

**MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
AND SUBSIDIARIES**

CONSOLIDATED STATUTORY FINANCIAL STATEMENTS

As of and for the years ended
December 31, 2024 and 2023

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
CONSOLIDATED STATUTORY FINANCIAL STATEMENTS

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

	December 31, 2024	December 31, 2023
	(In Millions)	
Assets:		
Bonds	\$ 166,513	\$ 147,300
Preferred stocks	1,030	451
Common stocks – subsidiaries and affiliates	24,147	23,597
Common stocks – unaffiliated	1,209	1,630
Mortgage loans	24,363	24,825
Policy loans	17,907	16,138
Real estate	323	329
Partnerships and limited liability companies	14,908	13,055
Derivatives	24,889	21,301
Cash, cash equivalents and short-term investments	6,288	11,941
Other invested assets	3,770	2,626
Total invested assets	285,347	263,193
Investment income due and accrued	5,436	5,324
Federal income taxes	581	319
Net deferred income taxes	1,881	1,685
Other than invested assets	6,485	5,806
Total assets excluding separate accounts	299,730	276,327
Separate account assets	55,935	58,997
Total assets	<u>\$ 355,665</u>	<u>\$ 335,324</u>
Liabilities and Surplus:		
Policyholders' reserves	\$ 181,225	\$ 170,570
Liabilities for deposit-type contracts	21,288	19,712
Contract claims and other benefits	624	732
Policyholders' dividends	2,533	2,150
General expenses due or accrued	921	1,049
Asset valuation reserve	6,038	6,071
Repurchase agreements	3,408	3,219
Debt	250	50
Collateral	1,986	2,160
Derivatives	17,125	14,013
Funds held under coinsurance	29,625	22,520
Other liabilities	6,969	5,342
Total liabilities excluding separate accounts	271,992	247,588
Separate account liabilities	55,791	58,859
Total liabilities	327,783	306,447
Surplus	27,882	28,877
Total liabilities and surplus	<u>\$ 355,665</u>	<u>\$ 335,324</u>

See accompanying notes to consolidated statutory financial statements

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

	Years Ended December 31,	
	2024	2023
	(In Millions)	
Revenue:		
Premium income	\$ 21,288	\$ 25,608
Net investment income	11,637	11,249
Fees and other income	1,307	1,097
Total revenue	<u>34,232</u>	<u>37,954</u>
Benefits, expenses and other deductions:		
Policyholders' benefits	17,745	18,344
Change in policyholders' reserves	8,459	11,580
General insurance expenses	2,412	2,383
Commissions	1,439	1,433
State taxes, licenses and fees	335	337
Other deductions	1,073	1,120
Total benefits and expenses	<u>31,463</u>	<u>35,197</u>
Net gain from operations before dividends and federal income taxes	<u>2,769</u>	<u>2,757</u>
Dividends to policyholders	<u>2,501</u>	<u>2,131</u>
Net gain from operations before federal income taxes	<u>268</u>	<u>626</u>
Federal income tax (benefit) expense	<u>(284)</u>	<u>123</u>
Net gain from operations	<u>552</u>	<u>503</u>
Net realized capital losses	<u>(807)</u>	<u>(505)</u>
Net loss	<u><u>\$ (255)</u></u>	<u><u>\$ (2)</u></u>

See accompanying notes to consolidated statutory financial statements

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

	Years Ended December 31,	
	2024	2023
	(In Millions)	
Surplus, beginning of year	\$ 28,877	27,941
Net (decrease) increase due to:		
Net loss	(255)	(2)
Change in net unrealized capital gains (losses), net of tax	50	(104)
Change in net unrealized foreign exchange capital (losses) gains, net of tax	(283)	403
Change in other net deferred income taxes	265	476
Change in nonadmitted assets	(199)	403
Change in asset valuation reserve	33	(297)
Change in reserve valuation basis	(5)	—
Change in surplus notes	(50)	(149)
Change in minimum pension liability	39	(7)
Prior period adjustments	(351)	168
Other	(239)	45
Net (decrease) increase	(995)	936
Surplus, end of year	\$ 27,882	28,877

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,	
	2024	2023
	(In Millions)	
Cash from operations:		
Premium and other income collected	\$ 22,563	\$ 26,647
Net investment income	10,290	12,508
Benefit payments	(17,368)	(18,065)
Net transfers from separate accounts	2,171	1,762
Commissions and other expenses	(5,232)	(5,272)
Dividends paid to policyholders	(2,118)	(1,907)
Federal and foreign income taxes paid	90	50
Net cash from operations	10,396	15,723
Cash from investments:		
Proceeds from investments sold, matured or repaid:		
Bonds	41,017	25,138
Preferred and common stocks – unaffiliated	254	290
Common stocks – affiliated	191	124
Mortgage loans	4,665	3,794
Real estate	(21)	5
Partnerships and limited liability companies	2,763	1,861
Derivatives	(570)	(227)
Other	(1,100)	(410)
Total investment proceeds	47,199	30,575
Cost of investments acquired:		
Bonds	(60,946)	(32,557)
Preferred and common stocks – unaffiliated	(1,075)	(316)
Common stocks – affiliated	(177)	(256)
Mortgage loans	(4,668)	(2,957)
Real estate	(3)	(8)
Partnerships and limited liability companies	(3,257)	(3,005)
Derivatives	236	—
Other	419	154
Total investments acquired	(69,471)	(38,945)
Net (increase) decrease in policy loans	(1,770)	1,157
Net cash used in investing activities	(24,042)	(7,213)
Cash from financing and miscellaneous sources:		
Net deposits on deposit-type contracts	1,210	1,222
Change in surplus notes	(50)	(150)
Change in repurchase agreements	195	171
Change in collateral	(83)	(2,187)
Other cash provided (used)	6,721	(1,362)
Net cash from (used in) financing and miscellaneous sources	7,993	(2,306)
Net change in cash, cash equivalents and short-term investments	(5,653)	6,204
Cash, cash equivalents and short-term investments:		
Beginning of year	11,941	5,737
End of year	\$ 6,288	\$ 11,941

See accompanying notes to consolidated statutory financial statements

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
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 income insurance (DI), individual and group annuities and guaranteed interest contracts (GIC) to individual and institutional customers in all 50 states of the United States of America (U.S.), the District of Columbia and Puerto Rico. Products and services are offered primarily through the Company's affiliated distribution channel, MassMutual Strategic Distributors (MMSD), Institutional Solutions (IS) and Worksite distribution channels.

The affiliated distribution channel is a sales force of financial professionals that operate in the U.S. The affiliated distribution channel sells life insurance, annuities, hybrid life and long term care insurance (LTC) and DI. The Company's MMSD channel sells life insurance, DI, annuity, and hybrid life and LTC solutions through a network of third-party distribution partners. The Company's IS distribution channel places group annuities, life insurance and GIC primarily through retirement advisory firms, actuarial consulting firms, investment banks, insurance benefit advisors and investment management companies. The Company's Worksite channel works with advisors and employers across the country to provide American workers with voluntary and executive benefits such as group whole life insurance, group critical illness insurance, group accident insurance and DI, through the workplace.

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:

Invested assets

- 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
- Changes in the fair value of derivative financial instruments are recorded as changes in surplus, whereas U.S. GAAP generally reports these changes in revenue unless deemed an effective hedge
- Interest rate and credit default swaps associated with replicated synthetic investment transactions are carried at amortized cost, whereas U.S. GAAP would carry them at fair value
- Embedded derivatives are recorded as part of the underlying contract, whereas U.S. GAAP would identify and bifurcate certain embedded derivatives from the host contract or security and account for them separately at fair value
- Income recognition on partnerships and limited liability companies, which are accounted for under the equity method, is limited to the amount of cash distribution, whereas U.S. GAAP is without limitation

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

- Certain majority-owned subsidiaries and variable interest entities are accounted for using the equity method, whereas U.S. GAAP would consolidate these entities
- Financial assets including mortgage and other commercial loans, equipment loans, held-to-maturity debt securities, and trade, lease, reinsurance and other receivables are accounted for using the other-than-temporary impairments(s) (OTTI) model described in Note 2dd, whereas U.S. GAAP would use the current expected credit loss impairment model for these financial assets carried at amortized cost.

Policyholders' liabilities

- Statutory policy reserves are generally based upon prescribed methods, such as the Commissioners' Reserve Valuation Method, Commissioners' Annuity Reserve Valuation Method 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
- Liabilities for policyholders' 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 recoverable or due from reinsurers
- 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

General insurance expenses and commissions

- 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 generally would capitalize these expenses and amortize them based on profit emergence over the expected life of the policies or over the premium payment period

Net realized capital (losses) gains

- After-tax realized capital (losses) gains 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

Surplus

- 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
- 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
- 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 limited liability companies 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
- 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 follows the current expected credit losses model
- 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

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

- Surplus notes issued by the Company are reported in surplus, whereas U.S. GAAP reports these notes as liabilities
- 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 AVR, prior period adjustments and change in minimum pension liability, whereas U.S. GAAP presents net income as retained earnings and net unrealized capital gains (losses), change in net unrealized foreign exchange capital gains (losses), change in minimum pension liability as other comprehensive income
- The change in the fair value for unaffiliated common stock is recorded in surplus, whereas the change in the fair value for ownership interests in an entity not accounted for under the equity method or consolidated are recorded in revenue for U.S. GAAP

Other

- 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

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, the value of the investment in MassMutual Holding LLC (MMHLLC), the liabilities for policyholders' reserves, the determination of admissible deferred tax assets (DTA), the liability for taxes and the liability for litigation or other contingencies. Future events including, but not limited to, changes in the level of mortality, morbidity, interest rates, persistency, asset valuations and defaults could cause results to differ from the estimates used in 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.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

b. Corrections of errors and reclassifications

For the years ended December 31, 2024 and 2023 corrections of prior years' errors were recorded in surplus, net of tax:

	Years Ended December 31, 2024 and 2023					
	Increase (Decrease) to:					
	Prior Years' Net Income		Current Year Surplus		Asset or Liability Balances	
	2024	2023	2024	2023	2024	2023
	(In Millions)					
Bonds	\$ (82)	\$ —	\$ (82)	\$ —	\$ (82)	\$ —
Common stocks - subsidiaries and affiliates	(1)	19	(1)	19	(1)	19
Partnerships and limited liability companies	(3)	15	(3)	15	(3)	15
Derivative assets	—	—	—	(125)	—	(125)
Cash, cash equivalents and short-term investments	(2)	—	(2)	—	(2)	—
Other invested assets	—	22	—	22	—	22
Investment income due and accrued	(161)	228	(161)	228	(161)	228
Policyholders' reserves	(15)	(146)	(15)	(146)	(15)	146
Derivative liabilities	—	—	—	7	—	(7)
Other liabilities	(87)	30	(96)	30	96	30
Total	<u>\$ (351)</u>	<u>\$ 168</u>	<u>\$ (360)</u>	<u>\$ 50</u>		

c. 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 investments. 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.

Fixed income securities with the highest ratings from a rating agency follow the retrospective method of accounting.

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.

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 2dd. "Net realized capital losses including other-than-temporary impairments and unrealized capital gains (losses)" for information on the Company's policy for determining OTTI.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

d. 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, 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 2dd. "Net realized capital losses including other-than-temporary impairments and unrealized capital gains (losses)" for information on the Company's policy for determining OTTI.

e. Common stocks - subsidiaries and affiliates

Common stocks of unconsolidated subsidiaries, primarily MMHLLC, Glidepath Holdings Inc. (Glidepath) and MM Investment Holding (MMIH), are accounted for using the statutory equity method. The Company accounts for the value of MMHLLC at its underlying U.S. GAAP equity value less adjustments for the limited statutory basis of accounting related to foreign insurance subsidiaries and controlled affiliated entities as well as an adjustment of \$305 million as of December 31, 2024 for a portion of its noncontrolling interests (NCI). Glidepath is valued on its underlying GAAP equity with adjustment to recognize its investment in MassMutual Ascend Life Insurance Company and other subsidiaries and affiliated entities (MM Ascend) based on MM Ascend's underlying statutory surplus, adjusted for any unamortized goodwill recognized under the statutory purchase method. Operating results, less dividends declared, for MMHLLC, Glidepath and MMIH are reflected as net unrealized capital gains in the Statutory Statements of Changes in Surplus. Dividends declared from MMHLLC, Glidepath and MMIH are recorded in net investment income when declared and are limited to MMHLLC, Glidepath and MMIH'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 5d. "Common stocks - subsidiaries and affiliates" for further information on the valuation of MMHLLC.

f. 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 2dd. "Net realized capital losses including other-than-temporary impairments and unrealized capital gains (losses)" for information on the Company's policy for determining OTTI.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

g. 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 2dd. "Net realized capital losses including other-than-temporary impairments and unrealized capital gains (losses)" for information on the Company's policy for determining OTTI.

h. 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.

i. 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 net realized capital (losses) gains.

Fair value is generally estimated using the present value of expected future cash flows discounted at a rate commensurate with the underlying risks, net of encumbrances. 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 2dd. "Net realized capital losses including other-than-temporary impairments and unrealized capital gains (losses)" for information on the Company's policy for determining OTTI.

j. Partnerships and limited liability companies

Partnerships and limited liability companies, 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.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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

k. *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 synthetic investments are recorded as unrealized capital gains (losses) in surplus. Gains and losses realized on settlement, termination, closing or assignment of contracts are recorded in net realized capital (losses) gains. Amounts receivable and payable are accrued as net investment income.

l. *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.

m. *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.

n. *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 (losses) gains if resulting from invested asset transactions. Changes in the balances of net 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.

o. *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.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

p. 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.

q. Nonadmitted assets

Assets designated as nonadmitted by the NAIC primarily include pension plan assets, intangibles, certain electronic data processing equipment, advances and prepayments, certain investments in partnerships and limited liability companies for which qualifying audits are not performed, the amount of deferred tax assets (DTA) (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.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

r. 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, policyholders' benefits (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.

s. Policyholders' reserves

Policyholders' reserves are developed by actuarial methods that will provide for the present value of estimated future obligations in excess of estimated future premium on policies in force and are determined based on either statutory prescribed mortality/morbidity tables using specified interest rates and valuation methods, or principles-based reserving under Valuation Manual-20, which considers a wide range of future economic conditions, computed using justified company experience factors, such as mortality, policyholder behavior and expenses.

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 GMDB 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.

Certain individual variable annuity and fixed annuity products have a variety of additional guarantees such as GMDB 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 lifetime withdrawal benefits (GLWB). 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 GMDB and VAGLB 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.

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.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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 follow statutory accounting requirements and are sufficient, in conjunction with future revenues, to meet future anticipated obligations of policies and contracts in force.

t. 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.

u. 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 51% and 52% of the Company's policyholders' reserves and liabilities for deposit-type contracts as of December 31, 2024 and 2023, respectively.

v. 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.

w. 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 limited liability companies 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.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

x. 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.

y. 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.

z. 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 included as net negative (Disallowed) IMR for any admitted portion in other than invested assets. Refer to *Note 3. "New accounting standards - Adoption of new accounting standards"* for further information on the adoption of INT 23-O1T - Disallowed IMR. Refer to *Note 7. "Other than invested assets"* for further information on the amount admitted as disallowed IMR.

aa. 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 six 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.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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.

At the time of retirement, both PRS and PSAR vest according to the original grant terms.

The phantom share price is determined using the enterprise value of each entity within the organization provided it is within a pre-established range calculated using management basis equity method. If outside the range, the maximum or minimum share price established by the management basis equity method would apply, as appropriate.

bb. Other liabilities

Other liabilities primarily consist of the derivative interest expense liability, remittances and items not allocated, other miscellaneous liabilities, liabilities for employee benefits and accrued separate account transfers.

cc. 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. DI 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.

dd. Net realized capital losses including other-than-temporary impairments and unrealized capital gains (losses)

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

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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.

