MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES

CONSOLIDATED STATUTORY FINANCIAL STATEMENTS

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

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
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Table of Contents

Page

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
CONSOLIDATED STATUTORY STATEMENTS OF FINANCIAL POSITION

	December 31, 2017	December 31, 2016
	(In Millions)	
Assets:		
Bonds	$ 94,870	$ 88,208
Preferred stocks	794	490
Common stocks – subsidiaries and affiliates	12,868	12,718
Common stocks – unaffiliated	1,217	1,122
Mortgage loans	23,521	21,932
Policy loans	13,569	12,700
Real estate	857	974
Partnerships and limited liability companies	7,863	7,387
Derivatives	9,253	10,272
Cash, cash equivalents and short-term investments	3,939	3,950
Other invested assets	424	370
Total invested assets	169,175	160,123
Investment income due and accrued	2,304	2,013
Federal income taxes	538	28
Deferred income taxes	788	1,654
Other than invested assets	3,465	2,986
Total assets excluding separate accounts	176,270	166,804
Separate account assets	75,505	68,234
Total assets	$ 251,775	$ 235,038
Liabilities and Surplus:		
Policyholders' reserves	$ 119,905	$ 116,354
Liabilities for deposit-type contracts	13,110	11,665
Contract claims and other benefits	532	406
Policyholders' dividends	1,601	1,609
General expenses due or accrued	1,075	1,122
Asset valuation reserve	3,308	3,264
Repurchase agreements	4,436	4,966
Commercial paper	250	250
Collateral	2,729	2,925
Derivatives	6,444	6,515
Funds held under coinsurance	4,001	-
Other liabilities	3,174	2,314
Total liabilities excluding separate accounts	160,565	151,390
Separate account liabilities	75,505	68,225
Total liabilities	236,070	219,615
Surplus	15,705	15,423
Total liabilities and surplus	$ 251,775	$ 235,038

See accompanying notes to consolidated statutory financial statements

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
CONSOLIDATED STATUTORY STATEMENTS OF OPERATIONS

	Years Ended December 31, 2017	Years Ended December 31, 2016
	(In Millions)	
Revenue:		
Premium income	$ 17,762	$ 21,246
Net investment income	6,866	6,660
Fees and other income	1,485	1,654
Total revenue	26,113	29,560
Benefits and expenses:		
Policyholders' benefits	20,646	19,118
Change in policyholders' reserves	550	6,845
Change in group annuity reserves assumed	(887)	(1,510)
General insurance expenses	2,675	2,304
Commissions	1,026	985
State taxes, licenses and fees	256	247
Total benefits and expenses	24,266	27,989
Net gain from operations before dividends and federal income taxes	1,847	1,571
Dividends to policyholders	1,569	1,566
Net gain from operations before federal income taxes	278	5
Federal income tax benefit	(290)	(277)
Net gain from operations	568	282
Net realized capital losses	(431)	(212)
Net income	$ 137	$ 70

See accompanying notes to consolidated statutory financial statements

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
CONSOLIDATED STATUTORY STATEMENTS OF CHANGES IN SURPLUS

	Years Ended December 31,	
	2017	2016
	(In Millions)	
Surplus, beginning of year	$ 15,423	$ 14,983
Increase (decrease) due to:		
Net income	137	70
Change in net unrealized capital gains (losses), net of tax	289	943
Change in net unrealized foreign exchange capital gains (losses), net of tax	758	(464)
Change in other net deferred income taxes	(1,145)	269
Change in nonadmitted assets	172	(352)
Change in asset valuation reserve	(44)	(365)
Change in surplus notes	36	-
Prior period adjustments	42	33
Change in minimum pension liability	61	6
Other	(24)	300
Net increase	282	440
Surplus, end of year	$ 15,705	$ 15,423

See accompanying notes to consolidated statutory financial statements

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
CONSOLIDATED STATUTORY STATEMENTS OF CASH FLOWS

	Years Ended December 31, 2017	2016
	(In Millions)	
Cash from operations:		
Premium and other income collected	$ 22,557	$ 21,896
Net investment income	6,849	6,711
Benefit payments	(20,356)	(18,527)
Net transfers from separate accounts	3,667	2,419
Net receipts from group annuity reserves assumed	887	1,510
Commissions and other expenses	(3,643)	(3,466)
Dividends paid to policyholders	(1,577)	(1,698)
Federal and foreign income taxes (paid) recovered	(49)	313
Net cash from operations	8,335	9,158
Cash from investments:		
Proceeds from investments sold, matured or repaid:		
Bonds	21,018	15,589
Preferred and common stocks – unaffiliated	517	592
Common stocks – affiliated	351	75
Mortgage loans	3,194	3,982
Real estate	226	59
Partnerships and limited liability companies	2,030	961
Derivatives	90	560
Other	(274)	(135)
Total investment proceeds	27,152	21,683
Cost of investments acquired:		
Bonds	(26,090)	(22,308)
Preferred and common stocks – unaffiliated	(890)	(388)
Common stocks – affiliated	(230)	(1,499)
Mortgage loans	(4,640)	(3,628)
Real estate	(267)	(201)
Partnerships and limited liability companies	(1,887)	(1,606)
Derivatives	(599)	(626)
Other	(89)	113
Total investments acquired	(34,692)	(30,143)
Net increase in policy loans	(871)	(638)
Net cash from investing activities	(8,411)	(9,098)
Cash from financing and miscellaneous sources:		
Net deposits on deposit-type contracts	1,362	768
Net cash provided by surplus notes	36	-
Change in repurchase agreements	(530)	(404)
Change in collateral	(197)	674
Other cash used	(606)	(572)
Net cash from financing and miscellaneous sources	65	466
Net change in cash, cash equivalents and short-term investments	(11)	526
Cash, cash equivalents and short-term investments:		
Beginning of year	3,950	3,424
End of year	$ 3,939	$ 3,950

See accompanying notes to consolidated statutory financial statements

1. Nature of operations

Massachusetts Mutual Life Insurance Company (MassMutual), a mutual life insurance company domiciled in the Commonwealth of Massachusetts, and its domestic life insurance subsidiaries domiciled in the State of Connecticut (collectively, the Company), 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

These consolidated statutory financial statements include MassMutual and its wholly-owned U.S. domiciled life insurance subsidiary, C.M. Life Insurance Company (C.M. Life), and C.M. Life's wholly-owned U.S. domiciled life insurance subsidiary, MML Bay State Life Insurance Company (MML Bay State). All intercompany transactions and balances for these consolidated entities have been eliminated. Other subsidiaries and affiliates are accounted for under the equity method in accordance with statutory accounting practices. Statutory financial statements filed with regulatory authorities are not presented on a consolidated basis.

The consolidated 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); and for the wholly-owned U.S. domiciled life insurance subsidiaries, the State of Connecticut Insurance Department (the Department).

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 Consolidated 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) Consolidated 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 these consolidated 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 these consolidated statutory financial statements. Although some variability is inherent in these estimates, management believes the amounts presented are appropriate.

Certain prior year amounts within these financial statements have been reclassified to conform to the current year presentation.

b. Bonds

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

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

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

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

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

Refer to *Note 2cc. "Realized capital gains (losses) including other-than-temporary impairments and unrealized capital gains (losses)"* for information on the Company's policy for determining OTTI.

c. Preferred stocks

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

Refer to *Note 2cc. "Realized capital gains (losses) including other-than-temporary impairments and unrealized capital gains (losses)"* for information on the Company's policy for determining OTTI.

d. Common stocks - subsidiaries and affiliates

Common stocks of unconsolidated subsidiaries, primarily 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 Consolidated 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 2cc. "Realized capital gains (losses) including other-than-temporary impairments and unrealized capital gains (losses)"* for information on the Company's policy for determining OTTI.

f. Mortgage loans

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

Refer to *Note 2cc. "Realized capital gains (losses) including other-than-temporary impairments and unrealized capital gains (losses)"* for information on the Company's policy for determining OTTI.

g. Policy loans

Policy loans are carried at the outstanding loan balance less amounts unsecured by the cash surrender value of the policy and amounts ceded to reinsurers. At issuance, policy loans are fully secured by the cash surrender value of the policy. Unsecured amounts can occur when subsequent charges are incurred on the underlying policy without the receipt of additional premium. If the premium is not paid during the contractual grace period, the policy will lapse. Unsecured nonadmitted amounts were less than $1 million as of December 31, 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 2cc. "Realized capital gains (losses) including other-than-temporary impairments and unrealized capital gains (losses)"* for information on the Company's policy for determining OTTI.

i. Partnerships and limited liability companies

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

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

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

Refer to *Note 2cc. "Realized capital gains (losses) including other-than-temporary impairments and unrealized capital gains (losses)"* for information on the Company's policy for determining OTTI.

j. Derivatives

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

k. Cash, cash equivalents and short-term investments

Cash and cash equivalents, which are carried at amortized cost, consist of all highly liquid investments purchased with original maturities of three months or less.

Short-term investments, which are carried at amortized cost, consist of short-term bonds, money market mutual funds and all highly liquid investments purchased with maturities of greater than three months and less than or equal to 12 months.

