the sale is finalized.

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 $1,547 million as of December 31, 2017 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,	
	2017	2016
	(In Millions)	
Adjusted cost basis	$ 1,030	$ 1,038
Gross unrealized gains	223	167
Gross unrealized losses	(42)	(85)
Carrying value	$ 1,212	$ 1,120

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. As of December 31, 2016, investments in unaffiliated common stocks in an unrealized loss position included holdings with a fair value of $280 million in 153 issuers, $186 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 2bb. "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, 2017 or 2016.

The Company held common stocks, for which the transfer of ownership was restricted by contractual requirements, with carrying values of $275 million as of December 31, 2017 and $244 million as of December 31, 2016.

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, 2017 and 2016, 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, 2017 or 2016.

The carrying value and fair value of the Company's mortgage loans were as follows:

	December 31,			
	2017		2016	
	Carrying Value	Fair Value	Carrying Value	Fair Value
	(In Millions)			
Commercial mortgage loans:				
Primary lender	$ 20,729	$ 21,253	$ 19,122	$ 19,588
Mezzanine loans	48	48	71	72
Total commercial mortgage loans	20,777	21,301	19,193	19,660
Residential mortgage loans:				
FHA insured and VA guaranteed	1,799	1,756	1,763	1,723
Other residential loans	4	4	5	5
Total residential mortgage loans	1,803	1,760	1,768	1,728
Total mortgage loans	$ 22,580	$ 23,061	$ 20,961	$ 21,388

As of December 31, 2017, scheduled commercial mortgage loan maturities were as follows (in millions):

2018	$ 373
2019	921
2020	1,509
2021	1,655
2022	1,114
Thereafter	15,205
Commercial mortgage loans	20,777
Residential mortgage loans	1,803
Total	$ 22,580

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, 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

	December 31, 2016					
	AAA/AA/A	BBB	BB	B	CCC and Lower	Total
	(In Millions)					
Commercial mortgage loans:						
Primary lender	$ 10,632	$ 7,683	$ 647	$ 144	$ 16	$ 19,122
Mezzanine loans	-	17	54	-	-	71
Total commercial mortgage loans	10,632	7,700	701	144	16	19,193
Residential mortgage loans:						
FHA insured and VA guaranteed	1,763	-	-	-	-	1,763
Other residential loans	5	-	-	-	-	5
Total residential mortgage loans	1,768	-	-	-	-	1,768
Total mortgage loans	$ 12,400	$ 7,700	$ 701	$ 144	$ 16	$ 20,961

The loan-to-value ratios by property type of the Company's commercial mortgage loans were as follows:

	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 %

	December 31, 2016				
	Less Than 81%	81% to 95%	Above 95%	Total	% of Total
	($ In Millions)				
Office	$ 6,125	$ -	$ 16	$ 6,141	32 %
Apartments	5,045	-	-	5,045	26
Industrial and other	3,109	-	-	3,109	16
Hotels	2,597	-	-	2,597	14
Retail	2,274	27	-	2,301	12
Total	$ 19,150	$ 27	$ 16	$ 19,193	100 %

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, 2017 and 2016. 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, 2017 and 2016.

The geographic distribution of commercial mortgage loans was as follows:

	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 %
Washington	1,329	47 %
District of Columbia	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.

	December 31, 2016	
	Carrying Value	Average Loan-to-Value Ratio
	($ In Millions)	
California	$ 4,977	51 %
New York	2,088	49 %
Illinois	2,074	50 %
Texas	1,558	54 %
Massachusetts	1,190	50 %
United Kingdom	982	51 %
Washington	957	46 %
All other	5,367	53 %
Total commercial mortgage loans	$ 19,193	51 %

All other consists of 28 jurisdictions, with no individual exposure exceeding $837 million.

Interest rates, including fixed and variable, on the Company's portfolio of mortgage loans were:

	December 31,					
	2017			2016		
	Low	High	Weighted Average	Low	High	Weighted Average
Commercial mortgage loans	3.1 %	12.3 %	4.2 %	3.1 %	12.3 %	4.3 %
Residential mortgage loans	2.8 %	11.4 %	4.7 %	2.5 %	11.4 %	4.9 %
Mezzanine mortgage loans	10.4 %	12.0 %	11.4 %	9.6 %	12.0 %	10.9 %

Interest rates, including fixed and variable, on new mortgage loans were:

	Years Ended December 31,					
	2017			2016		
	Low	High	Weighted Average	Low	High	Weighted Average
Commercial mortgage loans	3.3 %	9.8 %	4.1 %	3.2 %	6.0 %	3.8 %
Residential mortgage loans	3.6 %	4.6 %	4.2 %	4.1 %	4.4 %	4.2 %
Mezzanine mortgage loans	- %	- %	- %	9.6 %	9.6 %	9.6 %

As of December 31, 2017, the Company had no impaired mortgage loans with or without a valuation allowance, including mortgage loans subject to a participant or co-lender mortgage loan agreement with a unilateral mortgage loan foreclosure restriction.

	December 31, 2016				
	Carrying Value	Average Carrying Value	Unpaid Principal Balance	Valuation Allowance	Interest Income
	(In Millions)				
With allowance recorded:					
Commercial mortgage loans:					
Primary lender	$ 16	$ 17	$ 23	$ (3)	$ 1
With no allowance recorded:					
Commercial mortgage loans:					
Primary lender	6	9	13	-	-
Total impaired commercial mortgage loans	$ 22	$ 26	$ 36	$ (3)	$ 1

The Company did not hold any impaired mortgage loans subject to a participant or co-lender mortgage loan agreement with a unilateral mortgage loan foreclosure restriction as of December 31, 2016.

	December 31, 2015				
	Carrying Value	Average Carrying Value	Unpaid Principal Balance	Valuation Allowance	Interest Income
	(In Millions)				
With no allowance recorded:					
Commercial mortgage loans:					
Primary lender	$ 28	$ 31	$ 33	$ -	$ 2

The Company did not hold any impaired mortgage loans subject to a participant or co-lender mortgage loan agreement with a unilateral mortgage loan foreclosure restriction as of December 31, 2015.

The following presents changes in the valuation allowance recorded for the Company's commercial mortgage loans:

	Years Ended December 31,		
	2017	2016	2015
	Primary Lender		
	(In Millions)		
Beginning balance	$ (3)	$ -	$ -
Additions	-	(8)	(5)
Decreases	3	-	-
Write-downs	-	5	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, 2017 or 2016. The carrying value of commercial mortgage loans subject to a participant or co-lender mortgage loan agreement was $671 million as of December 31, 2017 and $623 million as of December 31, 2016.

f. Real estate

The carrying value of real estate was as follows:

	December 31,	
	2017	2016
	(In Millions)	
Held for the production of income	$ 1,873	$ 2,549
Accumulated depreciation	(654)	(1,101)
Encumbrances	(611)	(710)
Held for the production of income, net	608	738
Held for sale	105	81
Occupied by the Company	344	343
Accumulated depreciation	(200)	(185)
Occupied by the Company, net	144	158
Total real estate	$ 857	$ 977

g. Partnerships and limited liability companies

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

	December 31, 2017	December 31, 2016
	(In Millions)	
Joint venture interests:		
Common stocks	$ 4,188	$ 4,282
Real estate	1,531	1,203
Fixed maturities/preferred stock	870	743
Other	302	271
LIHTCs	330	325
Mortgage loans	211	169
Surplus notes	246	194
Total	$ 7,678	$ 7,187

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 $49 million and $41 million for 2017 and 2016. 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 1.8% for future benefits of two years to 2.4% for future benefits of ten or more years, and compares the result to its current carry value. 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 to LIHTC investments were recorded for the year ended December 31. 2017. Impairments were less than $1 million for the year ended December 31, 2016.

There were no write-downs or reclassifications of LIHTC partnerships made during the years ended December 31, 2017 or December 31, 2016, 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, 2017 or 2016.

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 $13,137 million as of December 31, 2017 and $12,083 million as of December 31, 2016. These notional amounts included replicated asset transaction values of $11,517 million as of December 31, 2017 and $10,739 million as of December 31, 2016, 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 $2,493 million as of December 31, 2017 and $3,274 million as of December 31, 2016. In the event of default, the full market value exposure at risk in a net gain position, net of offsets and collateral, was $115 million as of December 31, 2017 and $250 million as of December 31, 2016. The statutory net amount at risk, defined as net collateral pledged and statement values excluding accrued interest, was $595 million as of December 31, 2017 and $747 million as of December 31, 2016.

The Company had the right to rehypothecate or repledge securities totaling $635 million of the $2,493 million as of December 31, 2017 and $998 million of the $3,274 million as of December 31, 2016 of net collateral pledged by counterparties. There were no securities rehypothecated to other counterparties as of December 31, 2017 or December 31, 2016.