The Company analyzes investments whose fair value is below the cost for impairment. Generally, if the investment experiences significant credit or interest rate related deterioration, the cost of the investment is not recoverable, or the Company intends to sell the investment before anticipated recovery, an OTTI is recognized as realized investment loss.

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.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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 limited liability companies

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 limited liability companies, 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 August 2023, the NAIC adopted INT 23-01T — Disallowed IMR ("INT 23-01T"). INT 23-01T provides optional, limited-term guidance for the assessment of disallowed IMR for up to 10% of adjusted general account capital and surplus. An insurer's capital and surplus must first be adjusted to exclude certain "soft assets" including net positive goodwill, electronic data processing equipment and operating system software, net deferred tax assets and admitted disallowed IMR. An insurer will only be able to admit the negative IMR if the insurer's risk-based capital is over 300% authorized control level after adjusting to remove the assets described above.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

As adopted, negative IMR may be admitted first in the insurer's general account and then, if all disallowed IMR in the general account is admitted and the percentage limit is not reached, to the separate account proportionately between insulated and noninsulated accounts. If the insurer can demonstrate historical practice in which acquired gains from derivatives were also reversed to IMR (as liabilities) and amortized, there is no exclusion for derivatives losses. INT 23-01T was adopted by the Company as of September 30, 2023 and will be effective through December 31, 2025. To the extent the Company's IMR balance is a net negative, the effects of INT 23-01T will be reflected in the Company's financial position, results of operations, and financial statement disclosures. The Company has adopted this guidance and the adoption resulted in an admitted disallowed IMR of \$1,112 million for MassMutual and \$150 million for C.M. Life.

In March 2023, the NAIC adopted modifications to SSAP No. 34 – Investment Income Due and Accrued, effective December 31, 2023. The modifications require additional disclosures and data capture related to gross, non-admitted and admitted amounts for interest income due and accrued, deferred interest, and paid-in-kind (PIK) interest. In August 2023, the NAIC adopted revisions to further clarify the PIK interest disclosure in SSAP No. 34, effective December 31, 2023. The revisions clarify that decreasing amounts to principal balances are first applied to any PIK interest included in the principal balance. The original principal would not be reduced until the PIK interest had been fully eliminated from the balance. The revisions also provide a practical expedient for determining the PIK interest in the cumulative balance by subtracting the original principal/ par value from the current principal/ par value, with the resulting PIK interest not to go less than zero. The modifications did not have a material effect on the Company's financial statements.

In December 2023, the NAIC adopted revisions, effective January 1, 2024, to avoid allocating realized gains or losses from bond sales to the IMR when sold before a rating downgrade. Revisions were also made to avoid allocating realized gains or losses from mortgage loan sales when there is a credit loss allowance, where payments are not 90 days past due. Revisions were also made to update guidance on changes in credit ratings used to allocate credit or interest rate related gains or losses, requiring identification of realized losses from acute credit events to be allocated to AVR. The modifications did not have a material effect on the Company's financial statements.

In March 2024, the NAIC adopted revisions to the requirements of audit and admissibility in SSAP No. 97 – Investments in Subsidiary, Controlled and Affiliated Entities, effective March 16, 2024, to better align with the guidance on the look-through methodology. The revisions allow for admitting audited investments in entities owned by unaudited downstream noninsurance holding company SCA entity. The modifications did not have a material effect on the Company's financial statements.

Future adoption of new accounting standards

In August 2023, the NAIC adopted revisions to clarify and incorporate a new bond definition within disclosures SSAP No. 26 – Bonds, SSAP No. 43 – Asset-Backed Securities, and other related SSAPs, which will become effective January 1, 2025. The revisions were issued in connection with its principle-based bond definition project, "the Bond Project".

The Bond Project began in October 2020 through the development of a principle-based bond definition to be used for all securities in determining whether they qualify for reporting on the statutory annual statement Schedule D. Within the new bond definition, bonds are classified as an "issuer credit obligation" or an "asset-backed security."

An "issuer credit obligation" is defined as a bond where repayment is supported by the general creditworthiness of an operating entity, and an "asset-backed security" is defined as a bond issued by an entity created for the primary purpose of raising capital through debt backed by financial assets. The revisions to SSAP No. 26 reflect the principle-based bond definition, and SSAP No. 43 provides accounting and reporting guidance for investments that qualify as asset-backed securities under the new bond definition. Upon adoption, investments that do not qualify as bonds will not be permitted to be reported as bonds on Schedule D, Part 1 thereafter as there will be no grandfathering for existing investments that do not qualify under the revised SSAPs. The Company is currently assessing the impacts of the adopted SSAP No. 26, SSAP No. 43 and other related SSAPs in relation to the financial statements.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

In March 2024, the NAIC adopted revisions to SSAP No. 21 - Other Admitted Assets, effective January 1, 2025, clarifying that residuals follow the effective yield approach with a cap and providing an election for the cost recovery method. The modifications are not expected to have a material effect on the Company's consolidated financial statements. The Company will elect the effective yield method using the allowable earned yield, capped by the amount of cash distributions received. The Company is assessing the potential impact on the Company's consolidated financial statements.

Effective January 1, 2025, revisions will be made to short-term investments, which include excluding additional investment types from being reported as cash equivalents or short-term investments regardless of maturity date of the investment at the date of acquisition. Investments will be eliminated from being reported as cash equivalents or short-term investments unless they would qualify under SSAP No. 26 – Bonds as an issuer credit obligation. Such investments will then only qualify as a cash equivalent or short-term investment if they have a maturity date within 3-months (cash equivalents) or 12-months (short-term) from the date of acquisition or meet the specifics requirements for money market mutual funds or cash pooling arrangement. The Company is assessing the potential impact on the Company's consolidated financial statements.

The NAIC adopted revisions to various SSAPs at the Spring 2024 National Meeting for investments in tax credits and acquired tax credits in response to the comments received, as well as updated annual statement reporting categories for tax credit investment risk-based capital. These revisions are in addition to the previous ones, which include broad criteria to scope in various tax credit programs, including solar programs and state specific programs. Proportional amortization will be the measurement approach as with existing low-income housing tax credits, which means recording amortization of the investment in the partnership through net investment income and use of the tax credits in the appropriate tax line. The adopted revisions will be effective on January 1, 2025. The Company is assessing the potential impact on the Company's consolidated financial statements.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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, 2024					
	Carrying Value	Fair Value	Level 1	Level 2	Level 3
	(In Millions)				
Financial assets:					
Bonds:					
U. S. government and agencies	\$ 5,611	\$ 4,975	\$ —	\$ 4,975	\$ —
All other governments	979	809	—	801	8
States, territories and possessions	164	153	—	153	—
Political subdivisions	288	278	—	278	—
Special revenue	3,456	3,376	—	3,340	36
Industrial and miscellaneous	141,875	133,165	756	66,782	65,627
Hybrid securities	1,027	1,049	—	1,049	—
Parent, subsidiaries and affiliates	13,113	12,717	—	3,522	9,195
Preferred stocks	1,030	1,155	193	3	959
Common stocks - subsidiaries and affiliates	157	157	16	—	141
Common stocks - unaffiliated	1,209	1,209	299	—	910
Mortgage loans - commercial	17,492	16,066	—	—	16,066
Mortgage loans - residential	6,871	6,699	—	—	6,699
Derivatives:					
Interest rate swaps	21,073	14,627	—	14,627	—
Options	595	595	114	481	—
Currency swaps	2,787	2,738	—	2,738	—
Forward contracts	417	417	—	417	—
Credit default swaps	2	2	—	2	—
Financial Futures	15	15	15	—	—
Cash, cash equivalents and short-term investments	6,288	6,288	584	5,704	—
Separate account assets	55,935	55,879	36,435	17,621	1,823
Financial liabilities:					
GICs	17,955	17,249	—	—	17,249
Group annuity contracts and other deposits	1,714	1,570	—	—	1,570
Individual annuity contracts	31,439	32,405	—	—	32,405
Supplementary contracts	895	897	—	—	897
Repurchase agreements	3,408	3,420	—	3,420	—
Debt	250	250	—	250	—
Derivatives:					
Interest rate swaps	15,984	16,511	—	16,511	—
Options	78	78	63	15	—
Currency swaps	794	737	—	737	—
Forward contracts	68	65	—	65	—
Credit default swaps	175	175	—	175	—
Financial futures	26	26	26	—	—

Common stocks - subsidiaries and affiliates do not include unconsolidated subsidiaries, which had statutory carrying values of \$23,990 million.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

	December 31, 2023				
	Carrying Value	Fair Value	Level 1	Level 2	Level 3
	(In Millions)				
Financial assets:					
Bonds:					
U. S. government and agencies	\$ 5,067	\$ 4,752	\$ —	\$ 4,752	\$ —
All other governments	1,242	1,092	—	1,062	30
States, territories and possessions	242	240	—	240	—
Political subdivisions	377	367	—	367	—
Special revenue	5,081	5,071	—	5,034	37
Industrial and miscellaneous	124,508	116,179	66	51,231	64,881
Hybrid securities	688	660	—	660	—
Parent, subsidiaries and affiliates	10,095	9,659	—	1,442	8,217
Preferred stocks	451	475	96	—	379
Common stocks - subsidiaries and affiliates	436	436	253	—	183
Common stocks - unaffiliated	1,630	1,630	666	—	964
Mortgage loans - commercial	19,941	18,486	—	—	18,486
Mortgage loans - residential	4,884	4,596	—	—	4,596
Derivatives:					
Interest rate swaps	17,712	12,458	—	12,458	—
Options	575	575	68	507	—
Currency swaps	2,893	2,893	—	2,893	—
Forward contracts	15	15	—	15	—
Credit default swaps	1	1	—	1	—
Financial Futures	105	105	105	—	—
Cash, cash equivalents and short-term investments	11,941	11,941	818	11,123	—
Separate account assets	58,997	58,944	37,886	19,138	1,920
Financial liabilities:					
GICs	16,207	15,550	—	—	15,550
Group annuity contracts and other deposits	2,053	1,841	—	—	1,841
Individual annuity contracts	28,236	26,803	—	—	26,803
Supplementary contracts	1,001	1,003	—	—	1,003
Repurchase agreements	3,219	3,219	—	3,219	—
Debt	50	50	—	50	—
Derivatives:					
Interest rate swaps	12,178	12,544	—	12,544	—
Options	50	50	35	15	—
Currency swaps	1,298	1,313	—	1,313	—
Forward contracts	305	307	—	307	—
Credit default swaps	153	152	—	152	—
Financial futures	29	29	29	—	—

Common stocks - subsidiaries and affiliates do not include unconsolidated subsidiaries, which had statutory carrying values of \$23,161 million.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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 SOFR, 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 reviews the fair value hierarchy classifications at each reporting period. Overall, reclassifications between levels occur when there are changes in the observability of inputs and market activity used in the valuation of a financial asset or liability. Such reclassifications are reported as transfers between levels at the beginning fair value for the reporting period in which the changes occur. Given the types of assets classified as Level 1 (primarily equity securities including mutual fund investments), transfers between Level 1 and Level 2 measurement categories are expected to be infrequent. Transfers into and out of Level 3 are summarized in the schedule of changes in Level 3 assets and liabilities.

The fair value of group annuity contracts and other deposits is determined by multiplying the book value of the contract by an average market value adjustment factor. The market value adjustment factor is directly related to the difference between the book value of client liabilities and the present value of installment payments discounted at current market value yields. The market value yield is measured by the Barclay's Aggregate Bond Index, subject to certain adjustments, and the installment period is equivalent to the duration of the Company's invested asset portfolio.

The fair value of individual annuity and supplementary contracts is determined using one of several methods based on the specific contract type. For short-term contracts, generally less than 30 days, the fair value is assumed to be the book value. For contracts with longer durations, GICs and investment-type contracts, the fair value is determined by calculating the present value of future cash flows discounted at current market interest rates, the risk-free rate or a current pricing yield curve based on pricing assumptions using assets of a comparable corporate bond quality. Annuities receiving dividends are accumulated at the average minimum guaranteed rate and discounted at the risk-free rate. All others are valued using cash flow projections from the Company's asset/liability management analysis.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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

December 31, 2024				
	Level 1	Level 2	Level 3	Total
(In Millions)				
Financial assets:				
Bonds:				
Special revenue	\$ —	\$ 1	\$ —	\$ 1
Industrial and miscellaneous	755	113	272	1,140
Preferred stocks	44	—	51	95
Common stocks - subsidiaries and affiliates	16	—	141	157
Common stocks - unaffiliated	299	—	910	1,209
Derivatives:				
Interest rate swaps	—	21,068	—	21,068
Options	114	481	—	595
Currency swaps	—	2,707	—	2,707
Forward contracts	—	417	—	417
Credit default swaps	—	2	—	2
Financial Futures	15	—	—	15
Separate account assets	36,435	16,433	1,817	54,685
Total financial assets carried at fair value	\$ 37,678	\$ 41,222	\$ 3,191	\$ 82,091
Financial liabilities:				
Derivatives:				
Interest rate swaps	\$ —	\$ 15,984	\$ —	\$ 15,984
Options	63	15	—	78
Currency swaps	—	203	—	203
Forward contracts	—	68	—	68
Credit default swaps	—	175	—	175
Financial futures	26	—	—	26
Total financial liabilities carried at fair value	\$ 89	\$ 16,445	\$ —	\$ 16,534

The Company does not have any financial instruments that were carried at net asset value as a practical expedient.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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

	December 31, 2023			
	Level 1	Level 2	Level 3	Total
	(In Millions)			
Financial assets:				
Bonds:				
Special revenue	\$ —	\$ 2	\$ —	\$ 2
Industrial and miscellaneous	66	109	176	351
Preferred stocks	24	—	67	91
Common stocks - subsidiaries and affiliates	253	—	183	436
Common stocks - unaffiliated	670	1	960	1,631
Derivatives:				
Interest rate swaps	—	17,708	—	17,708
Options	68	507	—	575
Currency swaps	—	2,893	—	2,893
Forward contracts	—	15	—	15
Financial Futures	105	—	—	105
Separate account assets	37,886	17,964	1,914	57,764
Total financial assets carried at fair value	\$ 39,072	\$ 39,199	\$ 3,300	\$ 81,571
Financial liabilities:				
Derivatives:				
Interest rate swaps	\$ —	\$ 12,178	\$ —	\$ 12,178
Options	35	16	—	51
Currency swaps	—	196	—	196
Forward contracts	—	305	—	305
Credit default swaps	—	153	—	153
Financial futures	29	—	—	29
Total financial liabilities carried at fair value	\$ 64	\$ 12,848	\$ —	\$ 12,912

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 in the beginning fair value for the reporting period in which the changes occur.