The carrying value reported in the Consolidated 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 deferred tax assets or liabilities. Current tax expense (benefit) is reported in the Consolidated Statutory Statements of Operations as federal income tax expense (benefit) if resulting from operations and within net realized capital gains (losses) if resulting from invested asset transactions. Changes in the balances of deferred taxes, which provide for book-to-tax temporary differences, are subject to limitations and are reported within various lines within surplus. Accordingly, the reporting of book-to-tax temporary differences, such as reserves and policy acquisition costs, and of book-to-tax permanent differences, such as tax-exempt interest and tax credits, may result in effective tax rates in the Consolidated 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, supplemental accounts 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 Consolidated Statutory Statements of Financial Position with the corresponding change in the liability recorded as change in policyholders' reserves or policyholders' benefits in the Consolidated Statutory Statements of Operations.

Premium income, benefits and expenses of the separate accounts are included in the Consolidated 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 Consolidated 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 Consolidated Statutory Statements of Financial Position through a change in nonadmitted assets on the Consolidated 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 Consolidated 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 and fixed 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 Consolidated Statements of Financial Position and the related changes in these liabilities are included in change in policyholders' reserves in the Consolidated Statutory Statements 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 54% of the Company's policyholders' reserves and liabilities for deposit-type contracts as of December 31, 2017 and 52% 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 Consolidated Statutory Statements of Financial Position and the change in AVR, net of tax, is reported within the Consolidated 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 Consolidated Statutory Statements of Financial Position for repurchase agreements approximates the fair value.

x. Commercial paper

The Company issues commercial paper (CP) in the form of unsecured notes. Interest on CP is calculated using a 360-day year based on the actual number of days elapsed. Due to the short-term nature of CP, the carrying value approximates fair value.

y. Interest maintenance reserve

The Company maintains an IMR that is used to stabilize net income against fluctuations in interest rates. After-tax realized capital gains (losses), which result from changes in interest rates for all types of fixed-income investments and interest-related derivatives, are deferred into the IMR and amortized into net investment income using the grouped amortization method. In the grouped amortization method, assets are grouped based on years of maturity. IMR is reduced by the amount ceded to reinsurers when entering into in force coinsurance ceding agreements. The IMR is included in other liabilities or, if negative, is recorded as a nonadmitted asset.

z. Employee compensation plans

The Company has a long-term incentive compensation plan, under which certain employees of the Company and its subsidiaries may be issued phantom share-based compensation awards. These awards include Phantom Stock Appreciation Rights (PSARs) and Phantom Restricted Stock (PRS). These awards do not grant an equity or ownership interest in the Company.

PSARs provide the participant with the opportunity to share in the value created in the total enterprise. The PSAR value is the appreciation in the phantom stock price between the grant price and the share price at the time of exercise. Awards can only be settled in cash. PSARs typically cliff vest at the end of three years and expire five years after the date of grant. Vested PSARs may be exercised during quarterly two-week exercise periods prior to expiration. The compensation expense for an individual award is recognized over the service period.

PRS provide the participant with the opportunity to share in the value created in the total enterprise. Participants receive the full phantom share value (grant price plus/minus any change in share price) over the award period. Awards can only be settled in cash. PRS typically vests on a graded basis over five years, one third per year after years three, four and five. On each vesting date, a lump sum cash settlement is paid to the participant based on the number of shares vested multiplied by the most recent phantom stock price. Compensation expense is recognized on the accelerated attribution method. The accelerated attribution method recognizes compensation expense over the vesting period by which each separate payout year is treated as if it were, in substance, a separate award.

All awards granted under the Company’s plans are compensatory classified awards. Compensation costs are based on the most recent quarterly calculated intrinsic value of the PSARs (current share price less grant price per share not less than zero) and PRS (current share price per share), considering vesting provisions, net of forfeiture assumptions and are included in the Consolidated Statutory Statements of Financial Position as a liability in general expenses due or accrued. The compensation expense for an individual award is recognized over the service period. The cumulative compensation expense for all outstanding awards in any period is equal to the change in calculated liability period over period. The requisite service period for the awards is the vesting period.

At the time of death or disability, awards contain vesting conditions, whereby employees’ unvested awards immediately vest on an accelerated basis with a one-year exercise period for PSARs, full accelerated vesting and settlement for PRS awards granted 2016 and after. For PRS awards granted prior to 2016, awards vest on a pro-rata basis with immediate settlement.

At the time of retirement, for awards granted beginning in 2016, both PRS and PSAR vest according to the original grant terms. For awards granted prior to 2016, unvested awards immediately vest on an accelerated basis with a two-year exercise period for PSARs, and a pro-rata basis with immediate settlement for PRS.

The phantom share price is determined as the greater of the share price calculated using management basis core operating income or the share price calculated using management basis equity. This phantom share price is calculated and communicated to all participants quarterly and is used in calculating the liability of the Company based on intrinsic value.

aa. Other liabilities

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

bb. Premium and related expense recognition

Life insurance premium revenue is generally recognized annually on the anniversary date of the policy. However, premium for flexible products, primarily universal life and variable universal life contracts, is recognized as revenue when received. Annuity premium is recognized as revenue when received. Disability income and LTC premium is recognized as revenue when due.

Premium revenue is adjusted by the related deferred premium adjustment. Deferred premium adjusts for the overstatement created in the calculation of reserves as the reserve computation assumes the entire year’s net premium is collected annually at the beginning of the policy year and does not take into account installment or modal payments.

Commissions and other costs related to issuance of new policies and policy maintenance and settlement costs are charged to current operations when incurred. Surrender fee charges on certain life and annuity products are recorded as a reduction of benefits and expenses.

cc. Realized capital gains (losses) including other-than-temporary impairments and unrealized capital gains (losses)

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

Bonds - general

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

In addition, if the Company has the intent to sell, or the inability, or lack of intent to retain the investment for a period sufficient to recover the amortized cost basis, an OTTI is recognized as a realized loss equal to the entire difference between the investment's amortized cost basis and its fair value at the balance sheet date.

When a bond is other-than-temporarily impaired, a new cost basis is established.

Bonds - corporate

For corporate securities, if it is determined that a decline in the fair value of a bond is other than temporary, OTTI is recognized as a realized loss equal to the difference between the investment's amortized cost basis and, generally, its fair value at the balance sheet date.

Bonds - loan-backed and structured securities

For loan-backed and structured securities, if the present value of cash flows expected to be collected is less than the amortized cost basis of the security, an OTTI is recognized as a realized loss equal to the difference between the investment's amortized cost basis and the present value of cash flows expected to be collected. The expected cash flows are discounted at the security's effective interest rate. Internal inputs used in determining the amount of the OTTI on structured securities include collateral performance, prepayment speeds, default rates, and loss severity based on borrower and loan characteristics, as well as deal structure including subordination, over-collateralization and cash flow priority.

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

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

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

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

Common and preferred stock

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

Mortgage loans

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

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

Real estate

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

Adjustments to the carrying value of real estate held for sale are recorded in a valuation reserve as realized capital losses when the fair value less estimated selling costs is less than the carrying value.

Partnerships and LLCs

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

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

Unrealized capital gains (losses)

Unrealized capital gains (losses) include changes in the fair value of derivatives, excluding interest rate swaps and credit default index swaps associated with replicated assets; currency translation adjustments on foreign-denominated bonds; changes in the fair value of unaffiliated common stocks; changes in the fair value of bonds and preferred stocks that are carried at fair value; and changes in the inflation adjustments on U.S Treasury inflation-indexed securities. Changes in the Company's equity investments in partnerships and LLCs, including the earnings as reported on the financial statements, earnings recorded as accumulated undistributed earnings, foreign exchange asset valuation and mark-to-market on operating assets, and certain subsidiaries and affiliates are also reported as changes in unrealized capital gains (losses). Unrealized capital gains (losses) are recorded as a change in net unrealized capital gains (losses), net of tax, within the Consolidated 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 were 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 Securities Valuation Office (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. These 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 Flows: 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	$ 7,462	$ 8,017	$ -	$ 8,016	$ 1
All other governments	1,182	1,271	-	1,201	70
States, territories and possessions	626	684	-	684	-
Political subdivisions	548	595	-	595	-
Special revenue	5,934	6,651	-	6,640	11
Industrial and miscellaneous	71,818	75,215	-	43,386	31,829
Parent, subsidiaries and affiliates	7,300	7,417	-	1,148	6,269
Preferred stocks	794	814	54	-	760
Common stocks - subsidiaries and affiliates	471	471	362	-	109
Common stocks - unaffiliated	1,217	1,217	903	-	314
Mortgage loans - commercial	21,583	22,129	-	-	22,129
Mortgage loans - residential	1,938	1,891	-	-	1,891
Derivatives:					
Interest rate swaps	8,041	8,626	-	8,626	-
Options	765	765	-	765	-
Currency swaps	405	405	-	404	1
Forward contracts	13	22	-	22	-
Credit default swaps	29	36	-	36	-
Cash, cash equivalents and short-term investments	3,939	3,939	227	3,712	-
Separate account assets	75,505	75,517	48,927	25,866	724
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	9,612	11,902	-	-	11,902
Supplementary contracts	1,248	1,250	-	-	1,250
Repurchase agreements	4,436	4,436	-	4,436	-
Commercial paper	250	250	-	250	-
Derivatives:					
Interest rate swaps	5,754	5,812	-	5,812	-
Options	7	7	-	7	-
Currency swaps	590	590	-	582	8
Forward contracts	92	92	-	92	-
Credit default swaps	1	1	-	1	-

Common stocks - subsidiaries and affiliates do not include unconsolidated subsidiaries, which had statutory carrying values of $12,397 million.