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

	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

	December 31, 2016			
	Assets		Liabilities	
	Carrying Value	Notional Amount	Carrying Value	Notional Amount
	(In Millions)			
Interest rate swaps	$ 8,084	$ 71,560	$ 5,915	$ 86,362
Options	653	6,677	6	5
Currency swaps	937	6,834	36	1,068
Forward contracts	51	3,320	56	2,817
Credit default swaps	38	2,435	1	207
Financial futures	-	3,196	-	-
Total	$ 9,763	$ 94,022	$ 6,014	$ 90,459

The average fair value of outstanding derivative assets was $9,271 million for the year ended December 31, 2017 and $12,715 million for the year ended December 31, 2016. The average fair value of outstanding derivative liabilities was $5,957 million for the year ended December 31, 2017 and $8,899 million for the year ended December 31, 2016.

The following summarizes the notional amounts of the Company's credit default swaps by contractual maturity:

	December 31,	
	2017	2016
	(In Millions)	
Due in one year or less	$ -	$ 198
Due after one year through five years	1,567	2,444
Total	$ 1,567	$ 2,642

The following presents the Company’s gross notional interest rate swap positions:

	December 31,	
	2017	2016
	(In Millions)	
Open interest rate swaps in a fixed pay position	$ 80,472	$ 78,472
Open interest rate swaps in a fixed receive position	81,676	78,001
Other interest related swaps	1,799	1,449
Total interest rate swaps	$ 163,947	$ 157,922

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, 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	(1,081)
Options	(172)	(151)
Credit default swaps	23	-
Forward contracts	(147)	(72)
Financial futures	112	-
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

	Year Ended December 31, 2015	
	Net Realized Gains (Losses) on Closed Contracts	Change In Net Unrealized Gains (Losses) on Open Contracts
	(In Millions)	
Interest rate swaps	$ (187)	$ (93)
Currency swaps	21	343
Options	(99)	2
Credit default swaps	9	(1)
Forward contracts	249	(24)
Financial futures	(57)	-
Total	$ (64)	$ 227

The following summarizes gross and net information of derivative assets and liabilities, along with collateral posted in connection with master netting agreements:

	December 31, 2017			December 31, 2016		
	Derivative Assets	Derivative Liabilities	Net	Derivative Assets	Derivative Liabilities	Net
	(In Millions)					
Gross	$ 8,857	$ 5,979	$ 2,878	$ 9,763	$ 6,014	$ 3,749
Due and accrued	867	1,781	(914)	842	1,626	(784)
Gross amounts offset	(6,936)	(6,936)	-	(6,873)	(6,873)	-
Net asset	2,788	824	1,964	3,732	767	2,965
Collateral posted	(3,296)	(803)	(2,493)	(3,803)	(529)	(3,274)
Net	$ (508)	$ 21	$ (529)	$ (71)	$ 238	$ (309)

i. Repurchase agreements

The Company had repurchase agreements with carrying values of $4,204 million as of December 31, 2017 and $4,729 million as of December 31, 2016. As of December 31, 2017, the maturities of these agreements ranged from January 3, 2018 through March 6, 2018 and the interest rates ranged from 1.4% to 1.5%. The outstanding amounts were collateralized by cash and bonds with a carrying value of $4,221 million as of December 31, 2017 and $4,736 million as of December 31, 2016.

j. Net investment income

Net investment income, including IMR amortization, comprised the following:

	Years Ended December 31,		
	2017	2016	2015
	(In Millions)		
Bonds	$ 3,712	$ 3,583	$ 3,439
Preferred stocks	17	24	27
Common stocks - subsidiaries and affiliates	436	431	511
Common stocks - unaffiliated	39	59	48
Mortgage loans	928	1,009	976
Policy loans	797	757	709
Real estate	159	174	169
Partnerships and LLCs	658	460	639
Derivatives	305	343	292
Cash, cash equivalents and short-term investments	42	33	14
Other	2	-	13
Subtotal investment income	7,095	6,873	6,837
Amortization of the IMR	113	135	140
Investment expenses	(666)	(674)	(590)
Net investment income	$ 6,542	$ 6,334	$ 6,387

k. Net realized capital (losses) gains

Net realized capital losses, which include OTTI and are net of deferral to the IMR, comprised the following:

	Years Ended December, 31		
	2017	2016	2015
	(In Millions)		
Bonds	$ (102)	$ (248)	$ (66)
Preferred stocks	(6)	9	2
Common stocks - subsidiaries and affiliates	27	11	64
Common stocks - unaffiliated	(9)	(60)	(8)
Mortgage loans	(27)	(14)	(8)
Real estate	68	14	50
Partnerships and LLCs	(87)	(94)	(97)
Derivatives	(314)	(7)	(64)
Other	(135)	(4)	216
Net realized capital (losses) before federal and state taxes and deferral to the IMR	(585)	(393)	89
Net federal and state tax benefit	175	40	(151)
Net realized capital (losses) before deferral to the IMR	(410)	(353)	(62)
Net after tax (gains) losses deferred to the IMR	(12)	145	121
Net realized capital (losses)	$ (422)	$ (208)	$ 59

As of December 31, 2017, IMR had an asset balance of $112 million which was nonadmitted. The IMR liability balance was $5 million as of December 31, 2016 and was included in other liabilities on the Statutory Statements of Financial Position. Refer to *Note 2y. "Interest maintenance reserve"* for information on the Company's policy for IMR. 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,		
	2017	2016	2015
	(In Millions)		
Bonds	$ (64)	$ (78)	$ (170)
Preferred stock	(6)	(1)	(11)
Common stocks	(62)	(11)	(14)
Mortgage loans	-	(7)	(5)
Partnerships and LLCs	(53)	(91)	(70)
Total OTTI	$ (185)	$ (188)	$ (270)

The Company recognized OTTI of $7 million for the year ended December 31, 2017 and $6 million for the year ended December 31, 2016 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 $64 million of bond OTTI for the year ended December 31, 2017, 1% of the $78 million of bond OTTI for the year ended December 31, 2016, and 1% of the $170 million of bond OTTI for the year ended December 31, 2015. The remaining OTTI amounts were determined using external inputs such as publicly observable fair values and credit ratings. Refer *to Note 2bb. "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 21. "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 Tax Cuts and Jobs Act (the Act). The Act contains several key provisions that have significant financial statement effects. These provisions required the remeasurement of deferred tax assets and liabilities, imposed 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.

The Act required the remeasurement of deferred taxes, as it reduces the corporate tax rate to 21 percent, effective January 1, 2018. Accordingly, the Company remeasured its net admitted deferred taxes as of the enactment date and recognized a decrease in surplus of $507 million. 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).

Under the Act, a company is required to establish a liability for taxes due on mandatory deemed repatriation of previously untaxed foreign earnings. A company is deemed to have repatriated foreign earnings accumulated and deferred under prior tax law. Companies can no longer indefinitely defer the tax on those accumulated earnings, but may elect to pay the deemed repatriation tax over eight years. Mandatory deemed repatriation for a controlled foreign corporation (CFC) with the same year end as the US taxpayer creates a current tax liability. The Company recorded a provisional tax benefit of $3 million in the statements of operations. Provisional amounts have not been provided for specified foreign corporation investments under the Act for which a reasonable estimate of the tax effects could not be determined. The Company is in the process of obtaining the information needed to complete the calculation of the deemed repatriation tax liability. The Company will update the provisional amounts as it obtains additional information throughout the measurement period, but no later than December 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 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. The Company has 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 that will reverse over the eight year transition period. The Company is in the process of modifying its tax reserve systems to incorporate the new method. The Company will update the provisional amount when it completes its system modifications during the measurement period, but no later than December 2018.

The Act introduces a new tax on global intangible low-taxed income (GILTI). Generally, a CFC may incur a GILTI tax if its income exceeds a prescribed return on its business property. Recently issued accounting guidance does not require companies to recognize deferred taxes on the potential future impact of the GILTI provision. In accordance with this guidance, the Company's policy will be to recognize the tax impact in the period in which it is incurred.

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. This expensing regime goes further than current law bonus depreciation by applying to both new and used property. 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 deferred tax liability that will reverse over the useful life of the qualified property. The Company will update the provisional amount when it completes its analysis during the measurement period, but no later than December 2018.