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:

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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 SOFR 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.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

The following presents changes in the Company's Level 3 assets carried at fair value:

	Balance as of 01/01/24	Gains (Losses) in Net Income	Losses (Gains) in Surplus	Purchases	Issuances	Sales	Settlements	Transfers			Other	Balance as of 12/31/24
	(In Millions)											
Financial assets:												
Bonds:												
Industrial and miscellaneous	\$ 176	\$ (136)	\$ 9	\$ 7	\$ 3	\$ —	\$ (10)	\$ —	\$ —	\$ 223	\$ 272	
Preferred stocks	67	(9)	9	—	—	—	—	—	—	(16)	51	
Common Stocks:												
Subsidiaries and affiliates	183	3	3	415	(258)	66	(346)	—	(156)	231	141	
Unaffiliated	960	(7)	138	259	222	(13)	(674)	25	—	—	910	
Separate account assets	1,914	83	—	22	—	(196)	(6)	—	—	—	1,817	
Total financial assets	\$ 3,300	\$ (66)	\$ 159	\$ 703	\$ (33)	\$ (143)	\$ (1,036)	\$ 25	\$(156)	\$ 438	\$ 3,191	

	Balance as of 01/01/23	Gains (Losses) in Net Income	Losses (Gains) in Surplus	Purchases	Issuances	Sales	Settlements	Transfers		Other	Balance as of 12/31/23
	(In Millions)										
Financial assets:											
Bonds:											
Industrial and miscellaneous	\$ 230	\$ (4)	\$ (10)	\$ 37	\$ 1	\$ (2)	\$ (13)	\$ —	\$ —	\$ (62)	\$ 176
Preferred stocks	51	—	11	3	—	—	—	—	—	2	67
Common Stocks:											
Subsidiaries and affiliates	355	7	(189)	21	(6)	(47)	—	48	—	(6)	183
Unaffiliated	971	24	(54)	60	28	(29)	(38)	—	—	(2)	960
Separate account assets	1,693	271	—	134	—	(182)	(2)	—	—	—	1,914
Total financial assets	\$ 3,300	\$ 298	\$ (242)	\$ 255	\$ 23	\$ (260)	\$ (53)	\$ 48	\$ —	\$ (68)	\$ 3,300

Other transfers include assets that are either no longer carried at fair value or have just begun to be carried at fair value, such as assets with no level changes but a change in the lower of cost or market carrying basis. Industrial and miscellaneous bonds in other contain assets that are now carried at fair value due to ratings changes and assets are no longer carried at fair value where the fair value is now higher than the book value.

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.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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, 2024			
	Carrying Value	Gross Unrealized Gains	Gross Unrealized Losses	Fair Value
	(In Millions)			
U.S. government and agencies	\$ 5,611	\$ 22	\$ 658	\$ 4,975
All other governments	979	6	176	809
States, territories and possessions	164	—	11	153
Political subdivisions	288	5	15	278
Special revenue	3,456	39	119	3,376
Industrial and miscellaneous	141,875	750	9,460	133,165
Hybrid securities	1,027	44	22	1,049
Parent, subsidiaries and affiliates	13,113	29	425	12,717
Total	<u>\$ 166,513</u>	<u>\$ 895</u>	<u>\$ 10,886</u>	<u>\$ 156,522</u>

The December 31, 2024 gross unrealized losses exclude \$188 million of losses included in the carrying value. These losses include \$185 million from NAIC Class 6 bonds and \$3 million from RMBS and CMBS whose ratings were obtained from third-party modelers. These losses were primarily included in industrial and miscellaneous or parent, subsidiaries and affiliates.

	December 31, 2023			
	Carrying Value	Gross Unrealized Gains	Gross Unrealized Losses	Fair Value
	(In Millions)			
U.S. government and agencies	\$ 5,067	\$ 70	\$ 385	\$ 4,752
All other governments	1,242	13	163	1,092
States, territories and possessions	242	4	6	240
Political subdivisions	377	8	18	367
Special revenue	5,081	117	127	5,071
Industrial and miscellaneous	124,508	831	9,161	116,179
Hybrid securities	688	18	46	660
Parent, subsidiaries and affiliates	10,095	20	455	9,659
Total	<u>\$ 147,300</u>	<u>\$ 1,081</u>	<u>\$ 10,361</u>	<u>\$ 138,020</u>

The December 31, 2023 gross unrealized losses exclude \$128 million of losses included in the carrying value. These losses include \$127 million from NAIC Class 6 bonds and \$1 million from RMBS and CMBS whose ratings were obtained from third-party modelers. These losses were primarily included in industrial and miscellaneous or parent, subsidiaries and affiliates.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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 third-party modelers. The following sets forth the NAIC class ratings for the bond portfolio including RMBS and CMBS:

NAIC Class	Equivalent Rating Agency Designation	December 31,			
		2024		2023	
		Carrying Value	% of Total	Carrying Value	% of Total
		(In Millions)			
1	Aaa/Aa/A	\$ 97,009	59 %	\$ 82,631	56 %
2	Baa	61,156	37	54,909	37
3	Ba	3,632	2	3,907	3
4	B	2,272	1	2,910	2
5	Caa and lower	1,877	1	2,543	2
6	In or near default	567	—	400	—
	Total	<u>\$ 166,513</u>	<u>100 %</u>	<u>\$ 147,300</u>	<u>100 %</u>

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

NAIC Class	December 31,							
	2024				2023			
	RMBS		CMBS		RMBS		CMBS	
	Carrying Value	% of Total	Carrying Value	% of Total	Carrying Value	% of Total	Carrying Value	% of Total
(In Millions)								
1	\$ 617	86 %	\$ 2,273	79 %	\$ 250	95 %	\$ 2,134	76 %
2	91	13	166	6	—	—	247	9
3	4	1	161	6	1	—	159	6
4	2	—	34	1	5	2	144	5
5	1	—	135	5	7	3	63	2
6	—	—	87	3	—	—	72	3
	<u>\$ 715</u>	<u>100 %</u>	<u>\$ 2,856</u>	<u>100 %</u>	<u>\$ 263</u>	<u>100 %</u>	<u>\$ 2,819</u>	<u>100 %</u>

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

The following is a summary of the carrying value and fair value of bonds as of December 31, 2024 and 2023 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.

	December 31, 2024		December 31, 2023	
	Carrying Value	Fair Value	Carrying Value	Fair Value
	(In Millions)			
Due in one year or less	\$ 5,632	\$ 5,615	\$ 8,594	\$ 8,238
Due after one year through five years	48,128	47,340	33,376	32,728
Due after five years through ten years	39,437	38,091	38,857	37,278
Due after ten years	73,316	65,475	66,473	59,776
Total	<u>\$ 166,513</u>	<u>\$ 156,521</u>	<u>\$ 147,300</u>	<u>\$ 138,020</u>

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

	Years Ended December 31,	
	2024	2023
	(In Millions)	
Proceeds from sales	\$ 18,730	\$ 12,531
Gross realized capital gains from sales	212	115
Gross realized capital losses from sales	(455)	(736)

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, 2024					
	Less Than 12 Months			12 Months of Longer		
	Fair Value	Unrealized Losses	Number of Issuers	Fair Value	Unrealized Losses	Number of Issuers
	(In Millions)					
U. S. government and agencies	\$ 1,240	\$ 88	7	\$ 2,440	\$ 570	15
All other governments	61	2	14	622	174	27
States, territories and possessions	23	—	6	110	11	9
Political subdivisions	38	1	8	150	15	13
Special revenue	384	11	48	1,107	108	144
Industrial and miscellaneous	14,268	252	1,250	54,161	9,395	3,048
Hybrid securities	159	3	14	174	20	23
Parent, subsidiaries and affiliates	1,304	10	12	7,126	415	11
Total	<u>\$ 17,477</u>	<u>\$ 367</u>	<u>1,359</u>	<u>\$ 65,890</u>	<u>\$ 10,708</u>	<u>3,290</u>

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

	December 31, 2023					
	Less Than 12 Months			12 Months of Longer		
	Fair Value	Unrealized Losses	Number of Issuers	Fair Value	Unrealized Losses	Number of Issuers
	(In Millions)					
U. S. government and agencies	\$ 576	\$ 5	7	\$ 2,067	\$ 380	14
All other governments	26	—	5	882	163	32
States, territories and possessions	12	—	5	100	6	10
Political subdivisions	13	—	5	182	18	14
Special revenue	343	8	38	1,293	119	191
Industrial and miscellaneous	5,772	269	702	67,396	9,035	3,990
Hybrid securities	49	1	7	230	45	33
Parent, subsidiaries and affiliates	5,043	316	11	2,676	139	33
Total	<u>\$ 11,834</u>	<u>\$ 599</u>	<u>780</u>	<u>\$ 74,826</u>	<u>\$ 9,905</u>	<u>4,317</u>

As of December 31, 2024 and 2023, 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, 2024, investments in structured and loan-backed securities that had unrealized losses, which were not recognized in earnings, had a fair value of \$11,478 million. Securities in an unrealized loss position for less than 12 months had a fair value of 4,270 million and unrealized losses of \$42 million. Securities in an unrealized loss position for greater than 12 months had a fair value of \$7,207 million and unrealized losses of \$910 million. These securities were primarily categorized as industrial and miscellaneous or parent, subsidiaries and affiliates.

As of December 31, 2023, investments in structured and loan-backed securities that had unrealized losses, which were not recognized in earnings, had a fair value of \$17,621 million. Securities in an unrealized loss position for less than 12 months had a fair value of \$2,169 million and unrealized losses of \$49 million. Securities in an unrealized loss position for greater than 12 months had a fair value of \$15,452 million and unrealized losses of \$1,298 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, 2024 or 2023 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 \$18 and \$17 million as of December 31, 2024 and 2023, respectively.

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.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

As of December 31, 2024, RMBS had a total carrying value of \$3,917 million and a fair value of \$3,937 million of which approximately 2%, based on carrying value, was classified as Alt-A. Alt-A and subprime RMBS had a total carrying value of \$2,270 million and a fair value of \$2,291 million. As of December 31, 2023, RMBS had a total carrying value of \$3,831 million and a fair value of \$3,809 million of which approximately 4%, based on carrying value, was classified as Alt-A. Alt-A and subprime RMBS had a total carrying value of \$1,351 million and a fair value of \$1,334 million.

During the years ended December 31, 2024, 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, 2024, total leveraged loans had a carrying value of \$3,696 million and a fair value of \$3,688 million, of which approximately 48%, based on carrying value, were domestic leveraged loans. As of December 31, 2023, total leveraged loans had a carrying value of \$5,021 million and a fair value of \$4,987 million, of which approximately 53%, based on carrying value, were domestic leveraged loans.

In 2024, the Company refined its definition of leveraged loans to include commercial loans to high-yield corporations.

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 \$2,869 million and fair value of \$2,557 million as of December 31, 2024 and a carrying value of \$2,823 million and fair value of \$2,397 million as of December 31, 2023.

b. 5GI Securities

Securities owned by the Company with an NAIC designation of 5GI securities:

	December 31, 2024			December 31, 2023		
	Number of 5GI Securities	Carrying Value	Fair Value	Number of 5GI Securities	Carrying Value	Fair Value
	(In Millions)					
Investments:						
Bonds - amortized cost	258	\$ 1,004	\$ 990	274	\$ 1,471	\$ 1,444
Preferred stock - amortized cost	—	—	—	4	1	9
Preferred stock - fair value	3	1	1	1	—	—
Total	261	\$ 1,005	\$ 991	279	\$ 1,472	\$ 1,453

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

c. Preferred stocks

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

	December 31,	
	2024	2023
	(In Millions)	
Carrying value	\$ 1,030	\$ 451
Gross unrealized gains	128	29
Gross unrealized losses	(3)	(5)
Fair value	<u>\$ 1,155</u>	<u>\$ 475</u>

As of December 31, 2024, investments in preferred stocks in an unrealized loss position included holdings with a fair value of \$184 million in 14 issuers, \$146 million of which was in an unrealized loss position for more than 12 months. As of December 31, 2023, investments in preferred stocks in an unrealized loss position included holdings with a fair value of \$272 million in 25 issuers, \$270 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 2dd. "Net realized capital 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, 2024 or 2023.

As of December 31, 2024 and 2023, the Company held preferred stocks for which the transfer of ownership was restricted by contractual requirements with carrying values of \$96 million and \$201 million, respectively.

d. Common stocks – subsidiaries and affiliates

MMHLLC, a wholly-owned subsidiary of MassMutual, is the parent of subsidiaries that include Barings LLC (Barings) and deals in markets that include retail and institutional asset management entities and registered broker dealers.

The MMHLLC statutory carrying value was \$17.2 billion, which included \$122 million of nonadmitted asset adjustments as of December 31, 2024 and \$17.6 billion as of December 31, 2023, which included \$106 million of nonadmitted asset adjustments.

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

	As of and for the Years Ended	
	December 31,	
	2024	2023
	(In Billions)	
Total Revenue	\$ 5.1	\$ 3.4
Net income	1.2	0.7
Assets	27.7	27.2
Liabilities	9.5	9.1
Member's equity	18.2	18.1

MMHLLC paid \$785 million in dividends to MassMutual for the year ended December 31, 2024, \$630 million of which were declared in 2023, and paid \$730 million in dividends to MassMutual for the year ended December 31, 2023, \$450 million of which were declared in 2022.

MMHLLC declared an additional \$570 million in dividends to MassMutual for the year ended December 31, 2024, which will be paid in 2025.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

MassMutual contributed capital of \$32 million to MMHLLC for the year ended December 31, 2024, and \$235 million for the year ended December 31, 2023.

As of December 31, 2024 and 2023 the Glidepath statutory carrying value was \$4.7 billion and \$3.6 billion, respectively.

Summarized below is certain U.S. GAAP financial information for Glidepath:

	As of and for the Years Ended December 31,	
	2024	2023
	(In Billions)	
Total Revenue	\$ 3.0	\$ 0.8
Net income	0.3	0.8
Assets	58.6	53.4
Liabilities	55.0	51.5
Shareholder's equity	3.6	1.9

Summarized below is certain U.S. GAAP financial information for MMIH:

	As of and for the Years Ended December 31,	
	2024	2023
	(In Billions)	
Total Revenue	\$ 0.5	\$ 0.4
Net income (loss)	0.1	0.1
Assets	10.9	10.1
Liabilities	9.0	8.2
Member's equity	1.9	1.9

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.

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 \$1,701 million and \$1,905 million as of December 31, 2024 and 2023, respectively, 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"*.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

e. Common stocks – unaffiliated

The adjusted cost basis and carrying value of unaffiliated common stocks were as follows:

	December 31,	
	2024	2023
	(In Millions)	
Adjusted cost basis	\$ 789	\$ 1,274
Gross unrealized gains	443	409
Gross unrealized losses	(23)	(53)
Carrying value	<u>\$ 1,209</u>	<u>\$ 1,630</u>

As of December 31, 2024, investments in unaffiliated common stocks in an unrealized loss position included holdings with a fair value of \$43 million in 30 issuers, \$20 million of which were in an unrealized loss position for more than 12 months. As of December 31, 2023, investments in unaffiliated common stocks in an unrealized loss position included holdings with a fair value of \$310 million in 41 issuers, \$290 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 2dd. "Net realized capital 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, 2024 or 2023.