	December 31, 2016				
	Carrying Value	Fair Value	Level 1	Level 2	Level 3
	(In Millions)				
Financial assets:					
Bonds:					
U. S. government and agencies	$ 7,130	$ 7,653	$ -	$ 7,649	$ 4
All other governments	925	936	-	865	71
States, territories and possessions	709	759	-	759	-
Political subdivisions	498	530	-	530	-
Special revenue	5,731	6,304	-	6,271	33
Industrial and miscellaneous	66,432	68,240	-	41,334	26,906
Parent, subsidiaries and affiliates	6,783	6,886	-	657	6,229
Preferred stocks	490	507	16	31	460
Common stocks - subsidiaries and affiliates	594	594	508	23	63
Common stocks - unaffiliated	1,122	1,122	582	349	191
Mortgage loans - commercial	20,009	20,500	-	-	20,500
Mortgage loans - residential	1,923	1,878	-	-	1,878
Derivatives:					
Interest rate swaps	8,510	9,059	-	9,059	-
Options	679	679	-	679	-
Currency swaps	991	991	-	991	-
Forward contracts	54	54	-	54	-
Credit default swaps	38	40	-	40	-
Cash, cash equivalents and short-term investments	3,950	3,950	(86)	4,036	-
Separate account assets	68,234	68,242	42,282	25,206	754
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	9,807	11,911	-	-	11,911
Supplementary contracts	1,229	1,231	-	-	1,231
Repurchase agreements	4,966	4,966	-	4,966	-
Commercial paper and other borrowed money	250	250	-	250	-
Derivatives:					
Interest rate swaps	6,413	6,458	-	6,458	-
Options	6	6	-	6	-
Currency swaps	37	37	-	37	-
Forward contracts	58	58	-	58	-
Credit default swaps	1	1	-	1	-

Common stocks - subsidiaries and affiliates do not include unconsolidated subsidiaries, which had statutory carrying values of $12,124 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, guaranteed interest contracts 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 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	$ -	$ 7	$ -	$ 7
Industrial and miscellaneous	-	11	57	68
Parent, subsidiaries and affiliates	-	18	67	85
Preferred stocks	3	-	2	5
Common stocks - subsidiaries and affiliates	362	-	109	471
Common stocks - unaffiliated	903	-	314	1,217
Derivatives:				
Interest rate swaps	-	8,041	-	8,041
Options	-	765	-	765
Currency swaps	-	404	1	405
Forward contracts	-	13	-	13
Separate account assets	48,927	24,759	710	74,396
Total financial assets carried at fair value	$ 50,195	$ 34,018	$ 1,260	$ 85,473
Financial liabilities:				
Derivatives:				
Interest rate swaps	$ -	$ 5,754	$ -	$ 5,754
Options	-	7	-	7
Currency swaps	-	582	8	590
Forward contracts	-	92	-	92
Total financial liabilities carried at fair value	$ -	$ 6,435	$ 8	$ 6,443

The Company reviews the fair value hierarchy classifications each reporting period. Changes in the observability of the valuation attributes and the level of market activity may result in a reclassification of certain financial assets or liabilities between fair value hierarchy classifications. Such reclassifications are reported as transfers between levels at the beginning fair value for the reporting period in which the changes occur. For the year ended December 31, 2017, $298 million of unaffiliated common stock were transferred from Level 2 to Level 1.

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	-	4	58	62
Parent, subsidiaries and affiliates	-	60	58	118
Preferred stocks	1	-	3	4
Common stocks - subsidiaries and affiliates	508	23	63	594
Common stocks - unaffiliated	582	349	191	1,122
Derivatives:				
Interest rate swaps	-	8,510	-	8,510
Options	-	679	-	679
Currency swaps	-	991	-	991
Forward contracts	-	54	-	54
Credit default swaps	-	4	-	4
Separate account assets	42,282	24,127	738	67,147
Total financial assets carried at fair value	$ 43,373	$ 34,810	$ 1,111	$ 79,294
Financial liabilities:				
Derivatives:				
Interest rate swaps	$ -	$ 6,413	$ -	$ 6,413
Options	-	6	-	6
Currency swaps	-	37	-	37
Forward contracts	-	58	-	58
Credit default swaps	-	1	-	1
Total financial liabilities carried at fair value	$ -	$ 6,515	$ -	$ 6,515

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 (OIS) 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	$ 58	$ 1	$ (4)	$ -	$ -	$ -	$ (5)	$ -	$ (8)	$ 15	$ 57
Parent, subsidiaries, and affiliates	58	-	9	-	-	-	-	-	-	-	67
Preferred stocks	3	-	-	1	-	-	-	-	-	(2)	2
Common stocks - subsidiaries and affiliates	63	-	12	-	46	-	(11)	-	-	(1)	109
Common stocks - unaffiliated	191	(6)	31	38	-	(8)	(3)	75	(6)	2	314
Derivatives:											
Currency swaps	-		(5)					6			1
Separate account assets	738	56	-	72	-	(150)	(1)	-	(5)	-	710
Total financial assets	$ 1,111	$ 51	$ 43	$ 111	$ 46	$ (158)	$ (20)	$ 81	$ (19)	$ 14	$ 1,260
Financial liabilities											
Derivatives:											
Currency swaps	$ -	$ -	$ 4	$ -	$ -	$ -	$ -	$ 4	$ -	$ -	$ 8

Level 3 transfers in are assets that are consistently carried at fair value but have had a level change. Common stocks unaffiliated assets were transferred from Level 2 to Level 3 due to a change in the observability of pricing inputs, at the beginning fair value for the reporting period.

	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	$ (11)	$ (14)	$ -	$ 4	$ -	$ (6)	$ -	$ -	$ 63	$ 58
Parent, subsidiaries, and affiliates	50	1	8	2	11	(3)	(20)	-	-	9	58
Preferred stocks	3	-	-	2	-	-	-	-	-	(2)	3
Common stocks - subsidiaries and affiliates	40	-	7	-	1	-	(1)	-	-	16	63
Common stocks - unaffiliated	181	-	(5)	12	1	(2)	(1)	-	-	5	191
Separate account assets	725	22	-	149	-	(153)	(10)	5	-	-	738
Total financial assets	$ 1,021	$ 12	$ (4)	$ 165	$ 17	$ (158)	$ (38)	$ 5	$ -	$ 91	$ 1,111

Level 3 transfers in are assets that are consistently carried at fair value but have 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, at the beginning fair value for the reporting period.

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	$ 7,462	$ 573	$ 18	$ 8,017
All other governments	1,182	93	4	1,271
States, territories and possessions	626	59	1	684
Political subdivisions	548	47	-	595
Special revenue	5,934	724	7	6,651
Industrial and miscellaneous	71,818	3,720	323	75,215
Parent, subsidiaries and affiliates	7,300	157	40	7,417
Total	$ 94,870	$ 5,373	$ 393	$ 99,850

The December 31, 2017 gross unrealized losses exclude $25 million of losses included in the carrying value. These losses include $23 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	$ 7,130	$ 576	$ 53	$ 7,653
All other governments	925	38	27	936
States, territories and possessions	709	55	5	759
Political subdivisions	498	34	2	530
Special revenue	5,731	600	27	6,304
Industrial and miscellaneous	66,432	2,600	792	68,240
Parent, subsidiaries and affiliates	6,783	136	33	6,886
Total	$ 88,208	$ 4,039	$ 939	$ 91,308

The December 31, 2016 gross unrealized losses exclude $25 million of losses included in the carrying value. These losses include $20 million from NAIC Class 6 bonds and $5 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	$ 50,975	54 %	$ 49,956	57 %
2	Baa	34,812	37	30,673	35
3	Ba	4,514	5	3,483	4
4	B	3,060	3	2,583	3
5	Caa and lower	1,095	1	1,125	1
6	In or near default	414	-	388	-
	Total	$ 94,870	100 %	$ 88,208	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	$ 718	100 %	$ 1,939	99 %	$ 847	100 %	$ 1,824	100 %
2	-	-	6	-	-	-	-	-
3	-	-	3	-	-	-	-	-
5	-	-	-	-	-	-	6	-
6	-	-	28	1	-	-	5	-
	$ 718	100 %	$ 1,976	100 %	$ 847	100 %	$ 1,835	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	$ 1,817	$ 1,835
Due after one year through five years	23,162	23,743
Due after five years through ten years	26,356	27,302
Due after ten years	43,535	46,970
Total	$ 94,870	$ 99,850

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

	Years Ended December 31,	
	2017	2016
	(In Millions)	
Proceeds from sales	$ 7,013	$ 6,418
Gross realized capital gains from sales	121	144
Gross realized capital losses from sales	(163)	(252)

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	$ 892	$ 11	14	$ 201	$ 7	9
All other governments	39	1	11	74	3	15
States, territories and possessions	86	-	3	3	-	4
Political subdivisions	12	-	2	19	-	5
Special revenue	303	2	41	164	5	61
Industrial and miscellaneous	7,472	108	800	6,074	236	679
Parent, subsidiaries and affiliates	3,431	42	6	115	3	5
Total	$ 12,235	$ 164	877	$ 6,650	$ 254	778