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, 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

	December 31, 2016		
	Ordinary	Capital	Total
	(In Millions)		
Gross DTAs	$ 3,252	$ 617	$ 3,869
Statutory valuation allowance adjustment	-	-	-
Adjusted gross DTAs	3,252	617	3,869
DTAs nonadmitted	(44)	-	(44)
Subtotal net admitted DTA	3,208	617	3,825
Total gross DTLs	(1,669)	(550)	(2,219)
Net admitted DTA(L)	$ 1,539	$ 67	$ 1,606

	Change		
	Ordinary	Capital	Total
	(In Millions)		
Gross DTAs	$ (773)	$ (463)	$ (1,236)
Statutory valuation allowance adjustment	-	-	-
Adjusted gross DTAs	(773)	(463)	(1,236)
DTAs nonadmitted	44	-	44
Subtotal net admitted DTA	(729)	(463)	(1,192)
Total gross DTLs	32	315	347
Net admitted DTA(L)	$ (697)	$ (148)	$ (845)

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, 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 (lesser of 1 or 2):			
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

	December 31, 2016		
	Ordinary	Capital	Total
	(In Millions)		
Admitted DTA 3 years:			
Federal income taxes that can be recovered	$ 486	$ 131	$ 617
Remaining adjusted gross DTAs expected to be realized within 3 years			
1. Adjusted gross DTA to be realized	989	-	989
2. Adjusted gross DTA allowed per limitation threshold	2,071	-	2,071
Lesser of lines 1 or 2	989	-	989
Adjusted gross DTAs offset by existing DTLs	1,733	486	2,219
Total admitted DTA realized within 3 years	$ 3,208	$ 617	$ 3,825

	Change		
	Ordinary	Capital	Total
	(In Millions)		
Admitted DTA 3 years:			
Federal income taxes that can be recovered	$ (486)	$ (64)	$ (550)
Remaining adjusted gross DTAs expected to be realized within 3 years			
1. Adjusted gross DTA to be realized	(109)	-	(109)
2. Adjusted gross DTA allowed per limitation threshold	131	-	131
Lesser of lines 1 or 2	(109)	-	(109)
Adjusted gross DTAs offset by existing DTLs	(134)	(399)	(533)
Total admitted DTA realized within 3 years	$ (729)	$ (463)	$ (1,192)

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, 2017	December 31, 2016
	($ In Millions)	
Ratio percentage used to determine recovery period and threshold limitation	867%	869%
Amount of adjusted capital and surplus used to determine recovery period and threshold limitation above	$ 14,933	$ 13,808

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, 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 %

	December 31, 2016		
	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)	67 %	100 %	69 %

	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)	(10)%	(100)%	(12)%

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,		
	2017	2016	2015
	(In Millions)		
Federal income tax benefit on operating earnings	$ (300)	$ (333)	$ (159)
Foreign income tax expense on operating earnings	2	7	6
Total federal and foreign income tax benefit before impact of change in enacted legislation	(298)	(326)	(153)
Impact of change in enacted tax legislation on operating earnings	(22)	-	-
Total federal and foreign income tax benefit on operating earnings	(320)	(326)	(153)
Federal income tax (benefit) expense on net realized capital gains (losses) before impact of change in enacted legislation	(178)	(40)	151
Impact of change in enacted tax legislation on net realized capital gains (losses)	3	-	-
Total federal and foreign income tax benefit	$ (495)	$ (366)	$ (2)

The tax effects of temporary differences that give rise to significant portions of the DTAs and DTLs are as follows:

	December 31,		
	2017	2016	Change
	(In Millions)		
DTAs:			
Ordinary			
Reserve items	$ 1,059	$ 980	$ 79
Policy acquisition costs	459	700	(241)
Nonadmitted assets	293	555	(262)
Pension and compensation related items	191	291	(100)
Policyholders' dividends	189	342	(153)
Investment items	150	183	(33)
Expense items	45	45	-
Unrealized investment losses	3	1	2
Other	90	155	(65)
Total ordinary DTAs	2,479	3,252	(773)
Nonadmitted DTAs	-	(44)	44
Admitted ordinary DTAs	2,479	3,208	(729)
Capital			
Unrealized investment losses	111	431	(320)
Investment items	43	186	(143)
Total capital DTAs	154	617	(463)
Admitted capital DTAs	154	617	(463)
Admitted DTAs	2,633	3,825	(1,192)
DTLs:			
Ordinary			
Reserve items	528	76	452
Unrealized investment gains	498	759	(261)
Deferred and uncollected premium	212	319	(107)
Pension items	180	255	(75)
Reserve for audits and settlements	-	74	(74)
Investment Items	46	21	25
Other	173	165	8
Total ordinary DTLs	1,637	1,669	(32)
Capital			
Unrealized investment gains	235	479	(244)
Investment items	-	71	(71)
Total capital DTLs	235	550	(315)
Total DTLs	1,872	2,219	(347)
Net admitted DTA	$ 761	$ 1,606	$ (845)

The change in net deferred income taxes comprised the following:

	Years Ended December 31,		
	2017	2016	2015
	(In Millions)		
Net DTA(L)	$ (889)	$ 352	$ 340
Less: Items not recorded in the change in net deferred income taxes:			
Tax-effect of unrealized gains/(losses)	(188)	(59)	(109)
Tax-effect of changes from acquisitions/transfers	(7)	(46)	-
Change in net deferred income taxes	$ (1,084)	$ 247	$ 231

The change in net deferred income taxes 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, 2017, 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,		
	2017	2016	2015
	(In Millions)		
Provision computed at statutory rate of 35%	$ (151)	$ (184)	$ 101
Corporate rate reduction	919	-	-
Change in reserve valuation basis	15	26	23
Expense items	6	16	25
Foreign governmental income taxes	2	6	4
Investment items	(250)	(322)	(325)
Nonadmitted assets	67	(99)	(6)
Tax credits	(51)	(48)	(52)
Other impacts of tax reform	4	-	-
Other	28	(8)	(3)
Total statutory income tax expense (benefit)	$ 589	$ (613)	$ (233)
Federal and foreign income tax benefit	$ (495)	$ (366)	$ (2)
Change in net deferred income taxes	1,084	(247)	(231)
Total statutory income tax expense (benefit)	$ 589	$ (613)	$ (233)

The Company paid federal income taxes of $3 million in 2017, received refunds of $353 million in 2016 and paid $234 million in 2015.

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, 2017 and 2016, and totaled $135 million related to 2015.

The Company and its eligible U.S. subsidiaries are included in a consolidated U.S. federal income tax return. The Company and its subsidiaries and affiliates also file income tax returns in various states and foreign jurisdictions. The Company and its eligible 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 the Company 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 the Company 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, 2017	$	146
Gross change related to positions taken in prior years		12
Gross change related to settlements		-
Gross change related to positions taken in current year		33
Gross change related to lapse of statutes of limitations		-
Balance, December 31, 2017	$	191

Included in the liability for unrecognized tax benefits as of December 31, 2017, are $184 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, 2017 includes $5 million of unrecognized tax benefits that, if recognized, would impact the Company's effective tax rate.

The Company recognized an increase of $7 million in accrued interest related to the liability for unrecognized tax benefits as a component of the provision for income taxes. $6 million of the increase relates to the corporate tax rate reduction enacted as part of the Act in 2017. The amount of net interest recognized was $37 million as of December 31, 2017 and $24 million as of December 31, 2016. 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 the tax returns filed for the years 2013 and prior. The IRS commenced its exam of years 2014-2015 in September 2017. The adjustments resulting from these examinations are not expected to materially affect the position or liquidity of the Company.

The Company's litigation with the federal government regarding the timing of the deduction for certain policyholder dividends for tax years 1995 through 1997 was successfully concluded in 2015. The favorable effect of the decision in the U.S. Court of Federal Claims was reflected in the Company's financial statements in prior years.

As of December 31, 2017 and 2016, 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 beneficiary of these policies. The Company had recorded cash surrender values of these policies of $2,104 million as of December 31, 2017 and $1,981 million as of December 31, 2016.

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,			
	2017		2016	
	Gross	Net	Gross	Net
	(In Millions)			
Ordinary new business	$ 151	$ 47	$ 135	$ 42
Ordinary renewal	751	798	695	728
Group life	10	10	9	9
Total	$ 912	$ 855	$ 839	$ 779

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 $31,952 million as of December 31, 2017 and $31,660 million as of December 31, 2016 for which gross premium was less than net premium.

8. *Policyholders' liabilities*

a. Policyholders' reserves

The Company had life insurance in force of $621,740 million as of December 31, 2017 and $560,789 million as of December 31, 2016.

The following summarizes policyholders' reserves, net of reinsurance, and the range of interest rates by type of product:

	December 31,					
	2017			2016		
	Amount	Interest Rates		Amount	Interest Rates	
	($ In Millions)					
Individual life	$ 51,295	2.5%	- 6.0%	$ 47,789	2.5%	- 6.0%
Group life	16,486	2.5%	- 4.5%	18,449	2.5%	- 4.5%
Group annuities	24,718	2.3%	- 11.3%	23,729	2.3%	- 11.3%
Individual annuities	14,123	2.3%	- 11.8%	13,491	2.3%	- 11.8%
Individual universal and variable life	5,957	3.5%	- 6.0%	5,621	3.5%	- 6.0%
Disabled life claim reserves	1,852	3.5%	- 6.0%	1,896	3.5%	- 6.0%
Disability active life reserves	1,007	3.5%	- 6.0%	899	3.5%	- 6.0%
Other	326	2.5%	- 6.0%	312	2.5%	- 6.0%
Total	$ 115,764			$ 112,186		

Individual life includes whole life and term insurance. Group life includes corporate-owned life insurance, BOLI, 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.