As of December 31, 2024 and 2023 the Company held common stocks, for which the transfer of ownership was restricted by contractual requirements, with carrying values of \$6 million and \$106 million, respectively.

f. Mortgage loans

Mortgage loans are comprised of 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 some of which are backed by Federal Housing Administration (FHA) and Veterans Administration (VA) guarantees. As of December 31, 2024 and 2023, 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, 2024 or 2023.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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

	December 31, 2024		December 31, 2023	
	Carrying Value	Fair Value	Carrying Value	Fair Value
	(In Millions)			
Commercial mortgage loans:				
Primary lender	\$ 17,379	\$ 15,962	\$ 19,799	\$ 18,361
Mezzanine loans	113	104	142	125
Total commercial mortgage loans	17,492	16,066	19,941	18,486
Residential mortgage loans:				
FHA insured and VA guaranteed	1,711	1,590	1,962	1,818
Other residential loans	5,160	5,109	2,922	2,778
Total residential mortgage loans	6,871	6,699	4,884	4,596
Total mortgage loans	\$ 24,363	\$ 22,765	\$ 24,825	\$ 23,082

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

	December 31, 2024				
	Less Than 81%	81% to 95%	Above 95%	Total	% of Total
	(\$ In Millions)				
Office	\$ 2,991	\$ 1,344	\$ 1,476	\$ 5,811	33 %
Apartments	4,744	441	384	5,569	32
Industrial and other	2,681	27	75	2,783	16
Retail	1,575	145	34	1,754	10
Hotels	1,302	184	90	1,576	9
Total	\$ 13,293	\$ 2,141	\$ 2,059	\$ 17,493	100 %

	December 31, 2023				
	Less Than 81%	81% to 95%	Above 95%	Total	% of Total
	(\$ In Millions)				
Office	\$ 5,121	\$ 532	\$ 1,083	\$ 6,736	34 %
Apartments	5,239	436	240	5,915	30
Industrial and other	2,819	28	27	2,874	14
Retail	2,367	—	70	2,437	12
Hotels	1,801	87	92	1,980	10
Total	\$ 17,347	\$ 1,083	\$ 1,512	\$ 19,942	100 %

For the years ended December 31, 2024 and 2023, the Company's commercial mortgage loans' loan-to-value ratios below 81% were 76% and 87%, respectively.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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, 2024						
	AAA/ AA/A	BBB	BB	B	CCC and Lower	Total
	(In Millions)					
Commercial mortgage loans:						
Primary lender	\$ 4,429	\$ 8,446	\$ 2,776	\$ 1,015	\$ 713	\$ 17,379
Mezzanine loans	—	77	36	—	—	113
Total commercial mortgage loans	4,429	8,523	2,812	1,015	713	17,492
Residential mortgage loans:						
FHA insured and VA guaranteed	1,711	—	—	—	—	1,711
Other residential loans	745	4,392	22	1	—	5,160
Total residential mortgage loans	2,456	4,392	22	1	—	6,871
Total mortgage loans	\$ 6,885	\$ 12,915	\$ 2,834	\$ 1,016	\$ 713	\$ 24,363

December 31, 2023						
	AAA/ AA/A	BBB	BB	B	CCC and Lower	Total
	(In Millions)					
Commercial mortgage loans:						
Primary lender	\$ 6,196	\$ 10,030	\$ 2,213	\$ 920	\$ 445	\$ 19,804
Mezzanine loans	—	80	57	—	—	137
Total commercial mortgage loans	6,196	10,110	2,270	920	445	19,941
Residential mortgage loans:						
FHA insured and VA guaranteed	1,962	—	—	—	—	1,962
Other residential loans	—	2,789	25	108	—	2,922
Total residential mortgage loans	1,962	2,789	25	108	—	4,884
Total mortgage loans	\$ 8,158	\$ 12,899	\$ 2,295	\$ 1,028	\$ 445	\$ 24,825

As of December 31, 2024 and 2023 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 80% and 80%, respectively.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

The geographic distribution of commercial mortgage loans was as follows:

	December 31, 2024		December 31, 2023	
	Carrying Value	Average Loan-to-Value Ratio	Carrying Value	Average Loan-to-Value Ratio
	(\$ In Millions)			
California	\$ 3,618	83 %	\$ 4,079	66 %
Texas	1,906	62 %	1,869	56 %
United Kingdom	1,749	56 %	2,158	51 %
New York	1,618	81 %	1,952	66 %
Illinois	1,084	55 %	1,511	56 %
District of Columbia	915	80 %	969	82 %
Washington	799	62 %	1,059	70 %
All other	5,804	76 %	6,346	71 %
Total commercial mortgage loans	<u>\$ 17,493</u>	73 %	<u>\$ 19,943</u>	66 %

For the years ended December 31, 2024 and 2023, all other consists of 29 jurisdictions with no individual exposure exceeding \$768 million and 30 jurisdictions with no individual exposure exceeding \$894 million, respectively.

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

	Years Ended December 31,			
	2024		2023	
	Low	High	Low	High
Commercial mortgage loans	2.5%	12.2%	1.8%	12.9%
Residential mortgage loans	2.2%	12.2%	2.2%	11.8%
Mezzanine mortgage loans	5.3%	13.7%	5.3%	14.4%

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

	Years Ended December 31,			
	2024		2023	
	Low	High	Low	High
Commercial mortgage loans	4.3%	11.3%	4.3%	11.0%
Residential mortgage loans	4.1%	11.7%	0.0%	11.8%
Mezzanine mortgage loans	0.0%	0.0 %	5.5%	8.0%

As of December 31, 2024, the Company had impaired mortgage loans with or without a valuation allowance or mortgage loans derecognized as a result of foreclosure, including mortgage loans subject to a participant or co-lender mortgage loan agreement with a unilateral mortgage loan foreclosure restriction or mortgage loan derecognized as a result of a foreclosure.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

The following presents a summary of the Company's impaired mortgage loans as of December 31, 2024 and December 31, 2023:

	December 31, 2024				
	Carrying Value	Average Carrying Value	Unpaid Principal Balance	Valuation Allowance	Interest Income
	(In Millions)				
With allowance recorded:					
Commercial mortgage loans:					
Primary lender	\$ 97	\$ 112	\$ 138	\$ (39)	\$ 4
Total	97	112	138	(39)	4
With no allowance recorded:					
Commercial mortgage loans:					
Primary lender	\$ 407	\$ 411	\$ 562	\$ —	\$ 3
Total	407	411	562	—	3
Total impaired commercial mortgage loans	\$ 504	\$ 523	\$ 700	\$ (39)	\$ 7

						December 31, 2023									
						Carrying Value	Average Carrying Value	Unpaid Principal Balance	Valuation Allowance	Interest Income					
						(In Millions)									
With allowance recorded:															
Commercial mortgage loans:															
Primary lender						\$	481	\$	555	\$	644	\$	(161)	\$	25
Total							481		555		644		(161)		25
Total impaired commercial mortgage loans						\$	481	\$	555	\$	644	\$	(161)	\$	25

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, 2024 or 2023. As of December 31, 2024 and 2023 the carrying value of commercial mortgage loans subject to a participant or co-lender mortgage loan agreement was \$1,254 million and \$1,497 million, respectively.

Allowance for credit losses:

	Years Ended December 31,	
	2024	2023
Balance at the beginning of period	\$ (161)	\$ —
Additions charged to operations	(97)	(175)
Direct write-downs charged against the allowances	—	1
Recoveries of amounts previously charged off	219	13
Balance at the end of the period	<u>\$ (39)</u>	<u>\$ (161)</u>

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

g. Real estate

The carrying value of real estate was as follows:

	December 31,	
	2024	2023
	(In Millions)	
Held for the production of income	\$ 356	\$ 355
Accumulated depreciation	(109)	(94)
Encumbrances	(264)	(285)
Held for the production of income, net	(17)	(24)
Held for sale	76	76
Accumulated depreciation	(74)	(74)
Held for sale, net	2	2
Occupied by the Company	568	566
Accumulated depreciation	(230)	(215)
Occupied by the Company, net	338	351
Total real estate	\$ 323	\$ 329

For the years ended December 31, 2024 and 2023 depreciation expense on real estate was \$30 million and \$31 million, respectively.

h. Partnerships and limited liability companies

The carrying value of partnerships and limited liability companies holdings by annual statement category were:

	December 31,	
	2024	2023
	(In Millions)	
Joint venture interests:		
Common stocks - subsidiaries and affiliates	\$ 2,189	\$ 2,026
Common stocks - unaffiliated	3,343	3,508
Real estate	3,558	2,427
Bonds / preferred stock	959	735
Other	1,732	1,740
Mortgage loans	2,565	2,099
Surplus notes	447	392
LIHTCs	115	128
Total	\$ 14,908	\$ 13,055

As of December 31, 2024 and 2023, the Company held 25 affiliated partnerships and limited liability companies in a loss position with accumulated losses of \$66 million and 20 affiliated partnerships and limited liability companies in a loss position with accumulated losses of \$66 million, respectively.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

The Company's unexpired tax credits expire within a range of less than 1 year to 12 years.

As of December 31, 2024 and 2023, the Company recorded tax credits on these investments of \$57 million and \$55 million, respectively. The minimum holding period required for the Company's LIHTC investments extends from 1 year to 15 years.

For determining impairments for LIHTC investments, the Company uses the present value of all future benefits, the majority of which are tax credits, discounted at a risk-free rate ranging from 4.2% for future benefits of two years to 4.6% for future benefits of ten or more years, and compares the result to its current carry value. The Company recorded no impairments for the year ended December 31, 2024 and \$14 million impairments to LIHTC investments for the year ended December 31, 2023.

i. 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 replicated synthetic investments. These replicated synthetic investments are created when they are economically more attractive than the actual instrument or when similar instruments are unavailable. Replicated synthetic investments are created either to hedge and reduce the Company's credit exposure or to create an investment in a particular asset. The Company held replicated synthetic investments with a notional amount of \$34,282 million as of December 31, 2024 and \$32,507 million as of December 31, 2023, 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 45 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.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

The Company utilizes certain other agreements including forward contracts and financial futures. 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 to the counterparties was \$548 million as of December 31, 2024, and net collateral pledged by the counterparties was \$334 million as of December 31, 2023. In the event of default, the full market value exposure at risk, net of offsets and collateral, was \$161 million and \$321 million as of December 31, 2024 and 2023, respectively. The statutory net amount at risk, defined as net collateral pledged and statement values excluding accrued interest, was \$5,484 million and \$5,292 million as of December 31, 2024 and 2023, respectively.

As of December 31, 2024, the company had the right to rehypothecate or repledge securities totaling \$1,523 million, pledged by the counterparties, of the \$548 million of the net collateral pledged to counterparties. As of December 31, 2023, the company had the right to rehypothecate or repledge securities totaling \$1,476 million, pledged by the counterparties, of the \$334 million of the net collateral pledged to counterparties. There were no securities rehypothecated to other counterparties as of December 31, 2024 or December 31, 2023.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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

	December 31, 2024				December 31, 2023			
	Assets		Liabilities		Assets		Liabilities	
	Carrying Value	Notional Amount	Carrying Value	Notional Amount	Carrying Value	Notional Amount	Carrying Value	Notional Amount
	(In Millions)							
Interest rate swaps	\$ 21,073	\$178,171	\$ 15,984	\$170,306	\$ 17,712	\$181,119	\$ 12,178	\$133,793
Options	595	11,399	78	626	575	12,132	50	641
Currency swaps	2,787	31,652	794	15,483	2,893	29,187	1,298	14,742
Forward contracts	417	12,679	68	5,561	15	1,032	305	9,335
Credit default swaps	2	162	175	7,903	1	81	153	7,902
Financial futures	15	567	26	956	105	1,124	29	257
Total	<u>\$ 24,889</u>	<u>\$234,630</u>	<u>\$ 17,125</u>	<u>\$200,835</u>	<u>\$ 21,301</u>	<u>\$224,675</u>	<u>\$ 14,013</u>	<u>\$166,670</u>

The average fair value of outstanding derivative assets was \$23,152 and \$22,809 million for the years ended December 31, 2024 and 2023, respectively. The average fair value of outstanding derivative liabilities was \$15,883 and \$14,932 million for the years ended December 31, 2024 and 2023, respectively.

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

	December 31,	
	2024	2023
	(In Millions)	
Due after one year through five years	\$ 8,065	\$ 7,983
Total	<u>\$ 8,065</u>	<u>\$ 7,983</u>

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

	December 31,	
	2024	2023
	(In Millions)	
Open interest rate swaps in a fixed pay position	\$ 152,461	\$ 134,232
Open interest rate swaps in a fixed receive position	193,018	175,804
Other interest related swaps	2,998	4,875
Total interest rate swaps	<u>\$ 348,477</u>	<u>\$ 314,911</u>

The following summarizes the Company's net realized (losses) gains on closed contracts and change in net unrealized (losses) gains related to market fluctuations on open contracts by derivative type:

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

	Years Ended December 31,			
	2024		2023	
	Net Realized (Losses) Gains on Closed Contracts	Change in Net Unrealized (Losses) Gains on Open Contracts	Net Realized (Losses) Gains on Closed Contracts	Change in Net Unrealized (Losses) Gains on Open Contracts
	(In Millions)			
Interest rate swaps	\$ (294)	\$ (446)	\$ (262)	\$ 151
Currency swaps	127	(188)	105	(354)
Options	(26)	7	26	(94)
Credit default swaps	(69)	43	(39)	(24)
Forward contracts	(15)	639	(64)	(66)
Financial futures	(54)	(86)	(167)	56
Total	<u>\$ (331)</u>	<u>\$ (31)</u>	<u>\$ (401)</u>	<u>\$ (331)</u>

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

	December 31, 2024			December 31, 2023		
	Derivative Assets	Derivative Liabilities	Net	Derivative Assets	Derivative Liabilities	Net
	(In Millions)					
Gross	\$ 24,889	\$ 17,125	\$ 7,764	\$ 21,301	\$ 14,013	\$ 7,288
Due and accrued	1,449	2,671	(1,222)	1,396	2,532	(1,137)
Gross amounts offset	(22,845)	(22,845)	—	(19,524)	(19,524)	—
Net asset	3,493	(3,049)	6,542	3,173	(2,978)	6,151
Collateral posted	(3,471)	(4,019)	548	(3,557)	(3,223)	(334)
Net	<u>\$ 22</u>	<u>\$ (7,068)</u>	<u>\$ 7,090</u>	<u>\$ (384)</u>	<u>\$ (6,202)</u>	<u>\$ 5,817</u>

j. Repurchase agreements

The Company has entered into repurchase agreements whereby the Company sells securities and simultaneously agrees to repurchase the same or substantially the same securities. These repurchase agreements are accounted for as collateralized borrowings with the proceeds from the sale of the securities recorded as a liability and 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, which is at cost, reported in the Company's liabilities as repurchase agreements approximates the fair value.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

The following table provides contractual maturity, maximum balance during the year, and ending balance for bilateral repurchase agreements:

	December 31,			
	2024		2023	
	Maximum Balance	Ending Balance	Maximum Balance	Ending Balance
	(In Millions)			
2 Days to 1 Week	\$ 425	\$ —	\$ —	\$ —
From 1 Week to 1 Month	1,359	—	596	—
Greater than 1 Month to 3 Months	5,437	2,778	3,247	2,136
Greater than 3 Months to 1 Year	630	630	1,088	1,085
Total	<u>\$ 7,851</u>	<u>\$ 3,408</u>	<u>\$ 4,931</u>	<u>\$ 3,221</u>

The company did not have any repurchase agreements where securities sold and/or acquired resulted in default as of December 31, 2024 and 2023.