The December 31, 2017 gross unrealized losses include $25 million of losses included in the carrying value. These losses include $23 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	$ 799	$ 51	13	$ 87	$ 3	4
All other governments	452	25	47	20	1	8
States, territories and possessions	66	1	5	42	4	2
Political subdivisions	57	2	13	-	-	-
Special revenue	797	24	174	41	2	141
Industrial and miscellaneous	16,213	470	1,283	7,730	343	690
Parent, subsidiaries and affiliates	4,096	30	8	446	8	20
Total	$ 22,480	$ 603	1,543	$ 8,366	$ 361	865

The December 31, 2016 gross unrealized losses include $25 million of losses included in the carrying value. These losses include $20 million from NAIC Class 6 bonds and $5 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 $3,345 million. Securities in an unrealized loss position for less than 12 months had a fair value of $1,589 million and unrealized losses of $19 million. Securities in an unrealized loss position for greater than 12 months had a fair value of $1,756 million and unrealized losses of $51 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 $8,377 million. Securities in an unrealized loss position for less than 12 months had a fair value of $3,472 million and unrealized losses of $67 million. Securities in an unrealized loss position for greater than 12 months had a fair value of $4,905 million and unrealized losses of $108 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 $16 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 $1,513 million and a fair value of $1,689 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 $599 million and a fair value of $726 million. As of December 31, 2016, RMBS had a total carrying value of $1,590 million and a fair value of $1,813 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 $727 million and a fair value of $872 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 $11,408 million and a fair value of $11,554 million, of which approximately 83%, 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 $11,244 million and a fair value of $11,256 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 $2,010 million and fair value of $2,029 million as of December 31, 2017 and a carrying value of $2,159 million and fair value of $2,180 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	$ 794	$ 490
Gross unrealized gains	31	44
Gross unrealized losses	(11)	(27)
Fair value	$ 814	$ 507

As of December 31, 2017, investments in preferred stocks in an unrealized loss position included holdings with a fair value of $551 million in 22 issuers, $142 million of which was 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 $186 million in 24 issuers, $126 million of which was in an unrealized loss position for more than 12 months. Based upon the Company's impairment review process discussed in *Note 2cc. "Realized capital gains (losses) including other-than-temporary impairments and unrealized capital gains (losses)"* the decline in value of these securities was not considered to be other than temporary as of December 31, 2017 or 2016.

The Company held preferred stocks for which the transfer of ownership was restricted by contractual requirements with carrying values of $695 million as of December 31, 2017 and $310 million as of December 31, 2016.

c. Common stocks – subsidiaries and affiliates

MMHLLC, a wholly-owned subsidiary of MassMutual, is the parent of subsidiaries that include Oppenheimer Acquisition Corp. (OAC) and Barings LLC (Barings) and deals in markets that include retail and institutional asset management entities and registered broker dealers. MMI, a wholly-owned subsidiary of MassMutual, includes investments in international life insurance operations in Japan and Hong Kong and deals in markets that include 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 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
	(In Billions)	
Total revenue	$ 4.7	$ 8.8
Net income	0.8	1.6
Assets	17.1	16.7
Liabilities	6.6	6.1
Member's equity	10.5	10.6

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.

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

MassMutual 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 MassMutual 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, MassMutual'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, MassMutual 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 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.

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 Consolidated 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
	(In Billions)	
Total revenue	$ 3.3	$ 4.8
Net income	-	0.6
Assets	32.7	30.8
Liabilities	29.6	27.7
Member's equity	3.1	3.1

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

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, 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	$ 1,034	$ 1,040
Gross unrealized gains	225	168
Gross unrealized losses	(42)	(86)
Carrying value	$ 1,217	$ 1,122

As of December 31, 2017, investments in unaffiliated common stocks in an unrealized loss position included holdings with a fair value of $255 million in 172 issuers, $147 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 $281 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 2cc. "Realized capital gains (losses) including other-than-temporary impairments and unrealized capital gains (losses)"* the decline in value of these securities was not considered to be other than temporary as of December 31, 2017 or 2016.

The Company held common stocks, for which the transfer of ownership was restricted by contractual requirements, with carrying values of $278 million as of December 31, 2017 and $246 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 Carrying Value	2017 Fair Value	2016 Carrying Value	2016 Fair Value
	(In Millions)			
Commercial mortgage loans:				
Primary lender	$ 21,533	$ 22,078	$ 19,935	$ 20,424
Mezzanine loans	50	51	74	76
Total commercial mortgage loans	21,583	22,129	20,009	20,500
Residential mortgage loans:				
FHA insured and VA guaranteed	1,932	1,885	1,916	1,871
Other residential loans	6	6	7	7
Total residential mortgage loans	1,938	1,891	1,923	1,878
Total mortgage loans	$ 23,521	$ 24,020	$ 21,932	$ 22,378

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

2018	$ 389
2019	942
2020	1,565
2021	1,686
2022	1,134
Thereafter	15,867
Commercial mortgage loans	21,583
Residential mortgage loans	1,938
Total	$ 23,521

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	$ 11,944	$ 8,892	$ 484	$ 213	$ -	$ 21,533
Mezzanine loans	-	-	50	-	-	50
Total commercial mortgage loans	11,944	8,892	534	213	-	21,583
Residential mortgage loans:						
FHA insured and VA guaranteed	1,932	-	-	-	-	1,932
Other residential loans	6	-	-	-	-	6
Total residential mortgage loans	1,938	-	-	-	-	1,938
Total mortgage loans	$ 13,882	$ 8,892	$ 534	$ 213	$ -	$ 23,521

	December 31, 2016					
	AAA/AA/A	BBB	BB	B	CCC and Lower	Total
	(In Millions)					
Commercial mortgage loans:						
Primary lender	$ 11,068	$ 8,023	$ 674	$ 152	$ 18	$ 19,935
Mezzanine loans	-	17	57	-	-	74
Total commercial mortgage loans	11,068	8,040	731	152	18	20,009
Residential mortgage loans:						
FHA insured and VA guaranteed	1,916	-	-	-	-	1,916
Other residential loans	7	-	-	-	-	7
Total residential mortgage loans	1,923	-	-	-	-	1,923
Total mortgage loans	$ 12,991	$ 8,040	$ 731	$ 152	$ 18	$ 21,932

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	$ 6,680	$ -	$ -	$ 6,680	31 %
Apartments	5,625	-	-	5,625	26
Industrial and other	3,743	-	-	3,743	18
Hotels	2,890	-	-	2,890	13
Retail	2,604	41	-	2,645	12
Total	$ 21,542	$ 41	$ -	$ 21,583	100 %

	December 31, 2016				
	Less Than 81%	81% to 95%	Above 95%	Total	% of Total
	($ In Millions)				
Office	$ 6,422	$ -	$ 18	$ 6,440	32 %
Apartments	5,242	-	-	5,242	26
Industrial and other	3,219	-	-	3,219	16
Hotels	2,718	-	-	2,718	14
Retail	2,361	29	-	2,390	12
Total	$ 19,962	$ 29	$ 18	$ 20,009	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	$ 5,139	49 %
New York	2,249	49 %
Illinois	2,034	49 %
United Kingdom	1,600	48 %
Texas	1,516	55 %
Washington	1,373	47 %
District of Columbia	1,284	55 %
All other	6,388	52 %
Total commercial mortgage loans	$ 21,583	50 %

All other consists of 27 jurisdictions, with no individual exposure exceeding $1,069 million.

	December 31, 2016	
	Carrying Value	Average Loan-to-Value Ratio
	($ In Millions)	
California	$ 5,244	51 %
New York	2,178	50 %
Illinois	2,157	50 %
Texas	1,608	54 %
Massachusetts	1,213	50 %
United Kingdom	1,026	51 %
Washington	987	46 %
All other	5,596	53 %
Total commercial mortgage loans	$ 20,009	51 %

All other consists of 28 jurisdictions, with no individual exposure exceeding $873 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	$ 18	$ 19	$ 25	$ (3)	$ 1
With no allowance recorded:					
Commercial mortgage loans:					
Primary lender	7	11	15	-	-
Total impaired commercial mortgage loans	$ 25	$ 30	$ 40	$ (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.

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

	Years Ended December 31, 2017	2016
	Primary Lender	
	(In Millions)	
Beginning balance	$ (3)	$ -
Additions	-	(9)
Decreases	3	-
Write-downs	-	6
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	December 31, 2016
	(In Millions)	
Held for the production of income	$ 1,873	$ 2,546
Accumulated depreciation	(654)	(1,101)
Encumbrances	(611)	(710)
Held for the production of income, net	608	735
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	$ 974

Depreciation expense on real estate was $102 million for the year ended December 31, 2017 and $107 million for the year ended December 31, 2016.

g. Partnerships and limited liability companies

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

	December 31, 2017	December 31, 2016
	(In Millions)	
Joint venture interests:		
Common stocks	$ 4,275	$ 4,380
Real estate	1,604	1,282
Fixed maturities/preferred stock	877	751
Other	307	273
LIHTCs	331	327
Mortgage loans	211	169
Surplus notes	258	205
Total	$ 7,863	$ 7,387

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 for the year ended December 31, 2017 and $41 million for the year ended December 31, 2016. The minimum holding period required for the Company's LIHTC investments extends from 1 year to 15 years.