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,			
	2017		2016	
	Amount	Interest Rates	Amount	Interest Rates
	($ In Millions)			
Guaranteed interest contracts:				
Note programs	$ 6,233	1.6% - 6.2%	$ 4,710	1.6% - 6.2%
Federal Home Loan Bank of Boston	1,054	1.4% - 3.0%	1,103	1.4% - 3.0%
Municipal contracts	761	1.3% - 7.3%	831	0.9% - 7.3%
Other	787	1.0% - 9.7%	445	8.3% - 9.7%
Supplementary contracts	834	0.3% - 7.0%	808	0.3% - 7.0%
Dividend accumulations	522	3.2% - 4.0%	531	3.4% - 4.1%
Other deposits	2,823	4.0% - 8.0%	3,146	4.0% - 8.0%
Total	$ 13,014		$ 11,574	

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 $118 million outstanding as of December 31, 2017. Notes are currently issued from the Company's $17.0 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 $982 million as of December 31, 2017. 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 $946 million as of December 31, 2017. 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, 2017 and $75 million as of 2016.

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 $169 million as of December 31, 2017 and $176 million as of December 31, 2016. 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, 2017, the Company's GICs by expected maturity year were as follows (in millions):

2018	$	959
2019		1,535
2020		1,407
2021		1,399
2022		1,017
Thereafter		2,518
Total	$	8,835

Most GICs 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,	
	2017	2016
	(In Millions)	
Claim reserves, beginning of year	$ 2,083	$ 2,051
Less: Reinsurance recoverables	163	150
Net claim reserves, beginning of year	1,920	1,901
Claims paid related to:		
Current year	(12)	(13)
Prior years	(335)	(332)
Total claims paid	(347)	(345)
Incurred related to:		
Current year's incurred	223	237
Current year's interest	3	3
Prior year's incurred	(4)	43
Prior year's interest	82	81
Total incurred	304	364
Net claim reserves, end of year	1,877	1,920
Reinsurance recoverables	192	163
Claim reserves, end of year	$ 2,069	$ 2,083

The changes in reserves for incurred claims related to prior years are generally the result of recent loss development trends. The $4 million decrease in the prior years' incurred claims for 2017 and the $43 million increase in the prior years' incurred claims for 2016 were generally the result of differences between actual termination experience and statutorily prescribed termination tables.

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,	
	2017	2016
	(In Millions)	
Disabled life claim reserves	$ 1,852	$ 1,896
Accrued claim liabilities	25	24
Net claim reserves, end of year	$ 1,877	$ 1,920

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, 2016	$ 572
Incurred guarantee benefits	84
Paid guarantee benefits	(5)
Liability as of December 31, 2016	651
Incurred guarantee benefits	(131)
Paid guarantee benefits	(8)
Liability as of December 31, 2017	$ 512

The Company held reserves in accordance with the stochastic scenarios as of December 31, 2017 and 2016. As of December 31, 2017 and 2016, 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, 2017			December 31, 2016		
	Account Value	Net Amount at Risk	Weighted Average Attained Age	Account Value	Net Amount at Risk	Weighted Average Attained Age
	($ In Millions)					
GMDB	$ 20,118	$ 25	64	$ 18,800	$ 36	63
GMIB Basic	910	37	68	894	92	67
GMIB Plus	3,210	416	66	3,059	589	66
GMAB	3,233	1	59	3,158	22	58
GMWB	204	7	69	206	15	69

As of December 31, 2017, the GMDB account value above consists of $4,717 million of Modco assumed within the separate accounts. As of December 31, 2016, the GMDB account value above consists of $4,247 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,					
	2017			2016		
	Separate Account	General Account	Total	Separate Account	General Account	Total
	(In Millions)					
GMDB	$ 16,057	$ 4,061	$ 20,118	$ 14,776	$ 4,024	$ 18,800
GMIB Basic	891	19	910	876	18	894
GMIB Plus	3,210	-	3,210	3,059	-	3,059
GMAB	3,183	50	3,233	3,104	54	3,158
GMWB	204	-	204	206	-	206

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,	
	2017	2016
	(In Millions)	
Beginning balance	$ 3,098	$ 3,047
Net liability increase	355	51
Ending balance	$ 3,453	$ 3,098

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, 2017, the resulting reduction in surplus due to loss of reinsurance reserve credits, net of unearned premium, would be approximately $3,396 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,		
	2017	2016	2015
	(In Millions)		
Direct premium	$ 21,097	$ 21,319	$ 20,754
Premium assumed	1,359	1,442	1,608
Premium ceded	(4,970)	(1,329)	(819)
Total net premium	$ 17,486	$ 21,432	$ 21,543
Ceded reinsurance recoveries	$ 658	$ 566	$ 594
Assumed losses	$ 216	$ 95	$ 88

Reinsurance amounts included in the Statutory Statements of Financial Position were as follows:

	December 31,	
	2017	2016
	(In Millions)	
Reinsurance reserves:		
Assumed	$ 9,101	$ 9,368
Ceded	(8,898)	(4,488)
Ceded amounts recoverable	$ 165	$ 150
Benefits payable on assumed business	$ 37	$ 45
Funds held under coinsurance		
Ceded	$ 4,001	$ -

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. Reinsurance reserves ceded to unaffiliated reinsurers as of December 31, 2016 include $2,925 million associated with life insurance policies, $1,517 million for LTC, $35 million for disability and $11 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 $4.0 billion and recorded a liability for funds held under coinsurance of $4.0 billion on the Statutory Statement of Financial Position and ceded premium of $4.0 billion and reduced changes in policyholder reserves of $4.0 billion 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 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 2016, the Company strengthened its gross LTC policyholders' reserves by $189 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 $189 million.

As of December 31, 2017, one reinsurer accounted for 29% of the outstanding balance of the reinsurance recoverable and the next largest reinsurer had 19%. The Company continues to monitor its morbidity risk ceded to one unaffiliated reinsurer for its LTC business, in which approximately half 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, 2017 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	$ 13,960	$ -	$ -	$ 13,960	12 %
At book value less current surrender charge of 5% or more	1,402	-	-	1,402	1
At fair value	-	11,948	46,986	58,934	51
Subtotal	15,362	11,948	46,986	74,296	64
Subject to discretionary withdrawal:					
At book value without fair value adjustment	10,739	532	-	11,271	10
Not subject to discretionary withdrawal	25,234	5,820	-	31,054	26
Total	$ 51,335	$ 18,300	$ 46,986	$ 116,621	100 %

The following is a summary of total annuity actuarial reserves and liabilities for deposit-type contracts as of December 31, 2017 (in millions):

Statutory Statements of Financial Position:	
Policyholders' reserves – group annuities	$ 24,713
Policyholders' reserves – individual annuities	13,608
Liabilities for deposit-type contracts	13,014
Subtotal	51,335
Separate Account Annual Statement:	
Annuities	59,466
Other annuity contract deposit-funds and guaranteed interest contracts	5,820
Subtotal	65,286
Total	$ 116,621

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, 2017 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, 2017	$ -	$ -	$ 8,099	$ 8,099
Reserves at December 31, 2017:				
For accounts with assets at:				
Fair value	$ -	$ 18,300	$ 49,736	$ 68,036
Nonpolicy liabilities	-	-	1,126	1,126
Total	$ -	$ 18,300	$ 50,862	$ 69,162
Reserves by withdrawal characteristics:				
Subject to discretionary withdrawal:				
At fair value	$ -	$ 17,768	$ 49,736	$ 67,504
At book value without market value adjustment and current surrender charge of less than 5%	-	532	-	532
Subtotal	-	18,300	49,736	68,036
Nonpolicy liabilities	-	-	1,126	1,126
Total	$ -	$ 18,300	$ 50,862	$ 69,162

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,		
	2017	2016	2015
	(In Millions)		
From the Separate Account Annual Statement:			
Transfers to separate accounts	$ 8,099	$ 7,366	$ 8,167
Transfers from separate accounts	(9,078)	(8,408)	(7,560)
Subtotal	(979)	(1,042)	607
Reconciling adjustments:			
Net withdrawals on deposit-type liabilities	(1,902)	(1,183)	(1,360)
Net transfers from separate accounts	$ (2,881)	$ (2,225)	$ (753)

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, 2017, 2016 and 2015. Notes issued in 2017 had interest rates ranging from 0.60% to 1.25% with maturity dates ranging from 1 to 48 days. Interest expense for commercial paper was less than $1 million for the years ended December 31, 2017, 2016 and 2015.

The Company has a $1 billion, five year credit facility, with a syndicate of lenders that can be used for general corporate purposes and to support commercial paper borrowings. The facility has an upsize option for an additional $500 million. The terms of the credit facility 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, 2017, 2016 and 2015, the Company was in compliance with all covenants under the credit facility. For the years ended December 31, 2017, 2016 and 2015, there were no draws on the credit facilities. Credit facility fees were less than $1 million for the years ended December 31, 2017, 2016 and 2015.

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.