The following table presents the fair value and amortized cost of securities sold under bilateral repurchase agreement transactions, which were all NAIC rating of 1, for the years ended December 31, 2024 and 2023:

	Maximum Balance	Ending Balance
	(In Millions)	
March 31, 2024		
Fair Value	\$ 4,473	\$ 3,466
Carrying Value	\$ —	\$ 3,466
June 30, 2024		
Fair Value	\$ 3,532	\$ 3,449
Carrying Value	\$ —	\$ 3,799
September 30, 2024		
Fair Value	\$ 3,710	\$ 3,671
Carrying Value	\$ —	\$ 3,816
December 31, 2024		
Fair Value	\$ 3,650	\$ 3,420
Carrying Value	\$ —	\$ 3,824
March 31, 2023		
Fair Value	\$ 3,054	\$ 3,019
Carrying Value	\$ —	\$ 3,019
June 30, 2023		
Fair Value	\$ 3,615	\$ 2,910
Carrying Value	\$ —	\$ 2,910
September 30, 2023		
Fair Value	\$ 3,563	\$ 3,563
Carrying Value	\$ —	\$ 3,563
December 31, 2023		
Fair Value	\$ 3,563	\$ 3,221
Carrying Value	\$ —	\$ 3,221

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

The following table presents the cash collateral and the fair value of security collateral, which were all NAIC rating of 1, received in the bilateral repurchase agreement transactions for the years ended December 31, 2024 and 2023:

	Maximum Balance		Ending Balance	
	Cash	Securities	Cash	Securities
	(In Millions)			
March 31, 2024	\$ 96	\$ 3,530	\$ 16	\$ 3,487
June 30, 2024	\$ 3,741	\$ 14	\$ 3,431	\$ —
September 30, 2024	\$ 5,658	\$ 13	\$ 3,622	\$ —
December 31, 2024	\$ 5,897	\$ 1	\$ 3,357	\$ 1
March 31, 2023	\$ 130	\$ 3,066	\$ 19	\$ 3,022
June 30, 2023	\$ 89	\$ 3,031	\$ 4	\$ 2,918
September 30, 2023	\$ 110	\$ 3,247	\$ 110	\$ 2,717
December 31, 2023	\$ 137	\$ 3,230	\$ 1	\$ 3,230

The following table presents collateral received, aggregate allocation of the collateral by the remaining contractual maturity of the repurchase agreements for the years ended December 31, 2024 and 2023:

	Overnight and Continuous	30 Days or Less	31 to 90 Days	> 90days
	(In Millions)			
Maximum Balance				
March 31, 2024	\$ —	\$ —	\$ 1,626	\$ 1,880
June 30, 2024	\$ —	\$ 14	\$ 1,551	\$ 1,927
September 30, 2024	\$ —	\$ 789	\$ 2,164	\$ 213
December 31, 2024	\$ —	\$ 223	\$ 3,031	\$ 485
March 31, 2023	\$ —	\$ 259	\$ 2,787	\$ —
June 30, 2023	\$ —	\$ 92	\$ 2,925	\$ —
September 30, 2023	\$ —	\$ —	\$ 3,086	\$ —
December 31, 2023	\$ —	\$ 134	\$ 2,716	\$ 250
Ending Balance				
March 31, 2024	\$ —	\$ —	\$ 1,626	\$ 1,880
June 30, 2024	\$ —	\$ 14	\$ 1,551	\$ 1,927
September 30, 2024	\$ —	\$ 789	\$ 2,164	\$ 213
December 31, 2024	\$ —	\$ 223	\$ 3,031	\$ 485
March 31, 2023	\$ —	\$ 259	\$ 2,787	\$ —
June 30, 2023	\$ —	\$ 92	\$ 2,925	\$ —
September 30, 2023	\$ —	\$ —	\$ 3,086	\$ —
December 31, 2023	\$ —	\$ 134	\$ 2,716	\$ 250

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

The following table presents cash collateral received that has been reinvested, the total reinvested cash and the aggregate amortized cost and fair value of the invest asset acquired with the cash collateral for the years ended December 31, 2024 and 2023:

	1 to 2 Years		2 to 3 Years		> 3 Years	
	Amortized Cost	Fair Value	Amortized Cost	Fair Value	Amortized Cost	Fair Value
Maximum Balance						
March 31, 2024	\$ —	\$ —	\$ —	\$ —	\$ —	\$ —
June 30, 2024	\$ —	\$ —	\$ 1,125	\$ 1,139	\$ 2,674	\$ 2,310
September 30, 2024	\$ —	\$ —	\$ 1,142	\$ 1,183	\$ 2,674	\$ 2,467
December 31, 2024	\$ —	\$ —	\$ 1,149	\$ 1,170	\$ 2,256	\$ 1,881
March 31, 2023	\$ —	\$ —	\$ —	\$ —	\$ —	\$ —
June 30, 2023	\$ —	\$ —	\$ —	\$ —	\$ —	\$ —
September 30, 2023	\$ —	\$ —	\$ —	\$ —	\$ —	\$ —
December 31, 2023	\$ —	\$ —	\$ —	\$ —	\$ —	\$ —
	1 to 2 Years		2 to 3 Years		> 3 Years	
	Amortized Cost	Fair Value	Amortized Cost	Fair Value	Amortized Cost	Fair Value
Ending Balance						
March 31, 2024	\$ —	\$ —	\$ —	\$ —	\$ —	\$ —
June 30, 2024	\$ —	\$ —	\$ 1,125	\$ 1,139	\$ 2,674	\$ 2,310
September 30, 2024	\$ —	\$ —	\$ 1,142	\$ 1,183	\$ 2,674	\$ 2,467
December 31, 2024	\$ —	\$ —	\$ 1,149	\$ 1,170	\$ 2,256	\$ 1,881
March 31, 2023	\$ —	\$ —	\$ —	\$ —	\$ —	\$ —
June 30, 2023	\$ —	\$ —	\$ —	\$ —	\$ —	\$ —
September 30, 2023	\$ —	\$ —	\$ —	\$ —	\$ —	\$ —
December 31, 2023	\$ —	\$ —	\$ —	\$ —	\$ —	\$ —

To help manage the mismatch of maturity dates between the security lending transactions and the related reinvestment of the collateral received, the Company invests in highly liquid assets.

The following table presents liability recognized to return cash collateral, and the liability recognized to return securities received as collateral as required pursuant to the terms of the secured borrowing transactions for the years ended December 31, 2024 and 2023:

	Maximum Balance		Ending Balance	
	Cash	Securities	Cash	Securities
	(In Millions)			
March 31, 2024	\$ 96	\$ 3,530	\$ 16	\$ 3,487
June 30, 2024	\$ 3,741	\$ 14	\$ 3,431	\$ —
September 30, 2024	\$ 5,658	\$ 13	\$ 3,622	\$ —
December 31, 2024	\$ 5,897	\$ 1	\$ 3,357	\$ 1

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

	Maximum Balance		Ending Balance	
	Cash	Securities	Cash	Securities
	(In Millions)			
March 31, 2023	\$ 130	\$ 3,066	\$ 19	\$ 3,022
June 30, 2023	\$ 89	\$ 3,031	\$ 4	\$ 2,918
September 30, 2023	\$ 110	\$ 3,247	\$ 110	\$ 2,717
December 31, 2023	\$ 137	\$ 3,230	\$ 1	\$ 3,230

The company did not have any reverse repurchase transactions accounted for as secured borrowings as of December 31, 2024 and 2023.

The Company did not have any repurchase agreements or reverse repurchase agreements transactions accounted for as a sale as of December 31, 2024 and 2023.

k. Net investment income

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

	Years Ended December 31,	
	2024	2023
	(In Millions)	
Bonds	\$ 8,567	\$ 7,449
Preferred stocks	25	28
Common stocks - subsidiaries and affiliates	729	1,115
Common stocks - unaffiliated	127	113
Mortgage loans	1,179	1,137
Policy loans	1,075	1,070
Real estate	80	70
Partnerships and limited liability companies	972	971
Derivatives	(498)	(120)
Cash, cash equivalents and short-term investments	364	379
Other	275	197
Subtotal investment income	12,895	12,409
Amortization of the IMR	(133)	(53)
Net gains from separate accounts	3	3
Investment expenses	(1,128)	(1,110)
Net investment income	<u>\$ 11,637</u>	<u>\$ 11,249</u>

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

I. Net realized capital losses

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

	Years Ended December 31,	
	2024	2023
	(In Millions)	
Bonds	\$ (512)	\$ (800)
Preferred stocks	17	—
Common stocks - subsidiaries and affiliates	62	30
Common stocks - unaffiliated	(44)	15
Mortgage loans	(337)	(77)
Real estate	—	3
Partnerships and limited liability companies	(73)	(313)
Derivatives	(332)	(401)
Other	11	(8)
Net realized capital losses before federal and state taxes and deferral to the IMR	(1,208)	(1,551)
Net federal and state tax (expense) benefit	(28)	287
Net realized capital losses before deferral to the IMR	(1,236)	(1,264)
Net after tax capital losses deferred to the IMR	429	759
Net realized capital losses	<u>\$ (807)</u>	<u>\$ (505)</u>

OTTI, included in the net realized capital losses, consisted of the following:

	Years Ended December 31,	
	2024	2023
	(In Millions)	
Bonds	\$ (270)	\$ (179)
Common stocks - subsidiaries and affiliates	(3)	—
Common stocks - unaffiliated	(19)	(1)
Preferred stock	(9)	—
Mortgage loans	(220)	(13)
Partnerships and limited liability companies	(130)	(355)
Total OTTI	<u>\$ (651)</u>	<u>\$ (548)</u>

The Company recognized OTTI of \$17 million and \$15 million for the years ended December 31, 2024 and 2023, respectively, 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 \$270 million of bond OTTI for the year ended December 31, 2024 and 1% of the \$179 million of bond OTTI for the year ended December 31, 2023. The remaining OTTI amounts were determined using external inputs such as publicly observable fair values and credit ratings. Refer to *Note 2dd. "Net realized capital 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.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

m. Restricted assets

Admitted restricted assets by category:

December 31, 2024									
Restricted Asset Category	Gross (Admitted and Non-admitted) Restricted						Percentage		
	Total General Account	Total Separate Account Restricted Assets	Total	Total From Prior Year	Increase (Decrease)	Total Admitted Restricted	Gross Admitted and Non-admitted)	Admitted Restricted to Total	
							Restricted to Total Assets	Total Admitted Assets	
(In Millions)									
Subject to repurchase agreements	\$ 3,419	\$ —	\$ 3,419	\$ 3,230	\$ 189	\$ 3,419	0.96 %	0.96 %	
Letter stock or securities restricted as to sale - excluding									
FHLB capital stock	102	—	102	210	(108)	102	0.03	0.03	
FHLB capital stock	99	—	99	99	—	99	0.03	0.03	
On deposit with states	18	—	18	18	—	18	—	—	
Pledged collateral to FHLB (including assets backing funding agreements)	3,530	—	3,530	2,886	644	3,530	0.99	0.99	
Pledged as collateral not captured in other categories	5,746	—	5,746	4,763	983	5,746	1.61	1.62	
Total restricted assets	\$ 12,914	\$ —	\$ 12,914	\$ 11,206	\$ 1,708	\$ 12,914	3.62 %	3.63 %	

December 31, 2023									
Restricted Asset Category	Gross (Admitted and Non-admitted) Restricted						Percentage		
	Total General Account	Total Separate Account Restricted Assets	Total	Total From Prior Year	Increase (Decrease)	Total Admitted Restricted	Gross Admitted and Non-admitted)	Admitted Restricted to Total	
							Restricted to Total Assets	Admitted Assets	
(In Millions)									
Subject to repurchase agreements	\$ 3,230	\$ —	\$ 3,230	\$ 3,042	\$ 188	\$ 3,230	0.96 %	0.96 %	
Letter stock or securities restricted as to sale - excluding									
FHLB capital stock	210	—	210	361	(151)	210	0.06 %	0.06 %	
FHLB capital stock	99	—	99	99	—	99	0.03 %	0.03 %	
On deposit with states	18	—	18	18	—	18	0.01 %	0.01 %	
Pledged collateral to FHLB (including assets backing funding agreements)	2,886	—	2,886	2,477	409	2,886	0.86 %	0.86 %	
Pledged as collateral not captured in other categories	4,763	—	4,763	3,688	1,075	4,763	1.41 %	1.42 %	
Total restricted assets	\$ 11,206	\$ —	\$ 11,206	\$ 9,685	\$ 1,521	\$ 11,206	3.33 %	3.34 %	

6. Federal income taxes

On August 16th, 2022, the Inflation Reduction Act (IRA) was signed into law and includes certain corporate income tax provisions. Potential impacts to the Company include the imposition of a corporate alternative minimum tax (CAMT). The CAMT imposes a 15% minimum tax on adjusted financial statement income on applicable corporations that have an average adjusted financial statement income over \$1 billion in the prior three-year period. The United States Treasury Department and the Internal Revenue Service released proposed regulations on September 12, 2024. As of the reporting date, the Company is not an applicable corporation and therefore not liable for CAMT in 2024.

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.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

The net DTA or deferred liabilities (DTL) recognized in the Company's assets, liabilities and surplus is as follows:

December 31, 2024			
	Ordinary	Capital	Total
	(In Millions)		
Gross DTAs	\$ 4,057	\$ 804	\$ 4,861
Statutory valuation allowance adjustment	—	—	—
Adjusted gross DTAs	4,057	804	4,861
DTAs nonadmitted	(238)	(25)	(263)
Subtotal net admitted DTA	3,819	779	4,598
Total gross DTLs	(1,941)	(776)	(2,717)
Net admitted DTA(L)	\$ 1,878	\$ 3	\$ 1,881

December 31, 2023			
	Ordinary	Capital	Total
	(In Millions)		
Gross DTAs	\$ 4,040	\$ 774	\$ 4,814
Statutory valuation allowance adjustment	—	—	—
Adjusted gross DTAs	4,040	774	4,814
DTAs nonadmitted	(91)	(9)	(100)
Subtotal net admitted DTA	3,949	765	4,714
Total gross DTLs	(2,072)	(957)	(3,029)
Net admitted DTA(L)	\$ 1,877	\$ (192)	\$ 1,685

Change			
	Ordinary	Capital	Total
	(In Millions)		
Gross DTAs	\$ 17	\$ 30	\$ 47
Statutory valuation allowance adjustment	—	—	—
Adjusted gross DTAs	17	30	47
DTAs nonadmitted	(147)	(16)	(163)
Subtotal net admitted DTA	(130)	14	(116)
Total gross DTLs	131	181	312
Net admitted DTA(L)	\$ 1	\$ 195	\$ 196

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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, 2024			
	Ordinary	Capital	Total
	(In Millions)		
Admitted DTA 3 years:			
Federal income taxes that can be recovered	\$ —	\$ 29	\$ 29
Remaining adjusted gross DTAs expected to be realized within 3 years (lesser of 1 or 2):			
1. Adjusted gross DTA to be realized	1,799	54	1,853
2. Adjusted gross DTA allowed per limitation threshold	3,845	54	3,899
Lesser of line 1 or 2	1,799	54	1,853
Adjusted gross DTAs offset by existing DTLs	2,020	696	2,716
Total admitted DTA realized within 3 years	\$ 3,819	\$ 779	\$ 4,598

December 31, 2023			
	Ordinary	Capital	Total
	(In Millions)		
Admitted DTA 3 years:			
Federal income taxes that can be recovered	\$ —	\$ 90	\$ 90
Remaining adjusted gross DTAs expected to be realized within 3 years (lesser of 1 or 2):			
1. Adjusted gross DTA to be realized	1,595	—	1,595
2. Adjusted gross DTA allowed per limitation threshold	4,397	—	4,397
Lesser of line 1 or 2	1,595	—	1,595
Adjusted gross DTAs offset by existing DTLs	2,354	675	3,029
Total admitted DTA realized within 3 years	\$ 3,949	\$ 765	\$ 4,714

Change			
	Ordinary	Capital	Total
	(In Millions)		
Admitted DTA 3 years:			
Federal income taxes that can be recovered	\$ —	\$ (61)	\$ (61)
Remaining adjusted gross DTAs expected to be realized within 3 years (lesser of 1 or 2):			
1. Adjusted gross DTA to be realized	204	54	258
2. Adjusted gross DTA allowed per limitation threshold	(552)	54	(498)
Lesser of line 1 or 2	204	54	258
Adjusted gross DTAs offset by existing DTLs	(334)	21	(313)
Total admitted DTA realized within 3 years	\$ (130)	\$ 14	\$ (116)