There are no LIHTC investments subject to regulatory review for the years ended December 31, 2017 or 2016.

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.

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 $13,197 million as of December 31, 2017 and $12,147 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 $2,374 million as of December 31, 2017 and $3,236 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 $119 million as of December 31, 2017 and $264 million as of December 31, 2016. The statutory net amount at risk, defined as net collateral pledged and statement values excluding accrued interest, was $609 million as of December 31, 2017 and $766 million as of December 31, 2016.

The Company had the right to rehypothecate or repledge securities totaling $640 million of the $2,374 million as of December 31, 2017 and $1,031 million of the $3,236 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	$ 8,041	$ 84,861	$ 5,754	$ 91,151
Options	765	10,771	7	446
Currency swaps	405	4,538	590	6,661
Forward contracts	13	1,432	92	6,969
Credit default swaps	29	1,503	1	65
Financial futures	-	3,738	-	-
Total	$ 9,253	$ 106,843	$ 6,444	$ 105,292

	December 31, 2016			
	Assets		Liabilities	
	Carrying Value	Notional Amount	Carrying Value	Notional Amount
	(In Millions)			
Interest rate swaps	$ 8,510	$ 79,094	$ 6,413	$ 92,220
Options	679	6,898	6	5
Currency swaps	991	7,229	37	1,098
Forward contracts	54	3,444	58	2,941
Credit default swaps	38	2,435	1	215
Financial futures	-	3,646	-	-
Total	$ 10,272	$ 102,746	$ 6,515	$ 96,479

The average fair value of outstanding derivative assets was $9,733 million for the year ended December 31, 2017 and $13,531 million for the year ended December 31, 2016. The average fair value of outstanding derivative liabilities was $6,444 million for the year ended December 31, 2017 and $9,640 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	December 31, 2016
	(In Millions)	
Due in one year or less	$ -	$ 205
Due after one year through five years	1,568	2,445
Total	$ 1,568	$ 2,650

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

	December 31, 2017	December 31, 2016
	(In Millions)	
Open interest rate swaps in a fixed pay position	$ 86,283	$ 84,954
Open interest rate swaps in a fixed receive position	87,930	84,911
Other interest related swaps	1,799	1,449
Total interest rate swaps	$ 176,012	$ 171,314

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:

	Years Ended December 31,			
	2017		2016	
	Net Realized Gains (Losses) on Closed Contracts	Change In Net Unrealized Gains (Losses) on Open Contracts	Net Realized Gains (Losses) on Closed Contracts	Change In Net Unrealized Gains (Losses) on Open Contracts
	(In Millions)			
Interest rate swaps	$ (225)	$ 191	$ (5)	$ (96)
Currency swaps	102	(1,138)	27	391
Options	(175)	(155)	(144)	(21)
Credit default swaps	23	-	16	2
Forward contracts	(155)	(74)	315	(49)
Financial futures	149	-	(214)	-
Total	$ (281)	$ (1,176)	$ (5)	$ 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	$ 9,253	$ 6,444	$ 2,809	$ 10,272	$ 6,515	$ 3,757
Due and accrued	909	1,879	(970)	893	1,723	(830)
Gross amounts offset	(7,361)	(7,361)	-	(7,359)	(7,359)	-
Net asset	2,801	962	1,839	3,806	879	2,927
Collateral posted	(3,366)	(992)	(2,374)	(3,916)	(680)	(3,236)
Net	$ (565)	$ (30)	$ (535)	$ (110)	$ 199	$ (309)

i. Repurchase agreements

The Company had repurchase agreements with carrying values of $4,436 million as of December 31, 2017 and $4,966 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 $4,454 million as of December 31, 2017 and $4,976 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
	(In Millions)	
Bonds	$ 3,916	$ 3,797
Preferred stocks	18	25
Common stocks - subsidiaries and affiliates	437	431
Common stocks - unaffiliated	39	60
Mortgage loans	970	1,057
Policy loans	809	770
Real estate	159	174
Partnerships and LLCs	687	473
Derivatives	337	378
Cash, cash equivalents and short-term investments	45	35
Other	6	-
Subtotal investment income	7,423	7,200
Amortization of the IMR	124	149
Investment expenses	(681)	(689)
Net investment income	$ 6,866	$ 6,660

k. Net realized capital (losses) gains

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

	Years Ended December 31, 2017	Years Ended December 31, 2016
	(In Millions)	
Bonds	$ (110)	$ (249)
Preferred stocks	(6)	10
Common stocks - subsidiaries and affiliates	27	11
Common stocks - unaffiliated	(9)	(60)
Mortgage loans	(28)	(15)
Real estate	71	15
Partnerships and LLCs	(92)	(100)
Derivatives	(281)	(5)
Other	(127)	(2)
Net realized capital (losses) before federal and state taxes and deferral to the IMR	(555)	(395)
Net federal and state tax benefit	168	33
Net realized capital losses before deferral to the IMR	(387)	(362)
Net after tax (gains) losses deferred to the IMR	(44)	150
Net realized capital losses	$ (431)	$ (212)

The IMR liability balance was $57 million as of December 31, 2017 and $42 million as of December 31, 2016 and was included in other liabilities on the Consolidated 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	Years Ended December 31, 2016
	(In Millions)	
Bonds	$ (68)	$ (84)
Common stocks	(62)	(11)
Preferred stocks	(6)	(1)
Mortgage loans	-	(8)
Partnerships and LLCs	(57)	(96)
Total OTTI	$ (193)	$ (200)

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 $68 million of bond OTTI for the year ended December 31, 2017 and 1% of the $84 million of bond OTTI for the year ended December 31, 2016. The remaining OTTI amounts were determined using external inputs such as publicly-observable fair values and credit ratings. Refer to *Note 2cc. "Realized capital gains (losses) including other-than-temporary impairments and unrealized capital gains (losses)"* for more information on assumptions and inputs used in the Company's OTTI models.

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 $526 million in 2017. Of the $526 million net decrease, $978 million was reflected in the change in other deferred income taxes, $29 million was reflected in the change in net unrealized foreign exchange capital gains (losses), offset by increases of $428 million reflected in the change in net unrealized capital gains (losses), and $53 million reflected in change in non-admitted assets.

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 U.S. 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 $479 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. All of the companies included in these Consolidated Statutory Financial Statements have 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	$ 2,598	$ 173	$ 2,771
Statutory valuation allowance adjustment	-	-	-
Adjusted gross DTAs	2,598	173	2,771
DTAs nonadmitted	(64)	(16)	(80)
Subtotal net admitted DTA	2,534	157	2,691
Total gross DTLs	(1,666)	(237)	(1,903)
Net admitted DTA(L)	$ 868	$ (80)	$ 788

	December 31, 2016		
	Ordinary	Capital	Total
	(In Millions)		
Gross DTAs	$ 3,434	$ 672	$ 4,106
Statutory valuation allowance adjustment	-	-	-
Adjusted gross DTAs	3,434	672	4,106
DTAs nonadmitted	(145)	(30)	(175)
Subtotal net admitted DTA	3,289	642	3,931
Total gross DTLs	(1,704)	(573)	(2,277)
Net admitted DTA(L)	$ 1,585	$ 69	$ 1,654

	Change		
	Ordinary	Capital	Total
	(In Millions)		
Gross DTAs	$ (836)	$ (499)	$ (1,335)
Statutory valuation allowance adjustment	-	-	-
Adjusted gross DTAs	(836)	(499)	(1,335)
DTAs nonadmitted	81	14	95
Subtotal net admitted DTA	(755)	(485)	(1,240)
Total gross DTLs	38	336	374
Net admitted DTA(L)	$ (717)	$ (149)	$ (866)

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	$ -	$ 69	$ 69
Remaining adjusted gross DTAs expected to be realized within 3 years (lesser of 1 or 2):			
1. Adjusted gross DTA to be realized	904	-	904
2. Adjusted gross DTA allowed per limitation threshold	2,476	-	2,476
Lesser of lines 1 or 2	904	-	904
Adjusted gross DTAs offset by existing DTLs	1,630	88	1,718
Total admitted DTA realized within 3 years	$ 2,534	$ 157	$ 2,691

	December 31, 2016		
	Ordinary	Capital	Total
	(In Millions)		
Admitted DTA 3 years:			
Federal income taxes that can be recovered	$ 533	$ 132	$ 665
Remaining adjusted gross DTAs expected to be realized within 3 years (lesser of 1 or 2):			
1. Adjusted gross DTA to be realized	989	-	989
2. Adjusted gross DTA allowed per limitation threshold	2,331	-	2,331
Lesser of lines 1 or 2	989	-	989
Adjusted gross DTAs offset by existing DTLs	1,767	510	2,277
Total admitted DTA realized within 3 years	$ 3,289	$ 642	$ 3,931