Prior to January 1, 2016, the Company's Retiree Health Plans provided medical, dental and life insurance benefits to eligible retirees (the participant) and their eligible beneficiaries. Various eligibility rules applied based on specific coverage. Effective January 1, 2016, the Company amended the Retiree Health Plans to eliminate the retiree medical and dental options, with the exception of certain limited run-out coverage. On and after January 1, 2016, the Plans continue to provide medical reimbursements benefits, through the existing Retiree Health Reimbursement Arrangement (the "RHRA") for Home Office participants and the newly created Health Reimbursement Account (the "HRA") for certain grandfathered Home Office participants and all Agent participants, as well as life insurance benefits, to eligible retired employees (and in some cases, their eligible beneficiaries) of the Company and its affiliated companies that have adopted the Plan. The changes to the Plans were communicated to Plan participants in August 2015. Outside of the Plan, the Company also provides eligible retirees with access to a private insurance marketplace through which retirees may obtain purchase individual medical coverage.

On July 1, 2016, the Company agreed to provide certain service credits under the MassMutual Retired Agents' Welfare Benefits Plan for prior Premier Client Group (PCG) service. This resulted in an increase to the accumulated projected benefit obligation of $41 million recognized at the time of the acquisition. The expense attributable to prior service periods is recorded as amortization of the nonadmitted assets acquired rather than through the amortization of prior service cost. See *Note 18. "Business combinations and goodwill"* for further information on the acquisition of PCG.

The Society of Actuaries released updated mortality improvement scales in October 2017 (MP 2017) and 2016 (MP 2016). The Company adopted the new mortality projection scales and other key plan assumptions as part of its fourth quarter 2017 and 2016 remeasurements. As a result of these changes in projection scales, the Company's aggregate projected benefit obligation decreased by approximately $20 million as of December 31, 2017 and $37 million as of December 31, 2016.

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 $88 million in 2017 and $66 million in 2016 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 $2,874 million as of December 31, 2017 and $2,453 million as of December 31, 2016. 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 $56 million for the year ended December 31, 2017 and $46 million for the year ended December 31, 2016 and $42 million for 2015.

The Company also maintains a defined contribution plan for agents, which was frozen in 2001. The net assets available for these benefits were $182 million as of December 31, 2017 and $174 million as of December 31, 2016.

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,			
	2017	2016	2017	2016
	Pension Benefits		Other Postretirement Benefits	
	(In Millions)			
Accumulated benefit obligation	$ 2,936	$ 2,715	$ 354	$ 340

The following sets forth the change in projected benefit obligation of the defined benefit pension and other postretirement plans:

	December 31,			
	2017	2016	2017	2016
	Pension Benefits		Other Postretirement Benefits	
	(In Millions)			
Projected benefit obligation, beginning of year	$ 2,785	$ 2,675	$ 340	$ 305
Service cost	126	100	12	11
Interest cost	112	113	12	12
Contributions by plan participants	-	-	-	1
Plan amendments	-	-	-	41
Actuarial (gains) losses	(17)	(15)	(9)	(15)
Medicare prescription drug direct subsidy	-	-	-	1
Benefits paid	(146)	(126)	(15)	(16)
Change in discount rate	194	72	15	3
Change in actuarial assumptions	(18)	(34)	(1)	(3)
Projected benefit obligation, end of year	$ 3,036	$ 2,785	$ 354	$ 340

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 $100 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,	
	2017	2016
	(In Millions)	
General Investment Account	$ 241	$ 234
Separate Investment Accounts:		
Barings Long Duration Bond Fund	263	228
Oppenheimer International Growth Fund	147	116
Alternative Investment Separate Account	134	221
Oppenheimer Large Core Fund	115	98
MM Select Large Cap Value Fund	61	50
MM Premier Strategic Emerging Markets Fund	53	39
Oppenheimer Small Capitalization Core Fund	50	50
MM Select Blue Chip Growth Fund	51	48
MM Select Growth Opportunities Fund	48	36
MM Select Small Cap Value Fund	30	27
MM Select Small Cap Growth Fund	29	23
Oppenheimer Real Estate Fund	-	22
	$ 1,222	$ 1,192

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 $77 million for 2018.

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, 2017 and 11% as of December 31, 2016.

The following presents the change in fair value of plan assets:

	December 31,			
	2017	2016	2017	2016
	Pension Benefits		Other Postretirement Benefits	
	(In Millions)			
Fair value of plan assets, beginning of year	$ 2,180	$ 2,074	$ 4	$ 5
Actual return on plan assets	331	142	-	-
Employer contributions	120	90	15	14
Contributions by plan participants	-	-	-	1
Benefits paid	(146)	(126)	(15)	(16)
Fair value of plan assets, end of year	$ 2,485	$ 2,180	$ 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,	
	2017	2016
Bonds	59 %	58 %
Mortgage loans	15	16
Common stocks - subsidiaries and affiliates	10	10
Other investments	7	8
Partnerships and LLCs	5	5
Cash and cash equivalents	3	2
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):

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.

Oppenheimer International Growth Fund is a separate investment account investing in a mutual fund sub-advised by OFI Institutional Asset Management (OFI Institutional) 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.

Alternative Investment Separate Account is a separate investment account advised by Barings. Barings' strategy includes investing in private equity funds, hedge funds, a private real estate fund and an all cap U.S. equity index exchange traded fund.

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.

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.

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.

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, 2017, 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, 2017			
	Level 1	Level 2	Level 3	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	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
U.S. large capitalization	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	$ 503	$ 2,485

	December 31, 2016			
	Level 1	Level 2	Level 3	Total
	(In Millions)			
Investments in the qualified pension plan:				
Separate investment accounts:				
Common stocks:				
U.S. large capitalization	$ 78	$ 204	$ -	$ 282
U.S. small capitalization	32	51	-	83
U.S. mid capitalization	24	-	-	24
International small/mid capitalization	6	-	-	6
International large capitalization value	5	116	-	121
Total common stocks	145	371	-	516
Debt instruments:				
Corporate and other bonds	-	315	-	315
Long-term bond mutual fund	97	-	-	97
Short-term bond mutual funds	13	-	-	13
Total debt instruments	110	315	-	425
Registered investment companies:				
Exchange traded fund	63	-	-	63
Emerging markets	64	-	-	64
Total registered investment companies	127	-	-	127
Limited partnerships:				
International small/mid capitalization	-	-	168	168
Multi-strategy hedge funds	-	-	25	25
Private equity/venture capital	-	-	43	43
Total limited partnerships	-	-	236	236
Other:				
Government securities	-	278	-	278
Real estate	-	-	51	51
Other	-	87	37	124
Total other	-	365	88	453
Total separate investment accounts	382	1,051	324	1,757
Pension trust assets:				
Common stocks:				
U.S. large capitalization	84	-	-	84
Limited partnerships:				
Other	-	-	39	39
Real estate	-	-	41	41
Other	-	-	25	25
Total pension trust assets	84	-	105	189
Total general investment account	-	-	234	234
Total	$ 466	$ 1,051	$ 663	$ 2,180

The following sets forth a summary of changes in the fair value of the plan's Level 3 invested assets:

	Beginning Balance 1/1/2017	Actual Return on Plan Assets	Purchases	Sales	Transfers	Ending Balance 12/31/2017
	(In Millions)					
Separate investment accounts:						
Real estate	$ 51	$ 2	$ -	$ -	$ -	$ 53
Other	37	2	-	(20)	-	19
Limited partnerships:						
International small/mid cap	168	-	-	-	(168)	-
Private equity/venture capital	43	4	1	(5)	-	43
Multi-strategy hedge fund	25	1	-	(26)	-	-
General investment account	234	3	120	(116)	-	241
Pension trust assets:						
Limited partnerships:						
Other	39	2	69	(1)	-	109
Other	25	2	36	(25)	-	38
Real estate	41	-	-	-	(41)	-
Total	$ 663	$ 16	$ 226	$ (193)	$ (209)	$ 503

	Beginning Balance 1/1/2016	Actual Return on Plan Assets	Purchases	Sales	Transfers	Ending Balance 12/31/2016
	(In Millions)					
Separate investment accounts:						
Real estate	$ 46	$ 5	$ -	$ -	$ -	$ 51
Other	37	-	-	-	-	37
Limited partnerships:						
International small/mid cap	155	13	-	-	-	168
Private equity venture capital	39	1	5	(2)	-	43
Other	25	-	-	-	-	25
General investment account	197	10	131	(104)	-	234
Pension trust assets:						
Limited partnerships:						
Other	-	-	41	(2)	-	39
Real estate	-	1	40	-	-	41
Other	-	-	25	-	-	25
Total	$ 499	$ 30	$ 242	$ (108)	$ -	$ 663

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, 2017 and 2016.

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.

As of December 31, 2017, the unamortized balance of the transition liability upon adoption of SSAP 102 was $3 million. This transition liability is being amortized through 2018.