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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, 2024			
	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)	71 %	100 %	71 %
December 31, 2023			
	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)	78 %	— %	78 %
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)	(7)%	100 %	(7)%

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,	
		2024	2023
		(In Millions)	
Federal income tax expense (benefit) on operating earnings		\$ (284)	\$ 119
Foreign income tax expense on operating earnings		1	4
Total federal and foreign income tax expense (benefit) on operating earnings		(283)	123
Federal income tax expense (benefit) on net realized capital gains		25	(275)
Total federal and foreign income tax expense (benefit)		<u>\$ (258)</u>	<u>\$ (152)</u>

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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

	2024	December 31, 2023	Change
	(In Millions)		
DTAs:			
Ordinary			
Reserve items	\$ 1,966	\$ 1,798	\$ 168
Policy acquisition costs	1,048	971	77
Nonadmitted assets	327	320	7
Policyholders' dividends	266	234	32
Pension and compensation related items	95	73	22
Investment items	277	241	36
Expense items	61	66	(5)
Other	19	337	(318)
Total ordinary DTAs	4,059	4,040	19
Nonadmitted DTAs	(238)	(91)	(147)
Admitted ordinary DTAs	3,821	3,949	(128)
Capital			
Unrealized investment losses	424	443	(19)
Expense items	19	18	1
Investment items	361	314	47
Total capital DTAs	804	775	29
Nonadmitted DTAs	(25)	(9)	(16)
Admitted capital DTAs	779	766	13
Admitted DTAs	4,600	4,715	(115)
DTLs:			
Ordinary			
Reserve items	75	144	(69)
Unrealized investment gains	1,070	1,163	(93)
Deferred and uncollected premium	320	312	8
Pension items	65	64	1
Investment items	3	1	2
Other	409	388	21
Total ordinary DTLs	1,942	2,072	(130)
Capital			
Unrealized investment gains	772	830	(58)
Investment items	5	128	(123)
Total capital DTLs	777	958	(181)
Total DTLs	2,719	3,030	(311)
Net admitted DTA	\$ 1,881	\$ 1,685	\$ 196

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

The change in net deferred income taxes comprised the following:

	Years Ended December 31,	
	2024	2023
	(In Millions)	
Net DTA(L)	\$ 359	\$ 513
Less: Items not recorded in the change in net deferred income taxes:		
Tax-effect of unrealized losses	(109)	(25)
Tax-effect of changes from investment transfers	15	(12)
Change in net deferred income taxes	<u>\$ 265</u>	<u>\$ 476</u>

As of December 31, 2024, the Company had no net operating or capital loss carryforwards to include in deferred income taxes. The Company has \$9 million in 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,	
	2024	2023
	(In Millions)	
Provision computed at federal statutory rate of 21%	\$ (199)	\$ (194)
Investment items	(203)	(250)
Nonadmitted assets	(7)	(15)
Tax credits	(69)	(222)
Expense items	(72)	(4)
Foreign governmental income taxes	1	5
Other	27	54
Total statutory income tax benefit	<u>\$ (522)</u>	<u>\$ (626)</u>
 Federal and foreign income tax benefit	 \$ (258)	 \$ (150)
Change in net deferred income taxes	(264)	(476)
Total statutory income tax benefit	<u>\$ (522)</u>	<u>\$ (626)</u>

The Company received refunds in the amount of \$90 million in 2024 and \$50 million in 2023 and paid federal income taxes in the amount of \$28 million in 2022.

The total income taxes available in the current and prior years that will be available for recoupment in the event of future net capital losses totaled \$2 million related to December 31, 2024, \$0 million related to 2023 and \$31 million related to 2022.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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 Tax Agreement). The Tax Agreement sets forth the manner in which the total combined federal income tax is allocated among the Parties. The Tax 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 Tax 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. In accordance with the Tax Agreement, future CAMT is outside of the scope of the general tax allocation method and, consequently any future CAMT liability shall be allocated solely to MassMutual.

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, 2024	\$ 236
Gross change related to positions taken in prior years	—
Gross change related to positions taken in current year	2
Gross change related to settlements	—
Gross change related to lapse of statutes of limitations	—
Balance, December 31, 2024	<u>\$ 238</u>

Included in the liability for unrecognized tax benefits as of December 31, 2024, are \$224 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, 2024 includes \$9 million of unrecognized tax benefits that, if recognized, would impact the Company's effective tax rate.

The Company recognized an increase of \$6 million in accrued interest related to the liability for unrecognized tax benefits as a component of the provision for income taxes. The amount of net interest recognized was \$39 million as of December 31, 2024 and \$32 million as of December 31, 2023. 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 IRS has completed its examination of MassMutual and its subsidiaries for the year 2016 and prior. The IRS completed the examination of the 2017-2018 tax years and is at Appeals for 3 issues. The adjustments resulting from these examinations are not expected to materially affect the position or liquidity of the Company.

As of December 31, 2024 and 2023, the Company did not recognize any protective deposits as admitted assets.

7. Other than invested assets

a. Admitted negative (disallowed) IMR

As of December 31, 2024, the Company had \$1,567 million of disallowed IMR in aggregate and in the general account.

As of December 31, 2024, the calculated adjusted general capital and surplus was \$26,071 million.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

As of December 31, 2024, the percentage of adjusted general capital and surplus for which the admitted disallowed IMR represents was 6%.

The following represents allocated gains (losses) to IMR from derivatives:

	December 31, 2024
	(In Millions)
Unamortized fair value derivative gain	\$ 3,203
Unamortized fair value derivative losses	(4,544)
Total allocated net losses to IMR from derivatives	<u>\$ (1,341)</u>

When the Company sells bonds and recognizes losses due to interest-rate related factors, and the realized losses are transferred to the IMR, the sales proceeds are generally used for reinvestment as governed by prudent asset liability management (ALM) policies and procedures. Such sales of bonds are intermittently used to meet liquidity needs and managed within the ALM framework.

IMR losses for fixed income related derivatives were in accordance with documented risk management procedures, as well as the Company's derivative use plans, and reflect the same historical treatment of derivative gains reversed to IMR and amortized rather than immediately recognized as realized gain upon termination.

As of the period ended December 31, 2024, the IMR asset admitted under the currently adopted statutory accounting interpretation includes approximately \$127 million, net of tax, related to various Funds Withheld (FWH) reinsurance treaties. Included in the FWH assets are reimbursements of capital losses on the invested assets to back the ceded reinsurance liabilities and are recorded as an adjustment to the income statement. Both the IMR and FWH assets are admitted under statutory accounting guidance.

b. 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 owner and beneficiary of these policies. MassMutual had recorded cash surrender values of these policies of \$3,023 million and \$2,825 million as of December 31, 2024 and 2023, respectively.

The cash surrender value is allocated by the following investment categories:

	December 31, 2024	2023
Other invested assets	50 %	45 %
Bonds	27	28
Stocks	18	17
Cash and short-term investments	5	7
Real estate	—	3
	<u>100 %</u>	<u>100 %</u>

c. 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.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

The following summarizes the deferred and uncollected life insurance premium on a gross basis, as well as, net of loading and reinsurance:

	December 31,			
	2024		2023	
	Gross	Net	Gross	Net
	(In Millions)			
Ordinary new business	\$ 146	\$ 78	\$ 154	\$ 88
Ordinary renewal	1,308	1,259	1,256	1,215
Group life	10	10	10	10
Total	<u>\$ 1,464</u>	<u>\$ 1,347</u>	<u>\$ 1,420</u>	<u>\$ 1,313</u>

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.

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 \$74,660 million and \$68,637 million as of December 31, 2024 and 2023, respectively.

8. Policyholders' liabilities

a. Policyholders' reserves

The Company had life insurance in force of \$1,042 billion and \$998 billion as of December 31, 2024 and 2023, respectively.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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

	December 31,			
	2024		2023	
	Amount	Interest Rates	Amount	Interest Rates
	(\$ In Millions)			
Individual life	\$ 85,502	2.5 % - 6.0%	\$ 80,173	2.5 % - 6.0%
Group annuities	20,721	1.0 % - 11.8%	19,737	1.0 % - 11.8%
Individual universal and variable life	25,689	3.5 % - 6.0%	26,041	3.5 % - 6.0%
Individual annuities	40,930	1.0 % - 11.8%	36,579	1.0 % - 11.8%
Group life	4,656	3.0 % - 4.0%	4,178	3.0 % - 4.0%
Disabled life claim reserves	1,836	3.0 % - 6.0%	1,856	3.0 % - 6.0%
Disability active life reserves	1,364	3.0 % - 6.0%	1,504	3.0 % - 6.0%
Other	527	2.5 % - 6.0%	502	2.5 % - 6.0%
Total	<u>\$ 181,225</u>		<u>\$ 170,570</u>	

Individual life includes whole life and term insurance. Group life includes corporate-owned life insurance, group universal life and group variable universal life products. Individual annuities include individual annuity contracts, supplementary contracts involving life contingencies and structured settlements. Group annuities include deferred annuities and single premium annuity contracts. Disabled life claim reserves include disability income and LTC contracts and cover the future payments of known claims. Disability active life reserves include disability income and LTC contracts issued. Other is comprised of disability life and accidental death insurance.

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,			
	2024		2023	
	Amount	Interest Rates	Amount	Interest Rates
	(\$ In Millions)			
GICs:				
Note programs	\$ 13,986	1.2 % - 9.0%	\$ 12,376	0.6 % - 5.6 %
Federal Home Loan Bank of Boston	2,111	0.8 % - 3.4%	2,111	0.8 % - 3.4 %
Municipal contracts	1,858	0.0 % - 9.0%	1,720	0.0 % - 7.2 %
Supplementary contracts	2,885	1.0 % - 6.5%	3,045	1.0 % - 6.5 %
Dividend accumulations	427	3.4 % - 3.8%	439	3.0 % - 3.5 %
Other deposits	21	5.0 % - 6.5%	21	4.0 % - 8.0 %
Total	<u>\$ 21,288</u>		<u>\$ 19,712</u>	

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

Note program

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 program, 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 are currently issued from MassMutual's \$16.0 billion Global Medium-Term Note Program.

Federal Home Loan Bank of Boston

MassMutual has funding agreements with Federal Home Loan Bank (FHLB) of Boston in an investment spread strategy, consistent with its other funding agreements. These funding agreements are collateralized by securities with estimated fair values of \$1,972 million as of December 31, 2024. MassMutual's borrowing capacity with FHLB of 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 \$1,303 million as of December 31, 2024. As a member of FHLB of Boston, MassMutual held common stock of FHLB of Boston with a statement value of \$92 million and \$92 million as of December 31, 2024 and 2023, respectively.

Collateral pledged to FHLB:

	December 31, 2024			December 31, 2023		
	Fair Value	Carrying Value	Aggregate Total Borrowing	Fair Value	Carrying Value	Aggregate Total Borrowing
	(In Millions)					
Total collateral pledged	\$ 5,071	\$ 3,414	\$ 2,111	\$ 4,060	\$ 2,944	\$ 2,111
Maximum amount pledged	\$ 5,473	\$ 3,925	\$ 2,111	\$ 4,060	\$ 2,994	\$ 2,111

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.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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 \$153 million and \$216 million as of December 31, 2024 and 2023, respectively. 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, 2024, the Company's GICs by expected maturity year were as follows (in millions):

2025	\$ 2,729
2026	3,359
2027	3,904
2028	1,670
2029	1,937
Thereafter	4,357
Total	<u>\$ 17,956</u>

Most GICs only mature on their contractual maturity date. Actual maturities for municipal contracts may differ from their contractual maturity dates, as these contracts permit early contract termination under certain conditions.

c. Unpaid claims and claim expense reserves

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

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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

	December 31,	
	2024	2023
	(In Millions)	
Claim reserves, beginning of year	\$ 2,541	\$ 2,231
Less: Reinsurance recoverables	651	367
Net claim reserves, beginning of year	<u>1,890</u>	<u>1,864</u>
Claims paid related to:		
Current year	(14)	(14)
Prior years	<u>(343)</u>	<u>(333)</u>
Total claims paid	<u>(357)</u>	<u>(347)</u>
Incurred related to:		
Current year's incurred	327	375
Current year's interest	8	9
Prior year's incurred	(69)	(79)
Prior year's interest	<u>67</u>	<u>68</u>
Total incurred	<u>333</u>	<u>373</u>
Net claim reserves, end of year	1,866	1,890
Reinsurance recoverables	742	651
Claim reserves, end of year	<u><u>\$ 2,608</u></u>	<u><u>\$ 2,541</u></u>

The changes in reserves for incurred claims related to prior years are generally the result of recent loss development trends. The \$69 million decrease in the prior years' incurred claims for 2024 and the \$79 million decrease in the prior years' incurred claims for 2023 were generally the result of differences between actual termination experience and statutorily prescribed termination tables. In 2024, claim experience included normal claim volume with higher terminations, resulting in a reduction to the incurred reserve from favorable experience, while 2023 claims incurred was due to maturing LTC business partially offset by a corresponding increase in reinsurance recoverable.

The following reconciles disabled life claim reserves to the net claim reserves at the end of the years presented in the previous table. Disabled life claim reserves are recorded in policyholders' reserves. Accrued claim liabilities are recorded in other liabilities.

	December 31,	
	2024	2023
	(In Millions)	
Disabled life claim reserves	\$ 1,836	\$ 1,856
Accrued claim liabilities	30	33
Net claim reserves, end of year	<u><u>\$ 1,866</u></u>	<u><u>\$ 1,889</u></u>

d. Additional liability for annuity contracts

Certain variable annuity contracts include additional death or other insurance benefit features, such as GMDB, GMIB, GMAB and GLWB. In general, living benefit guarantees require the contract holder or policyholder to adhere to a company approved asset allocation strategy. Election of these benefit guarantees is generally only available at contract issue.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

The following shows the changes in the liabilities for GMDB, GMIB, GMAB and GLWB (in millions):

Liability as of January 1, 2023	\$ 56
Incurred guarantee benefits	27
Paid guarantee benefits	(9)
Liability as of December 31, 2023	74
Incurred guarantee benefits	2
Paid guarantee benefits	(9)
Liability as of December 31, 2024	<u>\$ 67</u>

The following summarizes the account values, net amount at risk and weighted average attained age for variable annuity contracts with GMDB, GMIB, GMAB and GLWB 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, 2024			December 31, 2023		
	Account Value	Net Amount at Risk	Weighted Average Attained Age	Account Value	Net Amount at Risk	Weighted Average Attained Age
	(\$ In Millions)					
GMDB	\$ 9,496	\$ 94	68	\$ 9,935	\$ 45	66
GMIB Basic	412	3	73	449	7	73
GMIB Plus	1,200	429	69	1,240	448	69
GMAB	1,089	4	64	1,400	20	63
GLWB	82	13	76	94	15	75

As of December 31, 2024, the GMDB account value above consists of \$1,039 million within the general account and \$8,457 million within separate accounts that includes \$3,807 million of Modco assumed. As of December 31, 2023, the GMDB account value above consists of \$1,405 million within the general account and \$8,530 million within separate accounts that includes \$3,712 million of Modco assumed.