	Change		
	Ordinary	Capital	Total
	(In Millions)		
Admitted DTA 3 years:			
Federal income taxes that can be recovered	$ (533)	$ (63)	$ (596)
Remaining adjusted gross DTAs expected to be realized within 3 years (lesser of 1 or 2):			
1. Adjusted gross DTA to be realized	(85)	-	(85)
2. Adjusted gross DTA allowed per limitation threshold	145	-	145
Lesser of lines 1 or 2	(85)	-	(85)
Adjusted gross DTAs offset by existing DTLs	(137)	(422)	(559)
Total admitted DTA realized within 3 years	$ (755)	$ (485)	$ (1,240)

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 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 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)	56 %	- %	56 %

	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)	65 %	100 %	66 %

	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)	(9)%	(100)%	(10)%

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
	(In Millions)	
Federal income tax benefit on operating earnings	$ (270)	$ (284)
Foreign income tax expense on operating earnings	2	7
Total federal and foreign income tax benefit before impact of change in enacted legislation	(268)	(277)
Impact of change in enacted tax legislation on operating earnings	(22)	-
Total federal and foreign income tax benefit on operating earnings	(290)	(277)
Federal income tax benefit on net realized capital gains (losses) before impact of change in enacted legislation	(171)	(34)
Impact of change in enacted tax legislation on net realized capital gains (losses)	3	-
Total federal and foreign income tax benefit	$ (458)	$ (311)

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	$ 1,092	$ 1,017	$ 75
Policy acquisition costs	485	741	(256)
Nonadmitted assets	294	556	(262)
Policyholders' dividends	189	342	(153)
Pension and compensation related items	191	291	(100)
Investment items	163	203	(40)
Expense items	45	45	-
Unrealized investment losses	17	25	(8)
Other	122	214	(94)
Total ordinary DTAs	2,598	3,434	(836)
Nonadmitted DTAs	(64)	(145)	81
Admitted ordinary DTAs	2,534	3,289	(755)
Capital			
Unrealized investment losses	113	459	(346)
Investment items	60	213	(153)
Total capital DTAs	173	672	(499)
Nonadmitted DTAs	(16)	(30)	14
Admitted capital DTAs	157	642	(485)
Admitted DTAs	2,691	3,931	(1,240)
DTLs:			
Ordinary			
Reserve items	537	76	461
Unrealized investment gains	498	759	(261)
Deferred and uncollected premium	214	323	(109)
Pension items	180	255	(75)
Reserve for audits and settlements	-	74	(74)
Investment Items	63	41	22
Other	174	176	(2)
Total ordinary DTLs	1,666	1,704	(38)
Capital			
Unrealized investment gains	235	501	(266)
Investment items	2	72	(70)
Total capital DTLs	237	573	(336)
Total DTLs	1,903	2,277	(374)
Net admitted DTA	$ 788	$ 1,654	$ (866)

The change in net deferred income taxes comprised the following:

	Years Ended December 31, 2017	2016
	(In Millions)	
Net DTA(L)	$ (962)	$ 391
Less: Items not recorded in the change in net deferred income taxes:		
Tax-effect of unrealized gains/(losses)	(177)	(76)
Tax-effect of changes from acquisitions/transfers	(6)	(46)
Change in net deferred income taxes	$ (1,145)	$ 269

The change in net deferred income taxes includes a decrease of $578 million due to the remeasurement of net DTA(L), of which an increase of $399 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 Consolidated Statutory Statements of Operations and the Consolidated 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
	(In Millions)	
Provision computed at statutory rate of 35%	$ (97)	$ (137)
Investment items	(263)	(335)
Corporate rate reduction	978	-
Nonadmitted assets	66	(96)
Tax credits	(51)	(49)
Change in reserve valuation basis	15	26
Expense items	6	16
Other impacts of tax reform	4	-
Other	29	(4)
Total statutory income tax expense (benefit)	$ 687	$ (579)
Federal and foreign income tax benefit	$ (458)	$ (310)
Change in net deferred income taxes	1,145	(269)
Total statutory income tax expense (benefit)	$ 687	$ (579)

The Company paid federal income taxes of $49 million in 2017 and received refunds of federal income taxes of $313 million in 2016.

The total income taxes incurred in the current and prior years that will be available for recoupment in the event of future net losses total nil related to December 31, 2017 and 2016, and totaled $149 million related to 2015.

MassMutual and its eligible U.S. subsidiaries are included in a consolidated U.S. federal income tax return. MassMutual and its eligible U.S. subsidiaries also file income tax returns in various states and foreign jurisdictions. MassMutual and its eligible U.S. subsidiaries and certain affiliates (the Parties) have executed and are subject to a written tax allocation agreement (the Agreement). The Agreement sets forth the manner in which the total combined federal income tax is allocated among the Parties. The Agreement provides MassMutual with the enforceable right to recoup federal income taxes paid in prior years in the event of future net capital losses, which it may incur. Further, the Agreement provides MassMutual with the enforceable right to utilize its net losses carried forward as an offset to future net income subject to federal income taxes.

Companies are generally required to disclose unrecognized tax benefits, which are the tax effect of positions taken on their tax returns that may be challenged by various taxing authorities, in order to provide users of financial statements more information regarding potential liabilities. The Company recognizes tax benefits and related reserves in accordance with existing statutory accounting practices for liabilities, contingencies and impairments of assets.

The following is a reconciliation of the beginning and ending liability for unrecognized tax benefits (in millions):

Balance, January 1, 2017	$	150
Gross change related to positions taken in prior years		12
Gross change related to positions taken in current year		35
Gross change related to settlements		-
Gross change related to lapse of statutes of limitations		-
Balance, December 31, 2017	$	197

Included in the liability for unrecognized tax benefits as of December 31, 2017, are $188 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 $38 million as of December 31, 2017 and $25 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 MassMutual its subsidiaries 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.

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

MassMutual 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. MassMutual pays all premiums and is the beneficiary of these policies. MassMutual 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 Consolidated 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	733	775	675	701
Group life	9	9	9	9
Total	$ 893	$ 831	$ 819	$ 752

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 $32,528 million as of December 31, 2017 and $32,224 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 $661,082 million as of December 31, 2017 and $605,379 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	$ 51,313	2.5 % - 6.0 %	$ 47,795	2.5 % - 6.0 %
Group life	16,556	2.5 % - 4.5 %	18,519	2.5 % - 4.5 %
Individual annuities	17,182	2.3 % - 11.8 %	16,599	2.3 % - 11.8 %
Group annuities	24,718	2.3 % - 11.3 %	23,728	2.3 % - 11.3 %
Individual universal and variable life	6,952	3.5 % - 6.0 %	6,607	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	325	2.5 % - 6.0 %	311	2.5 % - 6.0 %
Total	$ 119,905		$ 116,354	

Individual life includes whole life and term insurance. Group life includes corporate-owned life insurance, bank-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	1.4 % - 9.7 %
Supplementary contracts	930	0.3 % - 7.0 %	899	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	$ 13,110		$ 11,665	

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 Consolidated 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 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 MassMutual's $17.0 billion Global Medium-Term Note Program.

Federal Home Loan Bank of Boston

MassMutual 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. MassMutual's borrowing capacity with FHLB Boston is subject to the lower of the limitation on the pledge of collateral for a loan set forth by law or by MassMutual's internal limit. MassMutual's unused capacity was $946 million as of December 31, 2017. As a member of FHLB Boston, MassMutual held common stock of FHLB Boston 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 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 guaranteed interest contracts 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 guaranteed interest contracts only mature on their contractual maturity date. Actual maturities for municipal contracts may differ from their contractual maturity dates, as these contracts permit early contract termination under certain conditions.

c. Unpaid claims and claim expense reserves

The Company establishes unpaid claims and claim expense reserves to provide for the estimated costs of claims for individual disability and LTC policies. These reserves include estimates for both claims that have been reported and those that have been incurred but not reported, and include estimates of all future expenses associated with the processing and settling of these claims. This estimation process is primarily based on the assumption that experience is an appropriate indicator of future events and involves a variety of actuarial techniques that analyze experience, trends and other relevant factors. The amounts recorded for unpaid claims and claim expense reserves represent the Company's best estimate based upon facts and actuarial guidelines. Accordingly, actual claim payouts may vary from these estimates.

The following summarizes the changes in disabled life and LTC unpaid claims and claim expense reserves:

	December 31, 2017	December 31, 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. In 2016, claims incurred included both higher volume and size of claims, while 2017 claim experience included normal claim volume with higher terminations, resulting in a reduction to the incurred reserve from favorable experience.

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	December 31, 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 individual variable annuity and fixed index annuity products have 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	$ 579
Incurred guarantee benefits	81
Paid guarantee benefits	(6)
Liability as of December 31, 2016	654
Incurred guarantee benefits	(130)
Paid guarantee benefits	(9)
Liability as of December 31, 2017	$ 515

The Company held reserves in accordance with the stochastic scenarios as of December 31, 2017 and December 31, 2016. As of December 31, 2017 and December 31, 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			2016		
	Account Value	Net Amount at Risk	Weighted Average Attained Age	Account Value	Net Amount at Risk	Weighted Average Attained Age
	($ In Millions)					
GMDB	$ 21,887	$ 54	64	$ 20,473	$ 72	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	$ 17,441	$ 4,446	$ 21,887	$ 16,065	$ 4,408	$ 20,473
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	$ 3,251	$ 3,556
Net liability increase (decrease)	370	(305)
Ending balance	$ 3,621	$ 3,251

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.