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 2017 and 2016 and the amounts expected to be recognized in 2018:

	December 31,					
	2018	2017	2016	2018	2017	2016
	Pension Benefits			Other Postretirement Benefits		
	(In Millions)					
Net prior service cost	$ 3	$ 3	$ 3	$ (6)	$ (6)	$ (6)
Net recognized actuarial losses	55	65	70	2	2	3

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,			
	2017	2016	2017	2016
	Pension Benefits		Other Postretirement Benefits	
	(In Millions)			
Net prior service cost	$ 3	$ 6	$ (46)	$ (52)
Net actuarial losses	898	981	26	23
Unrecognized transition liability	3	10	-	-

The following sets forth the projected benefit obligation funded status of the plans:

	December 31,			
	2017	2016	2017	2016
	Pension Benefits		Other Postretirement Benefits	
	(In Millions)			
Projected benefit obligation	$ 3,036	$ 2,785	$ 354	$ 340
Less: fair value of plan assets	2,485	2,180	4	4
Projected benefit obligation funded status	$ (551)	$ (605)	$ (350)	$ (336)

The qualified pension plan was underfunded by $145 million as of December 31, 2017 and by $246 million as of December 31, 2016. The nonqualified pension plans are not funded and have total projected benefit obligations of $406 million as of December 31, 2017 and $359 million as of December 31, 2016.

The qualified pension plan non-admitted pension plan asset was $599 million as of December 31, 2017 and $624 million as of December 31, 2016.

The Company intends to fund $126 million in 2018 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,					
	2017	2016	2015	2017	2016	2015
	Pension Benefits			Other Postretirement Benefits		
	(In Millions)					
Service cost	$ 126	$ 100	$ 71	$ 12	$ 12	$ 9
Interest cost	112	113	99	12	14	13
Expected return on plan assets	(147)	(144)	(154)	-	-	-
Amortization of unrecognized net actuarial and	65	70	65	2	3	3
Amortization of unrecognized prior service cost	3	3	4	(6)	(6)	2
Total net periodic cost	$ 159	$ 142	$ 85	$ 20	$ 23	$ 27

The expected future pension and other postretirement benefit payments, which reflect expected future service, are as follows:

	Pension Benefits	Other Postretirement Benefits
	(In Millions)	
2018	$ 95	$ 20
2019	101	21
2020	107	21
2021	113	21
2022	118	20
2023-2027	674	97

The net expense recognized in the Statutory Statements of Operations for all employee and agent benefit plans is as follows:

	Years Ended December 31,		
	2017	2016	2015
	(In Millions)		
Pension	$ 159	$ 142	$ 85
Health	131	103	88
Thrift	56	46	42
Postretirement	20	23	27
Postemployment	-	-	4
Life	4	4	3
Disability	4	4	3
Other benefits	10	10	9
Total	$ 384	$ 332	$ 261

h. Assumptions

The assumptions the Company used to calculate the benefit obligations and to determine the benefit costs are as follows:

	December 31,					
	2017	2016	2015	2017	2016	2015
	Pension Benefits			Other Postretirement Benefits		
Weighted-average assumptions used to determine:						
Benefit obligations:						
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 %
Net periodic benefit cost:						
Discount rate	4.10 %	4.30 %	3.90 %	3.85 %	3.95 %	3.75 %
Expected long-term rate of return on plan assets	6.75 %	7.00 %	7.25 %	3.00 %	3.00 %	3.00 %
Expected rate of compensation increase	3.50 %	3.50 %	4.00 %	3.50 %	3.50 %	4.00 %

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,		
	2017	2016	2015
Weighted average grant date fair value:			
PSARs granted during the year	$ 79.47	$ 86.80	$ 99.42
PRS granted during the year	80.09	86.67	98.64
Intrinsic value (in thousands):			
PSARs options exercised	4,794	5,220	38,282
PRS liabilities paid	19,802	25,931	30,560
Fair value of shares vested during the year	35,563	26,622	44,476

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, 2015	2,562	$ 85.88	3.3	1,088	$ 80.89	2.7
Granted	1,175	86.80		400	86.67	
Exercised	(445)	77.79		(301)	69.54	
Forfeited	(298)	86.68		(105)	83.88	
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
Exercisable as of December 31, 2017	713	$ 81.44	1.3	-	$ -	-

The PSARs compensation was 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 and an expense of $5 million for the year ended December 31, 2015. The PSARs accrued compensation liability was $20 million as of December 31, 2017 and $2 million as of December 31, 2016. The unrecognized compensation expense related to nonvested PSARs awards was $16 million for the year ended December 31, 2017 and there was no unrecognized compensation expense related to novested PSARs awards for the year ended December 31, 2016 and $3 million for the year ended December 31, 2015. The weighted average period over which the expense is expected to be recognized is 3.1 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 $33 million for the year ended December 31, 2017 and $18 million for the year ended December 31, 2016 and $16 million for the year ended December 31, 2015. The PRS accrued compensation liability was $55 million for the year ended December 31, 2017 and $44 million for the year ended December 31,

2016. The Unrecognized compensation expense related to nonvested PRS awards was $53 million as of December 31, 2017, $39 million as of December 31, 2016 and December 31, 2015, respectively. The weighted average period over which the expense is expected to be recognized is 3.0 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, 2017:

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	250	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	491	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, 2017, the unapproved interest was $21 million. Through December 31, 2017, the Company paid cumulative interest of $1,571 million on surplus notes. Interest of $137 million was approved and paid during the year ended December 31, 2017.

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 or 2015.

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, 2017, 2016 and 2015. Accordingly, the Company has excluded these non-cash activities from the Statutory Statements of Cash Flows for the years ended December 31, 2017, 2016 and 2015.

	Years Ended December 31,		
	2017	2016	2015
	(In Millions)		
Premium ceded under new reinsurance agreement	$ 4,002	$ -	$ -
Bond conversions and refinancing	796	419	1,197
Partnerships and LLCs contributed to Insurance Road LLC	743	-	-
Premium recognized for group annuity contracts	490	905	1,471
Partnerships and LLCs contributed to MassMutual Asset Finance LLC	350	-	-
Stock conversions	331	22	-
Transfer of real estate to partnerships and LLCs	138	-	-
Contributions of affiliated common stock	103	-	-
Bond distributions from partnerships and LLCs	94	80	-
Stock to bond	74	-	-
Mortgage loans contributed to partnerships	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	143
Deposit-type liabilities assigned in exchange for bonds	-	-	690
Bonds received in exchange for equity of an indirect subsidiary	-	-	185
Bonds received as consideration for assignment of deposit-type liabilities	-	-	(690)
Bonds received as consideration for group annuity contracts	(490)	(905)	(1,466)
Funds held under coinsurance	(4,002)	-	-
Other	151	93	129

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 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.

Significant volatility in the financial markets, and government actions taken in response, may exacerbate some of the risks the Company faces. The Company holds investments in energy and certain other commodity sectors, which have experienced similar overall market volatility and declines. With the continued weaker economic outlook in these sectors, there may be an increase in reported default rates or potential downgrades to the ratings of companies exposed to these sectors. In addition, concerns over the solvency of certain countries and sovereignties and the entities that have significant exposure to their debt have created market volatility. This volatility may continue to affect the performance of various asset classes until there is an ultimate resolution of the sovereign debt related concerns.

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 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 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, such as the ongoing volatility with respect to the European Union, may 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 $160 million for the year ended December 31, 2017, $130 million for the year ended December 31, 2016. Net operating leases are net of sublease receipts of $10 million for the year ended December 31, 2017 and $8 million for the year ended December 31, 2016.

The Company has entered into three sale-leaseback transactions with unrelated parties to sell and leaseback certain fixed assets with book values of $120 million, $110 million and $100 million, which resulted in no gain or loss. The leases have five year terms, which expire in 2018, 2020 and 2021 with annual lease payments of approximately $24 million, $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, 2016 were as follows:

	Gross	Affiliated Subleases	Nonaffiliated Subleases	Net
	(In Millions)			
2018	$ 155	$ 9	$ 2	$ 144
2019	124	9	2	113
2020	110	9	1	100
2021	72	7	1	64
2022	38	4	1	33
Thereafter	58	4	-	54
Total	$ 557	$ 42	$ 7	$ 508

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. The Company is not able to provide a reasonable estimate of the aggregate range of any reasonably possible losses related to these matters.

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, 2017, the Company had approximately $123 million of these unsecured funding commitments to its subsidiaries and $300 million as of December 31, 2016. The unsecured commitments are included in private placements in the table below. As of December 31, 2017 and 2016, 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 $152 million as of December 31, 2017 and approximately $144 million as of December 31, 2016. As of December 31, 2017 and 2016, 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, 2017, the Company had the following outstanding commitments:

	2018	2019	2020	2021	2022	Thereafter	Total
	(In Millions)						
Private placements	$ 845	$ 1	$ 1,320	$ 32	$ 53	$ 210	$ 2,461
Mortgage loans	349	312	907	19	12	185	1,784
Real estate	-	16	204	-	-	-	220
Partnerships and LLC	481	439	292	213	350	910	2,685
LIHTCs (including equity contributions)	17	101	262	200	-	31	611
Total	$ 1,692	$ 869	$ 2,985	$ 464	$ 415	$ 1,336	$ 7,761

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, 2017 and 2016, 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, 2017 and 2016, 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, 2017.