Account values of variable annuity contracts with GMDB, GMIB, GMAB and GLWB are summarized below:

	December 31, 2024			December 31, 2023		
	Separate Account	General Account	Total	Separate Account	General Account	Total
	(In Millions)					
GMDB	\$ 8,457	\$ 1,039	\$ 9,496	\$ 8,530	\$ 1,405	\$ 9,935
GMIB Basic	403	9	412	434	15	449
GMIB Plus	1,200	—	1,200	1,240	—	1,240
GMAB	1,061	28	1,089	1,368	32	1,400
GLWB	82	—	82	94	—	94

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

e. Additional liability for individual life contracts

Certain universal life and variable universal life contracts include features such as 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 following presents the changes in the liability, net of reinsurance, for guarantees on universal life and variable universal life type contracts:

	December 31,	
	2024	2023
	(In Millions)	
Beginning balance	\$ 5,712	\$ 5,394
Net liability increase (decrease)	304	318
Ending balance	\$ 6,016	\$ 5,712

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 \$35 million.

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.

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

	Years Ended December 31,	
	2024	2023
	(In Millions)	
Direct premium	\$ 34,496	\$ 34,717
Premium assumed	1,007	933
Premium ceded	(14,215)	(10,042)
Total net premium	\$ 21,288	\$ 25,608
Ceded reinsurance recoveries	\$ 2,110	\$ 2,062
Assumed losses	\$ 423	\$ 324

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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

	December 31,	
	2024	2023
	(In Millions)	
Reinsurance reserves		
Assumed	\$ 5,362	\$ 5,962
Ceded	(59,388)	(52,393)
Ceded amounts recoverable	\$ 374	\$ 379
Benefits payable on assumed business	\$ 31	\$ 25
Funds held under coinsurance		
Ceded	\$ 29,625	\$ 22,520

Reinsurance reserves ceded to unaffiliated reinsurers as of December 31, 2024, include \$10,049 million associated with life insurance policies, \$6,916 million for LTC, \$24,111 million for annuity, \$13 million for disability and \$5 million for group life and health. Reinsurance reserves ceded to unaffiliated reinsurers as of December 31, 2023 include \$10,064 million associated with life insurance policies, \$6,497 million for LTC, \$26,881 million for annuity, \$14 million for disability and \$6 million for group life and health.

LTC policyholders' deficiency reserves were as follows:

	December 31, 2024		
	Direct	Ceded	Net
	(In Millions)		
LTC premium deficiency reserves, beginning of year	\$ 3,800	\$ (3,615)	\$ 185
Assumption changes	(435)	470	35
LTC premium deficiency reserves, end of year	\$ 3,365	\$ (3,145)	\$ 220

For the year ended December 31, 2024, the Company decreased its gross LTC policyholders' premium deficiency reserve by \$435 million primarily through a combination of various assumption changes to reflect the risk inherent in the cash flows of this business. The majority of the risk is ceded to unaffiliated reinsurers resulting in the ceded policyholders' premium deficiency reserves decreasing by \$470 million. The total net impact of the change is \$35 million, which was recorded as an increase to policyholders' liabilities on the Consolidated Statutory Statements of Financial Position and an increase to change in policyholders' reserves on the Consolidated Statutory Statements of Operations.

	December 31, 2023		
	Direct	Ceded	Net
	(In Millions)		
LTC premium deficiency reserves, beginning of year	\$ 4,390	\$ (3,910)	\$ 480
Assumption changes	(590)	295	(295)
LTC premium deficiency reserves, end of year	\$ 3,800	\$ (3,615)	\$ 185

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

For the year ended December 31, 2023, the Company decreased its gross LTC policyholders' premium deficiency reserve by \$590 million primarily through a combination of various assumption changes to reflect the risk inherent in the cash flows of this business. The majority of the risk is ceded to unaffiliated reinsurers resulting in the ceded policyholders' premium deficiency reserves decreasing by \$295 million. The total net impact of the change is \$295 million, which was recorded as an increase to policyholders' liabilities on the Consolidated Statutory Statements of Financial Position and an increase to change in policyholders' reserves on the Consolidated Statutory Statements of Operations.

As of December 31, 2024, one reinsurer accounted for 26% of the outstanding balance of the reinsurance recoverable and the next largest reinsurer had 25%. The Company continues to monitor its morbidity risk ceded to one reinsurer for its LTC business, in which 79% of the reserves are held in trust.

On July 5, 2023, the Company recaptured approximately \$16 million of statutory reserves reinsured on a yearly renewable term (YRT) basis for certain closed blocks of LTC business and reinsured on a coinsurance basis a portion of this product resulting in ceding \$692 million statutory reserves to a different reinsurer. The recapture settlement of \$17 million relieved the reinsurer of all obligations under the YRT agreement and resulted in an offset to premiums and disability benefits. As part of the coinsurance transaction, the Company transferred \$657 million of premium to the reinsurer.

On October 25, 2024, the Company executed a certain coinsurance treaty amendment to increase quota share reinsurance of certain closed long-term care business by 25%. The Company transferred \$357 million of premium to the reinsurer in exchange for ceding \$325 million in statutory reserves.

The Company holds invested assets associated with FWH that are managed externally, as of December 31, 2024 and 2023, these assets, at carry value, included:

	December 31,	
	2024	2023
	(In Millions)	
Bonds	\$ 21,471	\$ 15,215
Preferred stocks	51	79
Mortgage loans	1,556	1,043
Partnerships and LLCs	190	51
Cash, cash equivalents and short-term investments	776	946
Total	<u>\$ 24,044</u>	<u>\$ 17,334</u>

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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, 2024 are illustrated below:

Individual annuities

	General Account	Separate Account with Guarantees	Separate Account Non- Guaranteed	Total	% of Total
	(In Millions)				
Subject to discretionary withdrawal:					
With market value adjustment	\$ 2,340	\$ —	\$ —	\$ 2,340	3 %
At book value less current surrender charge of 5% or more	45,923	—	—	45,923	64 %
At fair value	—	—	8,929	8,929	12 %
Total with market value adjustment or at fair value	48,263	—	8,929	57,192	79 %
At book value without adjustment (minimal or no charge or adjustment)	5,880	—	—	5,880	8 %
Not subject to discretionary withdrawal	9,311	—	—	9,311	13 %
Total	63,454	—	8,929	72,383	100 %
Reinsurance ceded	22,642	—	—	22,642	
Total, net of reinsurance	\$ 40,812	\$ —	\$ 8,929	\$ 49,741	
Amount included in book value moving to at book value without adjustment after statement date	3,228	—	—	3,228	

Group annuities

	General Account	Separate Account with Guarantees	Separate Account Non- Guaranteed	Total	% of Total
	(In Millions)				
Subject to discretionary withdrawal:					
With market value adjustment	\$ 11,608	\$ —	\$ —	\$ 11,608	17 %
At fair value	—	9,403	18,973	28,376	43 %
Total with market value adjustment or at fair value	11,608	9,403	18,973	39,984	60 %
At book value without adjustment (minimal or no charge or adjustment)	279	318	—	597	1 %
Not subject to discretionary withdrawal	26,189	—	—	26,189	39 %
Total	38,076	9,721	18,973	66,770	100 %
Reinsurance ceded	17,380	—	—	17,380	
Total, net of reinsurance	\$ 20,696	\$ 9,721	\$ 18,973	\$ 49,390	

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

Deposit-type contracts

	General Account	Separate Account with Guarantees	Separate Account Non- Guaranteed	Total	% of Total
	(In Millions)				
Subject to discretionary withdrawal:					
With market value adjustment	\$ 2,166	\$ —	\$ —	\$ 2,166	7 %
At fair value	—	—	8,935	8,935	27 %
Total with market value adjustment or at fair value	2,166	—	8,935	11,101	34 %
At book value without adjustment (minimal or no charge or adjustment)	2,777	—	—	2,777	9 %
Not subject to discretionary withdrawal	18,729	—	—	18,729	57 %
Total	23,672	—	8,935	32,607	100 %
Reinsurance ceded	2,384	—	—	2,384	
Total, net of reinsurance	\$ 21,288	\$ —	\$ 8,935	\$ 30,223	

The following is a summary of total annuity actuarial reserves and liabilities for deposit-type contracts as of December 31, 2024 (in millions):

Consolidated Statutory Statements of Financial Position:

Policyholders' reserves – group annuities	\$ 20,696
Policyholders' reserves – individual annuities	40,812
Liabilities for deposit-type contracts	21,288
Subtotal	82,796

Separate Account Annual Statement:

Annuities	37,623
Other annuity contract deposit-funds and GICs	8,935
Subtotal	46,558
Total	\$ 129,354

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

b. Analysis of life actuarial reserves by withdrawal characteristics

The withdrawal characteristics of the Company's life actuarial reserves as of December 31, 2024 are illustrated below:

General account

	Account Value	Cash Value	Reserve
	(In Millions)		
Subject to discretionary withdrawal, surrender values, or policy loans:			
Universal life	\$ 21,664	\$ 21,662	\$ 21,719
Universal life with secondary guarantees	2,336	2,172	8,964
Other permanent cash value life insurance	—	85,152	90,098
Variable life	1	1	1
Variable universal life	1,335	1,332	1,412
Not subject to discretionary withdrawal or no cash values:			
Term policies without cash value	—	—	3,048
Accidental death benefits	—	—	3
Disability - active lives	—	—	197
Disability - disabled lives	—	—	349
Miscellaneous reserves	—	—	1,103
Total (gross: direct + assumed)	25,336	110,319	126,894
Reinsurance ceded	5,035	5,520	10,436
Total (net)	\$ 20,301	\$ 104,799	\$ 116,458

Separate account with guarantees

	Account Value	Cash Value	Reserve
	(In Millions)		
Subject to discretionary withdrawal, surrender values, or policy loans:			
Variable universal life	\$ 4,969	\$ 4,965	\$ 4,969
Total (gross: direct + assumed)	4,969	4,965	4,969
Total (net)	\$ 4,969	\$ 4,965	\$ 4,969

Separate account nonguaranteed

	Account Value	Cash Value	Reserve
	(In Millions)		
Subject to discretionary withdrawal, surrender values, or policy loans:			
Variable life	\$ 8	\$ 8	\$ 14
Variable universal life	4,066	4,042	4,049
Total (gross: direct + assumed)	4,074	4,050	4,063
Total (net)	\$ 4,074	\$ 4,050	\$ 4,063

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

c. *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, 2024 is as follows:

	Guaranteed			
	Nonindexed		Non	
	Indexed	Less than/ Equal to 4%	Guaranteed	Total
	(In Millions)			
Net premium, considerations or deposits for the year ended December 31, 2024	\$ —	\$ —	\$ 4,544	\$ 4,544
Reserves at December 31, 2024:				
For accounts with assets at:				
Fair value	\$ —	\$ 10,038	\$ 40,584	\$ 50,622
Amortized cost/book value	—	4,969	—	4,969
Subtotal SIA Reserves	—	15,007	40,584	55,591
Nonpolicy liabilities	—	—	200	200
Total Separate Account Liabilities	\$ —	\$ 15,007	\$ 40,784	\$ 55,791
Reserves by withdrawal characteristics:				
Subject to discretionary withdrawal:				
At fair value	\$ —	\$ 10,038	\$ 40,584	\$ 50,622
At book value without market value adjustment and current surrender charge of less than 5%	—	4,969	—	4,969
Subtotal	—	15,007	40,584	55,591
Nonpolicy liabilities	—	—	200	200
Total Separate Account Liabilities	\$ —	\$ 15,007	\$ 40,784	\$ 55,791

As of December 31, 2024, the Company has \$6,562 million of AVR related to book value separate accounts.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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,	
	2024	2023
	(In Millions)	
From the Separate Account Annual Statement:		
Transfers to separate accounts	\$ 1,932	\$ 2,000
Transfers from separate accounts	(10,451)	(9,614)
Subtotal	(8,519)	(7,614)
Reconciling adjustments:		
Miscellaneous	4,816	4,278
Net deposits on deposit-type liabilities	1,531	1,573
Net transfers from separate accounts	<u>\$ (2,172)</u>	<u>\$ (1,763)</u>

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

11. Debt

MassMutual issues CP in the form of Notes in minimum denominations of \$250 thousand up to a total aggregation of \$1,000 million 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 have a carrying value and face amount of \$250 million as of December 31, 2024 and \$50 million as of December 31, 2023. Notes issued in 2024 had interest rates ranging from 4.39% to 5.41% with maturity dates ranging from 1 to 62 days. Interest expense for commercial paper for the years ended December 31, 2024 and 2023, was \$20 million and \$7 million, respectively.

MassMutual has a \$1,500 million five-year credit facility, \$1,250 million of undrawn commitment, with a syndicate of lenders that can be used for general corporate purposes and to support CP borrowings. During December 2022, the facility was renewed and the scheduled maturity is December 16, 2027. The facility includes two one-year extension options that may be exercised with proper notification as set forth in the agreement. The facility has an upsize option for an additional \$500 million. The terms of the credit facility additionally provide for, among other provisions, covenants pertaining to liens, fundamental changes, transactions with affiliates and adjusted statutory surplus. As of and for the years ended December 31, 2024 and 2023, MassMutual was in compliance with all covenants under the credit facility. For the years ended December 31, 2024 and 2023, there were no draws on the credit facilities. Credit facility fees were less than \$1 million for the years ended December 31, 2024 and 2023.

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.

a. Pension plans

The Company sponsors funded and unfunded noncontributory defined benefit pension plans for its eligible employees, agents and retirees.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

The funded qualified defined benefit plan generally provides benefits under a cash balance formula based on age, service and salary during the participants' careers. Certain eligible participants may be entitled to benefits under a legacy defined benefit formula. The Company's policy is to fund the qualified pension plan in accordance with the Employee Retirement Income Security Act of 1974. There were no contributions in 2024 and 2023.

The Company has announced there will be no new benefit accruals under the plan after December 31, 2024.

b. Defined contribution plans

The Company sponsors funded qualified defined contribution plans and unfunded nonqualified deferred compensation thrift savings plans for its employees, agents and retirees. Defined contribution plan expense for 2024 and 2023 was \$58 million and \$56 million, respectively.

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 eligible 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 eligible 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 and projected 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 as of that date.

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 increases to an assumed date with respect to retirement, disability or death.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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, mortality and expected retirement age.

The following presents the total pension and other postretirement accumulated benefit obligation:

	December 31,			
	2024	2023	2024	2023
	Pension Benefits		Other Postretirement Benefits	
	(In Millions)			
Accumulated benefit obligation	\$ 2,570	\$ 2,634	\$ 307	\$ 313

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

	December 31,			
	2024	2023	2024	2023
			Other Postretirement	
	Pension Benefits		Benefits	
	(In Millions)			
Projected benefit obligation, beginning of year	\$ 2,634	\$ 2,590	\$ 313	\$ 315
Service cost	99	86	7	7
Interest cost	123	125	15	15
Actuarial (gains) losses	(5)	21	(1)	(14)
Benefits paid	(150)	(222)	(15)	(14)
Change in discount rate	(138)	34	(12)	4
Change in actuarial assumptions	7	—	—	—
Projected benefit obligation, end of year	\$ 2,570	\$ 2,634	\$ 307	\$ 313

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 \$53 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 are invested in a MassMutual group annuity contract and in the MassMutual Pension Plan Trust (Pension Trust). The group annuity contract includes a general investment account (GIA). As of December 31, 2024 and 2023, GIA assets managed by the Company were \$143 million and \$229 million, respectively. The Company was rated AA+ by Standards and Poor's as of December 31, 2024.

The Company's overall objective is to manage the assets in a liability framework where investments are selected that are expected to have similar changes in fair value as the related liabilities will have upon changes in interest rates. The company invests in a portfolio of both return-seeking and liability-hedging assets, to achieve long-term growth and to insulate the funded position from interest rate volatility.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

The target range allocations are based on two broad categories, return-seeking (generally equities and alternative investments) and liability-hedging (generally fixed income). The return-seeking allocation range is 46% to 54% and liability-hedging range is 46% to 54%. Of the return-seeking assets, the range is 35% to 55% global public equity and 45% to 65% alternatives. The pension plan assets invested in the GIA through the unallocated group annuity contract earn a fixed interest. These assets comprised approximately 6% and 9% of the plan assets as of December 31, 2024 and 2023, respectively.