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 $3,975 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 Consolidated Statutory Statements of Operations were as follows:

	Years Ended December 31, 2017	2016
	(In Millions)	
Direct premium	$ 21,839	$ 21,801
Premium assumed	1,305	1,389
Premium ceded	(5,382)	(1,944)
Total net premium	$ 17,762	$ 21,246
Ceded reinsurance recoveries	$ 852	$ 741
Assumed losses	$ 32	$ -

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

	December 31, 2017	2016
	(In Millions)	
Reinsurance reserves		
Assumed	$ 8,327	$ 8,587
Ceded	(10,177)	(5,557)
Ceded amounts recoverable	$ 217	$ 188
Benefits payable on assumed business	$ 2	$ -
Funds held under coinsurance		
Ceded	$ 4,001	$ -

Reinsurance reserves ceded to unaffiliated reinsurers as of December 31, 2017 include $8,148 million associated with life insurance policies, $1,733 million for LTC, $256 million for annuity, $30 million for disability and $10 million for group life and health. Reinsurance reserves ceded to unaffiliated reinsurers as of December 31, 2016 include $3,994 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 Consolidated Statutory Statement of Financial Position and ceded premium of $4.0 billion and reduced changes in policyholder reserves of $4.0 billion in the Consolidated Statutory Statements of Operations.

Effective December 31, 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 $313 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 December 2016, the Company ceded premium of $965 million and policyholders' reserves of $776 million in the change in policyholders' reserves in the Consolidated Statutory Statement of Operations and recorded a $284 million increase in the Consolidated 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 28% 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	Total	% of Total
	($ In Millions)				
Subject to discretionary withdrawal:					
With market value adjustment	$ 13,980	$ -	$ -	$ 13,980	12%
At book value less current surrender charge of 5% or more	1,437	-	-	1,437	1
At fair value	-	11,947	48,370	60,316	50
Subtotal	15,417	11,947	48,370	75,734	64
Subject to discretionary withdrawal:					
At book value without fair value adjustment	13,807	532	-	14,339	11
Not subject to discretionary withdrawal	25,266	5,820	-	31,086	26
Total	$ 54,490	$ 18,299	$ 48,370	$ 121,159	100%

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

Consolidated Statutory Statements of Financial Position:	
Policyholders' reserves – group annuities	$ 24,713
Policyholders' reserves – individual annuities	16,668
Liabilities for deposit-type contracts	13,110
Subtotal	54,491
Separate Account Annual Statement:	
Annuities	60,849
Other annuity contract deposit-funds and guaranteed interest contracts	5,820
Subtotal	66,669
Total	$ 121,160

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	$ -	$ -	$ 8,195	$ 8,195
Reserves at December 31, 2017:				
For accounts with assets at:				
Fair value	$ -	$ 18,300	$ 54,944	$ 73,244
Amortized cost/book value	-	1,117	-	1,117
Subtotal SIA Reserves	-	19,417	54,944	74,361
Nonpolicy liabilities	-	1	1,143	1,144
Total Separate Account Liabilities	$ -	$ 19,418	$ 56,087	$ 75,505
Reserves by withdrawal characteristics:				
Subject to discretionary withdrawal:				
At fair value	$ -	$ 17,768	$ 54,944	$ 72,712
At book value without market value adjustment and current surrender charge of less than 5%	-	1,649	-	1,649
Subtotal	-	19,417	54,944	74,361
Not subject to discretionary withdrawal	-	-	-	-
Nonpolicy liabilities	-	1	1,143	1,144
Total Separate Account Liabilities	$ -	$ 19,418	$ 56,087	$ 75,505

As of December 31, 2017, the Company has $5 million of AVR related to book value separate accounts.

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 Consolidated Statutory Statements of Operations:

	Years Ended December 31, 2017	2016
	(In Millions)	
From the Separate Account Annual Statement:		
Transfers to separate accounts	$ 8,195	$ 7,462
Transfers from separate accounts	(9,330)	(8,641)
Subtotal	(1,135)	(1,179)
Reconciling adjustments:		
Net withdrawals on deposit-type liabilities	(1,909)	(1,183)
Net transfers from separate accounts	$ (3,044)	$ (2,362)

Net withdrawals on deposit-type liabilities are not considered premium and therefore are excluded from the Consolidated Statutory Statements of Operations.

11. Debt

MassMutual 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 MassMutual. The Notes had a carrying value and face amount of $250 million as of December 31, 2017 and 2016. Notes issued in 2017 had interest rates ranging from 0.60% to 1.25% with maturity dates ranging from 1 to 41 days. Interest expense for commercial paper was $2.6 million for the year ended December 31, 2017 and less than $1 million for the year ended December 31, 2016.

MassMutual 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 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 t*he* years ended December 31, 2017 and December 31, 2016.

12. Employee benefit plans

The Company sponsors multiple employee benefit plans, providing retirement, life, health and other benefits to employees, certain employees of unconsolidated subsidiaries, agents, general agents and retirees who meet plan eligibility requirements.

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.

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 Consolidated 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	December 31, 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 Consolidated 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 "Consolidated Statement 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 "Consolidated Statement 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 Consolidated Statutory Statements of Operations. The net periodic cost recognized is as follows:

	Years Ended December 31,			
	2017	2016	2017	2016
	Pension Benefits		Other Postretirement Benefits	
	(In Millions)			
Service cost	$ 126	$ 100	$ 12	$ 12
Interest cost	112	113	12	14
Expected return on plan assets	(147)	(144)	-	-
Amortization of unrecognized net actuarial and other losses	65	70	2	3
Amortization of unrecognized prior service cost	3	3	(6)	(6)
Total net periodic cost	$ 159	$ 142	$ 20	$ 23

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

	Pension Benefits	Other Postretirement Benefits
	(In Millions)	
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 Consolidated Statutory Statements of Operations for all employee and agent benefit plans is as follows:

	Years Ended December 31,	
	2017	2016
	(In Millions)	
Pension	$ 159	$ 142
Health	131	103
Thrift	56	46
Postretirement	20	23
Life	4	4
Disability	4	4
Other benefits	10	10
Total	$ 384	$ 332

h. Assumptions

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

	December 31,			
	2017	2016	2017	2016
	Pension Benefits		Other Postretirement Benefits	
Weighted-average assumptions used to determine:				
Benefit obligations:				
Discount rate	3.60 %	4.10 %	3.40 %	3.85 %
Expected long-term rate of return on plan assets	6.75 %	6.75 %	3.00 %	3.00 %
Expected rate of compensation increase	3.50 %	3.50 %	3.50 %	3.50 %
Net periodic benefit cost:				
Discount rate	4.10 %	4.30 %	3.85 %	3.95 %
Expected long-term rate of return on plan assets	6.75 %	7.00 %	3.00 %	3.00 %
Expected rate of compensation increase	3.50 %	3.50 %	3.50 %	3.50 %

The discount rate used to determine the benefit obligations as of year end is used to determine the expense in the next fiscal year.

The Company determines its assumptions for the expected rate of return on plan assets for its plans using a “building block” approach, which focuses on ranges of anticipated rates of return for each asset class. A weighted range of nominal rates is determined based on target allocations for each class of asset.

13. Employee compensation plans

The Company has a long-term incentive compensation plan under which certain employees of the Company and its subsidiaries may be issued phantom stock-based compensation awards. These awards include PSARs and PRS. These awards do not grant an equity or ownership interest in the Company.

A summary of the weighted average grant price of PSARs and PRS shares granted, the intrinsic value of PSARs shares exercised, the PRS liabilities paid and the fair value of shares vested during the year is as follows:

	December 31,	
	2017	2016
Weighted average grant date fair value:		
PSARs granted during the year	$ 79.47	$ 86.80
PRS granted during the year	80.09	86.67
Intrinsic value (in thousands):		
PSARs options exercised	4,794	5,220
PRS liabilities paid	19,802	25,931
Fair value of shares vested during the year	35,563	26,622

A summary of PSARs and PRS shares is as follows:

	PSARs			PRS		
		Weighted Average			Weighted Average	
	Number of Share Units	Price	Remaining Contract Terms	Number of Share Units	Price	Remaining Contract Terms
	(In Thousands)		(In Years)	(In Thousands)		(In Years)
Outstanding as of December 31, 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. 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 as of December 31, 2017 and there was no unrecognized compensation expense related to nonvested PSARs awards for the year ended December 31, 2016. The weighted average period over which the expense is expected to be recognized is 3.1 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. The PRS accrued compensation liability was $55 million for the year ended December 31, 2017 and $44 million for year ended December 31, 2016. The unrecognized compensation expense related to nonvested PRS awards was $53 million as of December 31, 2017 and $39 million as of December 31, 2016. 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

MassMutual executed a tender offer in March 2017 for $440 million par value of surplus notes maturing in 2039. MassMutual 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 Consolidated Statutory Statements of Operations and other costs of investments acquired within the Consolidated 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 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, MassMutual 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 MassMutual, all policy claims and all prior claims against MassMutual 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 Consolidated 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 and 2016. Accordingly, the Company has excluded these non-cash activities from the Consolidated Statutory Statements of Cash Flows for the years ended December 31, 2017 and 2016.