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 $206 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, MassMutual Asia Limited, Oppenheimer Acquisition Corp. and MassMutual Japan).	-	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		
	2017	2016	2015
	(In Millions)		
Fee income:			
Management and service contracts and cost-sharing arrangements	$ 341	$ 310	$ 253
Investment advisory income	23	21	24
Recordkeeping and other services	23	23	21
Fee expense:			
Investment advisory services	248	303	270
Roaylty and licensing fees	26	-	-

The Company reported amounts due from subsidiaries and affiliates of $59 million as of December 31, 2017 and $69 million as of December 31, 2016. The Company reported amounts due to subsidiaries and affiliates of ($7) million as of December 31, 2017 and $37 million as of December 31, 2016. 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, 2017, MassMutual credited interest on deposits of $2 million to the Barings contract and $1 million to the BREA contract. For the year ended December 31, 2016, MassMutual credited interest on deposits of $4 million to the Barings contract and $2 million to the BREA contract.

MassMutual and C.M. Life together, approved financing for MassMutual Asset Finance, LLC (MMAF) of $4,475 million for 2017 and 2016, which can be used to finance ongoing asset purchases and refinance existing Company provided lines of credit. As of December 31, 2017 and 2016, the Company approved financing of $4,229 million. During 2017, MMAF borrowed $1,781 million and repaid $1,890 million under the credit facility. During 2016 MMAF borrowed $1,647 million and repaid $1,136 million under the credit facility. Outstanding borrowings under the facility with MassMutual were $3,177 million as of December 31, 2017 and $3,286 million as of December 31, 2016. Interest for these borrowings was $73 million for the year ended December 31, 2017 and $63 million for the year ended December 31, 2016. The interest of this facility adjusts monthly based on the 30-day LIBOR.

MassMutual and C.M. Life together, approved financing of $250 million as of December 31, 2017 and 2016, for Jefferies Finance LLC (Jefferies) that can be used for the short-term financing of assets underwritten by Jefferies. As of December 31, 2017 and 2016, MassMutual approved financing of $225 million for Jefferies. During 2017, Jefferies borrowed $2,379 million and repaid $2,177 million under the credit facility. During 2016, Jefferies borrowed $203 million and repaid $178 million under the credit facility. There were no outstanding borrowings under the facility as of December 31, 2017 and 2016 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 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. In 2017, MassMutual paid a fee of $26 million for these rights.

In 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.

On November 23, 2015, MassMutual and Pioneers Gate LLC (Pioneers Gate) completed an equity for debt swap. Pioneers Gate swapped $185 million of MassMutual's contributed capital for $185 million of additional Pioneers Gate debt. No cash was distributed by Pioneers Gate.

The Company held debt issued by MMHLLC that amounted to $1,769 million as of December 31, 2017 and $1,769 million as of December 31, 2016. The Company recorded interest income on MMHLLC debt of $67 million in 2017 and $76 million in 2016.

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, 2017, the net reinsurance amounts due to C.M. Life and MML Bay State were $39 million and as of December 31, 2016, the net reinsurance amounts due to C.M. Life and MML Bay State were $66 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,		
	2017	2016	2015
	(In Millions)		
Premium assumed	$ 52	$ 53	$ 57
Modco adjustments, included in fees and other income	14	9	15
Expense allowance on reinsurance assumed, included in commissions	(20)	(21)	(21)
Policyholders' benefits	(134)	(109)	(97)
Experience refunds paid	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. Business combinations and goodwill

On July 1, 2016, the Company acquired the PCG. The advisor force includes more than 40 local sales and advisory operations and approximately 4,000 advisors across the country, which expands the Company's existing MMFA to more than 9,200 financial professionals. The purchase of MSIFS was accounted for under the statutory purchase method, classified as investments in common stocks – subsidiaries and affiliates at a cost of $126 million and resulted in the recognition of statutory goodwill of $38 million. The Company also paid $162 million of cash to acquire the remaining PCG assets of $251 million and liabilities of $89 million, which includes the $41 million of liabilities as disclosed in *Note 12. "Employee benefit plans"*. The remaining PCG assets include $208 million of assets that are nonadmitted. The Company recorded $4 million of goodwill amortization in 2017.

19. Subsequent events

Management of the Company has evaluated subsequent events through February 16, 2018, the date the financial statements were available to be issued.

On January 11, 2018, MassMutual issued a $500 million funding agreement with a 2.95% fixed rate and a 7-year maturity.

No additional events have occurred subsequent to the date of the Statements of Financial Position.

20. Subsidiaries and affiliated companies

A summary of ownership and relationship of the Company and its subsidiaries and affiliated companies as of December 31, 2017 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
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
Invicta Advisors 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
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
Pioneers Gate 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

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

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
First Mercantile Trust Company

Haven Life Insurance Agency, LLC
MassMutual Assignment Company
MassMutual Capital Partners LLC
MassMutual Ventures LLC
MM Rothesay Holdco US LLC
MML Investors Services, LLC
LifeScore Labs, LLC
MM Asset Management Holding LLC

Subsidiaries of MassMutual International LLC
MassMutual Asia Limited
MassMutual Life Insurance Company
MassMutual Internacional (Chile) SpA

Subsidiaries of MML Management Corporation
MassMutual Holding MSC, Inc.
MassMutual International Holding MSC, Inc.

MSI Financial Services, Inc.
(No subsidiaries)

Subsidiaries of Barings LLC (a subsidiary of MM Asset Management Holding LLC)
Barings Finance LLC
Barings Securities LLC
Barings Guernsey Limited
Barings Advisers (Japan) KK
Barings Multifamily Capital Holdings LLC
Barings Real Estate Advisers Inc.
Barings Real Estate Advisers Japan K.K.
Barings Real Estate UK Holdings Limited
MassMutual Baring Holding, LLC
Barings Australia Holding Company Pty Ltd.
Barings Investment Advisers (Hong Kong) Ltd

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
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

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 non-domestic insurance subsidiaries and controlled affiliates of the Company:

		As of December 31, 2017						
	CUSIP	Gross Value	Non-admitted	Admitted	Latest Filing	2016 Approved Valuation	Filing Code	Valuation Method Disallowed?
		($ in Millions)						
MassMutual Holding LLC	57543#-11-8	$ 9,116	$ -	$ 9,116	6/29/2017	$ 8,870	Sub-2	No
The MassMutual Trust Co, FSB	57631@-10-5	22	-	22	6/27/2017	19	Sub-2	No
Cornerstone Global REIT Corp	21926@-10-5	-	-	-	6/22/2017	2	Sub-2	No
MML Management Corporation	55338@105	956	-	956	6/27/2017	-	Sub-1	No
Aggregate Total:		$ 10,094	$ -	$ 10,094		$ 8,891		

21. 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, 2017	$ 3,949,512.96	$ -	$ 3,949,512.96	$ 1,958,758.69	$ (1,990,754.27)	$ 1,958,758.69	$ 2,023,951.71
September 30, 2017	4,436,541.89	-	4,436,541.89	876,942.38	(3,559,599.51)	876,942.38	4,647,683.14
June 30, 2017	40,538,550.91	-	40,538,550.91	39,808,955.56	(729,595.35)	39,808,955.56	60,990,731.58
March 31, 2017	41,788,379.55	-	41,788,379.55	41,391,888.99	(396,490.56)	41,391,888.99	56,156,935.64
December 31, 2016	42,175,937.60	-	42,175,937.60	42,045,720.84	(130,216.76)	42,045,720.84	54,619,477.38
September 30, 2016	44,266,477.52	-	44,266,477.52	41,890,535.09	(2,375,942.43)	41,890,535.09	61,300,065.96
June 30, 2016	49,097,216.64	-	49,097,216.64	48,202,702.65	(894,513.99)	48,202,702.65	63,207,410.31
March 31, 2016	57,985,070.61	-	57,985,070.61	55,783,978.83	(2,201,091.78)	55,783,978.83	70,578,396.73
December 31, 2015	4,881,393.98	-	4,881,393.98	4,783,193.97	(98,200.01)	4,783,193.97	4,728,735.62
September 30, 2015	50,531,382.40	-	50,531,382.40	45,665,858.52	(4,865,523.88)	45,665,858.52	58,523,652.24
June 30, 2015	66,924,926.70	-	66,924,926.70	65,240,585.41	(1,684,341.29)	65,240,585.41	72,953,475.23
March 31, 2015	17,856,447.05	-	17,856,447.05	17,681,510.35	(174,936.70)	17,681,510.35	17,553,998.88
December 31, 2014	69,225,742.98	-	69,225,742.98	68,301,291.28	(924,451.70)	68,301,291.28	79,410,553.48
September 30, 2014	645,720.82	-	645,720.82	604,437.11	(41,283.71)	604,437.11	627,381.39
June 30, 2014	57,012,606.16	-	57,012,606.16	55,422,168.01	(1,590,438.15)	55,422,168.01	75,253,387.54
March 31, 2014	91,702,041.47	-	91,702,041.47	80,744,073.99	(10,957,967.48)	80,744,073.99	97,672,070.74
December 31, 2013	113,707,950.98	-	113,707,950.98	108,815,640.18	(4,892,310.80)	108,815,640.18	111,783,051.88
September 30, 2013	81,945,730.49	-	81,945,730.49	80,589,482.19	(1,356,248.30)	80,589,482.19	77,049,314.39
June 30, 2013	147,215,936.13	-	147,215,936.13	142,140,571.53	(5,075,364.60)	142,140,571.53	130,973,022.96
March 31, 2013	194,772,024.52	-	194,772,024.52	188,372,088.50	(6,399,936.02)	188,372,088.50	176,678,910.26
December 31, 2012	378,096,660.04	-	378,096,660.04	366,323,110.21	(11,773,549.83)	366,323,110.21	333,086,072.58
September 30, 2012	816,573,456.06	-	816,573,456.06	788,350,822.82	(28,222,633.24)	788,350,822.82	697,683,288.85
June 30, 2012	912,025,936.52	-	912,025,936.52	890,494,220.76	(21,531,715.76)	890,494,220.76	708,872,106.49
March 31, 2012	1,095,018,529.18	-	1,095,018,529.18	1,058,132,041.09	(36,886,488.09)	1,058,132,041.09	841,095,012.78
December 31, 2011	1,090,904,993.06	-	1,090,904,993.06	1,056,761,288.41	(34,143,704.65)	1,056,761,288.41	754,310,837.90
September 30, 2011	762,320,631.78	-	762,320,631.78	738,510,047.63	(23,810,584.15)	738,510,047.63	546,494,231.96
June 30, 2011	1,130,732,656.14	-	1,130,732,656.14	1,078,535,670.23	(52,196,985.91)	1,078,535,670.23	839,143,290.12
March 31, 2011	1,097,705,351.09	-	1,097,705,351.09	1,068,852,203.67	(28,853,147.42)	1,068,852,203.67	816,688,348.33
December 31, 2010	968,742,508.30	-	968,742,508.30	950,111,416.81	(18,631,091.49)	950,111,416.81	708,895,636.97
September 30, 2010	915,728,029.86	-	915,728,029.86	889,896,058.18	(25,831,971.68)	889,896,058.18	673,462,492.71
June 30, 2010	1,362,887,892.31	-	1,362,887,892.31	1,335,628,211.52	(27,259,680.79)	1,335,628,211.52	975,241,505.93
March 31, 2010	1,471,905,695.71	-	1,471,905,695.71	1,391,337,542.96	(80,568,152.75)	1,391,337,542.96	1,015,645,802.04
December 31, 2009	1,349,124,213.70	-	1,349,124,213.70	1,290,817,167.68	(58,307,046.02)	1,290,817,167.68	852,088,739.42
September 30, 2009	2,953,442,689.02	(106,853,708.32)	2,846,588,980.70	2,700,948,264.43	(145,640,716.27)	2,700,948,264.43	1,692,409,639.54
Totals		$ (106,853,708.32)			$ (643,996,675.34)		

The following is the impairment listing for loan-backed and structured securities for the three months ended December 31, 2017:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
03927RAA2	2,886,562.89	-	2,886,562.89	1,464,907.06	(1,421,655.83)	1,464,907.06	1,481,241.11
03927RAB0	910,639.01	-	910,639.01	363,542.69	(547,096.32)	363,542.69	362,175.51
07386HCP4	7,994.89	-	7,994.89	1,386.05	(6,608.84)	1,386.05	2,673.29
12669GMS7	25,100.71	-	25,100.71	21,923.44	(3,177.27)	21,923.44	21,921.13
22541QQR6	21,202.35	-	21,202.35	12,504.34	(8,698.01)	12,504.34	16,105.52
2254W0NK7	97,695.32	-	97,695.32	94,495.11	(3,200.21)	94,495.11	139,833.41
86359ACG6	317.79	-	317.79	-	(317.79)	-	1.74

Totals	$ 3,949,512.96	$ -	$ 3,949,512.96	$ 1,958,758.69	$ (1,990,754.27)	$ 1,958,758.69	$ 2,023,951.71

The following is the impairment listing for loan-backed and structured securities for the three months ended September 30, 2017:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
22541NMA4	42,273.18	-	42,273.18	41,434.09	(839.09)	41,434.09	41,095.03
22541NMB2	11,868.56	-	11,868.56	11,634.10	(234.46)	11,634.10	11,534.82
22541SSD1	12,232.04	-	12,232.04	19.50	(12,212.54)	19.50	5,978.48
52108MDP5	3,497,947.00	-	3,497,947.00	-	(3,497,947.00)	-	1,925,412.53
55274SAM3	167,196.18	-	167,196.18	153,990.63	(13,205.55)	153,990.63	179,428.50
76110W4J2	1,131.15	-	1,131.15	229.03	(902.12)	229.03	555.83
88157QAL2	686,944.68	-	686,944.68	660,920.66	(26,024.02)	660,920.66	2,125,942.76
89789KAC9	16,949.10	-	16,949.10	8,714.37	(8,234.73)	8,714.37	357,735.19
Totals	$ 4,436,541.89	$ -	$ 4,436,541.89	$ 876,942.38	$ (3,559,599.51)	$ 876,942.38	$ 4,647,683.14

The following is the impairment listing for loan-backed and structured securities for the three months ended June 30, 2017:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
76110H4M8	4,413.15	-	4,413.15	2,326.35	(2,086.80)	2,326.35	4,073.27
86358RLG0	3,484.71	-	3,484.71	2,669.64	(815.07)	2,669.64	30,170.77
86359ACG6	16,323.86	-	16,323.86	2.02	(16,321.84)	2.02	2.49
88157QAL2	774,182.08	-	774,182.08	675,598.95	(98,583.13)	675,598.95	1,947,675.43
89789KAC9	17,294.14	-	17,294.14	8,919.66	(8,374.48)	8,919.66	356,046.75
77277LAF4	22,514,590.18	-	22,514,590.18	22,167,493.44	(347,096.74)	22,167,493.44	34,318,674.16
77277LAH0	1,135,087.94	-	1,135,087.94	1,118,158.56	(16,929.38)	1,118,158.56	2,738,435.22
77277LAJ6	16,073,174.85	-	16,073,174.85	15,833,786.94	(239,387.91)	15,833,786.94	21,595,653.49
Totals	$ 40,538,550.91	$ -	$ 40,538,550.91	$ 39,808,955.56	$ (729,595.35)	$ 39,808,955.56	$ 60,990,731.58

The following is the impairment listing for loan-backed and structured securities for the three months ended March 31, 2017:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
17307GH76	$ 274,893.76	$ -	$ 274,893.76	$ 44,730.49	$ (230,163.27)	$ 44,730.49	$ 152,776.75
22541QJR4	11,175.33	-	11,175.33	53.52	(11,121.81)	53.52	6,865.92
32051DCK6	182,177.17	-	182,177.17	160,728.11	(21,449.06)	160,728.11	179,180.14
55274SAM3	225,789.88	-	225,789.88	209,839.17	(15,950.71)	209,839.17	218,832.17
86358RA23	1,326,199.14	-	1,326,199.14	1,253,635.93	(72,563.21)	1,253,635.93	1,289,098.83
86359ACG6	6,287.32	-	6,287.32	48.80	(6,238.52)	48.80	2.41
US77277LAF40	22,537,014.10	-	22,537,014.10	22,514,590.18	(22,423.92)	22,514,590.18	31,699,906.98
US77277LAH06	1,136,181.78	-	1,136,181.78	1,135,087.94	(1,093.84)	1,135,087.94	2,662,526.10
US77277LAJ61	16,088,661.07	-	16,088,661.07	16,073,174.85	(15,486.22)	16,073,174.85	19,947,746.34
Totals	$ 41,788,379.55	$ -	$ 41,788,379.55	$ 41,391,888.99	$ (396,490.56)	$ 41,391,888.99	$ 56,156,935.64

22. 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, 2017:

CUSIP Identification	Actual Cost	Fair Value	Book / Adjusted Carrying Value	Mortgage-Referenced Security (YES/NO)
3137G0EQ8	$ 836,289	$ 837,227	$ 836,289	YES
3137G0HQ5	1,058,318	1,060,396	1,058,318	YES
391164AF7	8,467,560	8,283,764	8,234,722	NO
5262720	1,262,834	1,268,626	1,270,727	NO
912810FR4	4,944,283	6,292,872	5,593,897	NO
912810PS1	1,874,118	2,718,974	2,310,670	NO
912810RF7	67,974,258	85,528,045	80,374,392	NO
BYZK109	9,327,385	10,243,850	9,347,705	NO
XS0841385411	937,950	937,950	951,189	NO
Total	$ 96,682,995	$ 117,171,704	$ 109,977,909	