	Years Ended December 31, 2017	Years Ended December 31, 2016
	(In Millions)	
Premium ceded under new reinsurance agreement	$ 4,002	$ -
Bond conversions and refinancing	835	442
Partnerships and LLCs contributed to Insurance Road LLC	743	-
Premium recognized for group annuity contracts	490	905
Partnerships and LLCs contributed to MassMutual Asset Finance LLC	350	-
Stock conversion	331	-
Transfer of real estate to partnerships and LLCs	138	-
Contributions of affiliated common stock	103	-
Other invested assets to bonds	96	80
Stock to bond	74	-
Mortgage loans contributed to partnerships	22	100
Stock distributions from partnerships and LLCs	2	114
Acquisition of affiliated common stock for bonds and mortgage loans	-	3,287
Partnerships and LLCs contributed to MMHLLC	-	682
Bonds converted from long-term to short-term	-	89
Bank loan rollovers	-	5
Bonds received as consideration for group annuity contracts	(490)	(905)
Funds held under coinsurance	(4,002)	-
Other	151	113

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 long-term care insurance policies to mitigate the impact of its underwriting risk.

Investment and interest rate risks

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

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

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

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

Currency exchange risk

The Company has currency risk due to its non-U.S. dollar investments and medium-term notes along with its indirect international operations. The Company mitigates 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 and $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, 2017 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 consolidated statement of financial position. However, an adverse outcome in certain matters could have a material adverse effect on the consolidated results of operations for the period in which such matter is resolved, or an accrual is determined to be required, on the consolidated 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	$ 862	$ 1	$ 1,404	$ 33	$ 56	$ 226	$ 2,582
Mortgage loans	355	316	936	20	12	193	1,832
Real estate	-	16	204	-	-	-	220
Partnerships and LLCs	496	449	323	219	367	928	2,782
LIHTCs (including equity contributions)	17	101	262	200	-	31	611
Total	$ 1,730	$ 883	$ 3,129	$ 472	$ 435	$ 1,378	$ 8,027

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 (Barings Real Estate Advisers LLC (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*

MassMutual has management and service contracts and cost-sharing arrangements with various subsidiaries and affiliates where MassMutual, for a fee, will furnish a subsidiary or affiliate, as required, operating facilities, human resources, computer software development and managerial services.

MassMutual 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 MassMutual receives revenue for certain recordkeeping and other services that MassMutual provides to customers who select, as investment options, mutual funds managed by these affiliates.

MassMutual has agreements with its subsidiaries, Barings, BREA, MML Investment Advisers, LLC, OFI and MMIP, which provide investment advisory services and licensing agreements to MassMutual.

The following table summarizes the transactions between MassMutual and the related parties:

	Years Ended December 31, 2017	2016
	(In Millions)	
Fee income:		
Management and service contracts and cost-sharing arrangements	$ 255	$ 241
Investment advisory income	25	25
Recordkeeping and other services	25	24
Fee expense:		
Investment advisory services	248	303
Royalty and licensing fees	26	-

The Company reported amounts due from subsidiaries and affiliates of $60 million as of December 31, 2017 and $69 million as of December 31, 2016. The Company reported amounts due to subsidiaries and affiliates of $29 million as of December 31, 2017 and $59 million as of December 31, 2016. Terms generally require settlement of these amounts within 30 to 90 days.

The Company's wholly owned indirect subsidiaries, Barings and Barings Real Estate Advisers (BREA), invest a portion of their nonqualified compensation plan in GICs with the Company. For the year ended December 31, 2017, the Company credited interest on deposits of $9 million to the Barings contract and $3 million to the BREA contract. For the year ended December 31, 2016, the Company credited interest on deposits of $4 million to the Barings contract and $2 million to the BREA contract.

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

As of December 31, 2017, MassMutual and C.M. Life, together, approved financing of $4,475 million for MassMutual Asset Finance, LLC (MMAF) that can be used to finance ongoing asset purchases and refinance existing MassMutual provided lines of credit. As of December 31, 2017 and 2016, MassMutual 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 and C.M. Life were $3,362 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 for the years ended 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 $206 million and repaid $155 million under the credit facility. During 2016, Jefferies borrowed $203 million and repaid $178 million under the credit facility. As of December 31, 2017, there were no outstanding borrowings under this facility. All outstanding interest due under the facility, as of December 31, 2017 and 2016, 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 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 with MassMutual Intellectual Property LLC (MMIP) effective June 30, 2017 that gave MassMutual the right to use certain intellectual property in the operation of its business. In 2017, MassMutual incurred an expense 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.

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.

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 MassMutual'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.

Glossary of Terms

Term	Description
ABS	Asset-backed securities
AVR	Asset valuation reserve
Barings	Barings LLC
BOLI	Bank-owned life insurance
BREA	Barings Real Estate Advisers LLC
C.M. Life	C.M. Life Insurance Company
CARVM	Commissioners Annuity Reserve Valuation Method
CDHS	Clearly defined hedging strategy
CDOs	Collateralized debt obligations
CFC	Controlled foreign corporation
CMBS	Commercial mortgage-backed securities
CP	Commercial paper
CRVM	Commissioners Reserve Valuation Method
DTAs	Deferred tax assets
DTC	Direct to Consumer
DTLs	Deferred tax liabilities
FHA	Federal Housing Administration
FHLB Boston	Federal Home Loan Bank of Boston
GIA	General investment account
GICs	Guaranteed interest contracts
GMAB	Guaranteed minimum accumulation benefits
GMDB	Guaranteed minimum death benefits
GMIB	Guaranteed minimum income benefits
GMWB	Guaranteed minimum withdrawal benefits
IMR	Interest maintenance reserve
IRS	Internal Revenue Service
IS	Institutional Solutions
LIHTCs	Low income housing tax credits
LLCs	Limited liability companies
LTC	Long-term care
MassMutual	Massachusetts Mutual Life Insurance Company
MBS	Mortgage-backed securities
MMAF	MassMutual Asset Finance LLC
MMFA	MassMutual Financial Advisors
MMHLLC	MassMutual Holding LLC
MMI	MassMutual International LLC
MML Bay State	MML Bay State Life Insurance Company
MODCO	Modified coinsurance
MSIFS	MSI Financial Services Inc.
NAIC	National Association of Insurance Commissioners
NAV	Net asset value
NCI	Noncontrolling interest
OAC	Oppenheimer Acquisition Corporation
OFI	OppenheimerFunds Inc.
OFI Institutional	OFI Institutional Asset Management
OTTI	Other-than-temporary impairment(s)
PBR	Principles-based reserving

Pension Trust Assets	MassMutual Pension Plan Trust
PCG	Premier Client Group
PRS	Phantom Restricted Stock
PSARs	Phantom Stock Appreciation Rights
RBC	Risk-based capital
RHRA	Retire Health Reimbursement Account
RMBS	Residential mortgage-backed securities
SCA	Subsidiary, controlled or affiliated
SPEs	Special purpose entities
SSAP	Statements of Statutory Accounting Principles
SVO	Securities Valuation Office
TBA	"To be announced" forward contracts
the Act	Tax Cuts and Jobs Act
The Company	Massachusetts Mutual Life Insurance Company, a mutual life insurance company domiciled in the Commonwealth of Massachusetts, and its domestic life insurance subsidiaries domiciled in the State of Connecticut
The Division	Commonwealth of Massachusetts Division of Insurance
The Parties	MassMutual and its eligible subsidiaries and certain affiliates
U.S. GAAP	U.S. generally accepted accounting principles
VA	Veterans administration
VAGLB	Variable annuity guaranteed living benefits
WS	Workplace Solutions

Statement of Standard Accounting Practice (SSAP)

SSAP No. 1	*Accounting Policies, Risks & Uncertainties and Other Disclosures* adopted by NAIC in April, 2016 effective January 31, 2017.
SSAP No. 26R	*Bond* adopted by NAIC in April, 2017 effective December 31, 2017.
SSAP No. 30	*Unaffiliated Common Stock* adopted by NAIC in June, 2017 effective January 1, 2017.
SSAP No. 35R	*Guaranty Fund and Other Assessments* adopted by NAIC in December, 2016 effective March 16, 2017.
SSAP No. 37	*Mortgage Loans* adopted by NAIC in June, 2017 effective June 8, 2017.
SSAP No. 41R	*Surplus Notes* adopted by NAIC in April, 2016 effective January 1, 2017.
SSAP No. 43R	*Loan-backed and Structured Securities* adopted by NAIC in June, 2016 effective January 1, 2017.
SSAP No. 48	*Joint Ventures, Partnerships and Limited Liability Companies* adopted by NAIC in June, 2017 effective January 1, 2017.
SSAP No. 51R	*Life Contracts* adopted by NAIC in August, 2016 effective January 1, 2017.
SSAP No. 69	*Statement of Cash Flows: Classification of Certain Cash Receipts and Cash Payments* adopted by NAIC in June, 2017 effective December 31, 2019.
SSAP No. 86	*Derivatives* adopted by NAIC in January, 2017 effective January 1, 2018.
SSAP No. 97	*Investments in Subsidiary, Controlled and Affiliated Entities* adopted by NAIC in June, 2017 effective January 1, 2017.
SSAP No. 100R	*Fair Value* adopted by NAIC in November, 2017 effective January 1, 2018.
SSAP No. 102	*Pensions* adopted by NAIC in June, 2016.