The following presents the change in plan assets:

	December 31,			
	2024	2023	2024	2023
	Pension Benefits		Other Postretirement Benefits	
	(In Millions)			
Plan assets, beginning of year	\$ 2,521	\$ 2,483	\$ 4	\$ 2
Actual return on plan assets	73	230	—	—
Employer contributions	26	30	12	14
Benefits paid	(150)	(222)	(15)	(14)
Other	—	—	(1)	2
Plan assets, end of year	<u>\$ 2,470</u>	<u>\$ 2,521</u>	<u>\$ —</u>	<u>\$ 4</u>

The GIA is designed to provide stable, long-term investment growth. Investments in the GIA are stated at contract value. Contract value is the amount participants would receive if they were to initiate certain transactions under the terms of the plan. It provides for a stated return on principal invested over a specified period and permits withdrawals at contract value for benefit payments, loans, or transfers.

Investments in the Pension Trust are stated at fair value. Noninterest bearing cash is stated at cost value.

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.

Cash, cash equivalents and short-term investments: Short-term investments are stated at cost, which is equal to fair value. Foreign currencies are stated at cost and adjusted for foreign currency gains and losses.

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.

Bonds: 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.

Mutual funds: Mutual funds are valued at the daily closing price as reported by the fund. Certain mutual funds held by the plan are registered with the SEC and are required to publish their daily NAV. These mutual funds held by the Plan are deemed to be actively traded and are therefore classified as Level 1. The remaining mutual funds do not publish their daily NAV and are therefore classified as Level 2.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

Collective investment trusts: 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 is classified as NAV practical expedient.

Real estate investment trusts: Real estate investment trusts are valued using the plan's pro-rata interest in the fund and does not have a lock-up period, a funding commitment, or a specific redemption period but are dependent upon the liquidation of underlying assets. Therefore, these investments are classified as NAV practical expedient.

Hedge funds: Hedge funds are based on the plan's pro rata interest in the fund and have a 45-day redemption period and therefore classified as NAV practical expedient.

Limited partnerships – Private equity/venture capital: The plan utilizes the NAV 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 are accounted for at fair value as described in the partnership's audited financial statements. These funds can be redeemed periodically with notice that generally ranges from 45 to 90 days. There are no lockups or funding commitments.

Limited partnerships – Real estate: The plan utilizes the NAV 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. These funds can be redeemed periodically with notice that generally ranges from 45 to 90 days. There are no lockups or funding commitments.

Limited partnerships – Hedge: The Plan utilizes the NAV 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 hedge funds can be redeemed semi-annually with 95-days notice. There are no lockups or funding commitments.

Other investments: Investments included in this category include asset backed securities, mortgage backed securities, swaps, derivatives, futures and options. Closing prices are not available on the active market. Fair value is determined using models such as matrix pricing and therefore, these securities are classified as Level 2.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

The following tables set forth by level, within the fair value hierarchy, the plan's assets at fair value as of December 31, 2024 and 2023.

Fair Value as of December 31, 2024					
	Level 1	Level 2	Level 3	NAV Practical Expedient	Total
	(In Millions)				
Cash, cash equivalents, and short-term investments	\$ 44	\$ —	\$ —	\$ —	\$ 44
Government securities	—	459	—	—	459
Bonds	—	374	—	—	374
Mutual funds	512	—	—	—	512
Real estate investment trusts	—	—	—	47	47
Hedge funds	—	—	—	34	34
Limited partnerships:					
Private equity/venture capital	—	—	—	512	512
Real estate	—	—	—	108	108
Hedge	—	—	—	225	225
Other investments	—	3	—	—	3
Total	\$ 556	\$ 836	\$ —	\$ 926	\$ 2,318

Fair Value as of December 31, 2023					
	Level 1	Level 2	Level 3	NAV Practical Expedient	Total
	(In Millions)				
Cash, cash equivalents, and short-term investments	\$ 76	\$ —	\$ —	\$ —	\$ 76
Government securities	—	486	—	—	486
Bonds	—	371	—	—	371
Mutual funds	471	—	—	—	471
Real estate investment trusts	—	—	—	54	54
Hedge funds	—	—	—	31	31
Limited partnerships:					
Private equity/venture capital	—	—	—	480	480
Real estate	—	—	—	120	120
Hedge	—	—	—	205	205
Other investments	—	12	—	—	12
Total	\$ 547	\$ 869	\$ —	\$ 890	\$ 2,306

Plan assets measured at contract value and non-interest bearing cash are excluded from the preceding table.

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.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

Unrecognized net actuarial (gains) losses are variances between assumptions used and actual experience. These assumptions include return on assets, discount rate, demographics and mortality. The unrecognized net actuarial (gains) losses are amortized if they exceed 10% of the projected benefit obligation and are amortized starting in the period after recognition. These are amortized for pension and other postretirement benefits into net periodic benefit cost over the remaining service-years of active employees.

The prepaid pension asset is a cumulative balance of employer contributions made to the plan netted against the plan's accumulated net periodic benefit costs. The prepaid pension asset is a nonadmitted asset.

The accrued benefit cost recognized is the funded status of the plan adjusted for the remaining balance of unrecognized prior service cost, unrecognized net actuarial loss and the nonadmitted prepaid pension asset.

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

	December 31,			
	2024	2023	2024	2023
	Pension Benefits		Other Postretirement Benefits	
	(In Millions)			
Projected benefit obligation	\$ (2,570)	\$ (2,634)	\$ (307)	\$ (313)
Less: plan assets	2,470	2,521	—	4
Projected benefit obligation funded status	<u>\$ (100)</u>	<u>\$ (113)</u>	<u>\$ (307)</u>	<u>\$ (309)</u>

The qualified pension plan was overfunded by \$307 million and \$312 million as of December 31, 2024 and 2023, respectively. The nonqualified pension plans are not funded and have total projected benefit obligations of \$407 million and \$425 million as of December 31, 2024 and 2023, respectively.

The qualified pension plan nonadmitted pension plan asset was \$631 million and \$653 million as of December 31, 2024 and 2023, respectively.

The Company intends to fund \$56 million in 2025 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,			
	2024	2023	2024	2023
	Pension Benefits		Other Postretirement Benefits	
	(In Millions)			
Service cost	\$ 99	\$ 86	\$ 7	\$ 7
Interest cost	123	125	15	15
Expected return on plan assets	(171)	(169)	—	—
Amortization of unrecognized losses and (gains)	19	27	(10)	(9)
Amortization of unrecognized prior service benefit	—	—	(5)	(5)
Total net periodic expense	\$ 70	\$ 69	\$ 7	\$ 8

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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

	Pension Benefits	Other Postretirement Benefits
	(In Millions)	
2025	\$ 205	\$ 19
2026	203	20
2027	195	21
2028	194	22
2029	187	22
2030 - 2034	915	114

h. Assumptions

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

	Years Ended December 31,			
	2024	2023	2024	2023
			Other Postretirement	
	Pension Benefits		Benefits	
	(In Millions)			
Weighted-average assumptions used to determine:				
Benefit obligations:				
Discount rate	5.50 %	4.85 %	5.55 %	4.85 %
Expected rate of compensation increase	3.50 %	3.50 %	3.50 %	3.50 %
Interest Crediting rate	5.00 %	5.00 %	5.55 %	4.85 %
Net periodic benefit cost:				
Discount rate	4.85 %	5.00 %	4.85 %	5.05 %
Expected long-term rate of return on plan assets	7.00 %	7.00 %	3.00 %	3.00 %
Expected rate of compensation increase	3.50 %	3.50 %	3.50 %	3.50 %
Interest Crediting rate	5.00 %	5.00 %	4.85 %	5.05 %

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.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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,	
	2024	2023
Weighted average grant date fair value:		
PSARs granted during the year	\$ 151.50	\$ 145.77
PRS granted during the year	150.96	145.67
Intrinsic value (in thousands):		
PSARs options exercised	1,986	65,810
PRS liabilities paid	103,656	45,600
Fair value of shares vested during the year	99,903	64,779

A summary of PSARs and PRS shares is as follows:

	PSARs			PRS		
	Weighted Average			Weighted Average		
	Number of		Remaining	Number of		Remaining
	Share Units	Price	Contract	Share Units	Price	Contract
	(In Thousands)		(In Years)	(In Thousands)		(In Years)
Outstanding as of						
December 31, 2022	3,394	\$ 160.09	4.0	872	\$ 151.41	2.4
Granted	2,762	145.77		1,002	145.67	
Exercised	(1,329)	130.59		(252)	116.36	
Forfeited	(788)	239.79		(37)	180.80	
Outstanding as of						
December 31, 2023	4,039	144.46	4.4	1,585	152.73	2.1
Granted	1,591	151.50		332	150.96	
Exercised	(215)	141.60		(684)	142.11	
Forfeited	(229)	147.01		(85)	160.51	
Outstanding as of						
December 31, 2024	<u>5,186</u>	146.66	4.0	<u>1,148</u>	157.97	2.8
Exercisable as of						
December 31, 2024	1,046	\$ 141.62	2.2	4	\$ 142.60	0.8

The PSARs compensation was an expense of \$10 million and \$17 million for the years ended December 31, 2024 and 2023, respectively. The PSARs accrued compensation liability was \$1 million and \$13 million as of December 31, 2024 and 2023, respectively. There was no unrecognized compensation expense related to nonvested PSAR awards as of December 31, 2024, and the unrecognized compensation expense related to nonvested PSAR awards was \$20 million as of December 31, 2023. The weighted average period over which the expense is expected to be recognized is 4.0 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.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

The PRS compensation expense was \$39 million and \$96 million for the years ended December 31, 2024 and 2023, respectively. The PRS accrued compensation liability was \$85 million and \$148 million for the year ended December 31, 2024 and 2023, respectively. The unrecognized compensation expense related to nonvested PRS awards was \$66 million and \$87 million as of December 31, 2024 and 2023, respectively. The weighted average period over which the expense is expected to be recognized is 2.8 years. The PRS unrecognized compensation expense represents the total value of all shares issued if 100% vested at the current stock price, minus current compensation liability.

14. Surplus notes

The following table summarizes the surplus notes issued and outstanding as of December 31, 2024:

Issue Date	Face Amount	Carrying Value	Interest Rate	Maturity Date	Scheduled Interest Payment Dates	Type of Assets Received Upon Issuance
(\$ In Millions)						
05/12/03	\$ 193	\$ 193	5.625%	05/15/33	May 15 & Nov 15	Cash
06/01/09	130	129	8.875%	06/01/39	Jun 1 & Dec 1	Cash
01/17/12	263	263	5.375%	12/01/41	Jun 1 & Dec 1	Cash
04/15/15	258	254	4.500%	04/15/65	Apr 15 & Oct 15	Cash
03/23/17	475	471	4.900%	04/01/77	Apr 1 & Oct 1	Cash
10/11/19	838	603	3.729%	10/15/70	Apr 15 & Oct 15	Cash
04/16/20	700	698	3.375%	04/15/50	Apr 15 & Oct 15	Cash
06/26/20	600	815	5.077%	02/15/69	Feb 15 & Aug 15	Treasury Notes
03/01/21	200	231	5.077%	02/15/69	Feb 15 & Aug 15	Treasury Notes
11/18/21	675	670	3.200%	12/01/61	Jun 1 & Dec 1	Treasury Notes
12/01/22	500	500	5.672%	12/01/52	Jun 1 & Dec 1	Treasury Notes
Total	<u>\$ 4,832</u>	<u>\$ 4,827</u>				

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, 2024, the unapproved interest was \$43 million. Through December 31, 2024, MassMutual paid cumulative interest of \$2,270 million on surplus notes. Interest of \$219 million was approved and paid during the year ended December 31, 2024.

There are no sinking fund requirements for the notes issued in 2003, 2009, 2012, 2015, 2017, 2019, 2020, 2021 or 2022.

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, 2024 and 2023. Accordingly, the Company has excluded these non-cash activities from the Consolidated Statutory Statements of Cash Flows for the years ended December 31, 2024 and 2023.

	Years Ended December 31,	
	2024	2023
	(In Millions)	
Stock conversions	\$ 5,748	\$ 207
Bond conversions and refinancing	1,829	1,470
Transfer of affiliated common stocks to partnerships and limited liability companies	1,652	38
Change in market value of corporate owned life insurance asset	204	217
Transfer of mortgage loans to partnerships and limited liability companies	193	—
Transfer of partnerships and limited liability companies to partnerships and limited liability companies	76	277
Transfer of mortgage loans to bonds	66	132
Net investment income payment-in-kind bonds	31	30
Transfer of mortgage loans to mortgage loans	17	—
Transfer of bonds to partnerships and limited liability companies	—	122
Transfer of partnerships and limited liability companies to bonds	—	100
Transfer of mortgage loans to short-term investments	—	60
Accrued discount on mortgage loans	—	10
Transfer of partnerships and limited liability companies to stocks	—	3

16. *Business risks, commitments and contingencies*

a. *Risks and uncertainties*

The Company operates in a business environment subject to various risks and uncertainties. The principal risks include insurance and underwriting risks, investment and interest rate risks, currency exchange risk and credit risk. The combined impact of these risks could have a material, adverse effect on the Company's financial statements or result in operating losses in future periods. The Company employs the use of reinsurance, portfolio diversification, asset/liability management processes and other risk management techniques to mitigate the impact of these risks.

Insurance and underwriting risks

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

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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

Credit and other market risks

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

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

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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

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

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

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

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

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

Political Uncertainties

Political events, domestically or internationally, may directly or indirectly trigger or exacerbate risks related to product offerings, profitability, or any of the risk factors described above. Whether those underlying risk factors are driven by geopolitics or not, the Company's dynamic approach to managing risks enables management to identify risks, internally and externally, develop mitigation plans, and respond to risks in an attempt to proactively reduce the potential impact of each underlying risk factor on the Company.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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 Barings. Total rental expense on net operating leases, recorded in general insurance expenses, was \$77 million and \$93 million for the years ended December 31, 2024 and 2023, respectively. Net operating leases are net of sublease receipts of \$9 million and \$5 million for the years ended December 31, 2024 and 2023, respectively.

For the years ended December 31, 2024 and 2023, the company has not entered into any sale-leaseback transactions with any unrelated parties.

Future minimum commitments for all lease obligations as of December 31, 2024 were as follows:

	Gross	Affiliated Subleases	Nonaffiliated Subleases	Net
	(In Millions)			
2025	\$ 83	\$ 6	\$ 2	\$ 75
2026	70	6	2	62
2027	64	6	2	56
2028	59	5	2	52
2029	55	4	2	49
Thereafter	267	16	5	246
Total	\$ 598	\$ 43	\$ 15	\$ 540

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.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

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 offset by related insurance recoveries or other contributions, if any. An accrual may be subject to subsequent adjustment as a result of additional information and other developments. The resolution of matters is inherently difficult to predict, especially in the early stages of matter. Even if a loss is probable, due to many complex factors, such as speed of discovery and the timing of court decisions or rulings, a loss or range of loss may not be reasonably estimated until the later stages of the matter. For matters where a loss is material and it is either probable or reasonably possible then it is disclosed. For matters where a loss may be reasonably possible, but not probable, or is probable but not reasonably estimated, no accrual is established, but the matter, if material, is disclosed.

e. Commitments

In the normal course of business, the Company provides specified guarantees and funding to MMHLLC and certain of its subsidiaries. As of December 31, 2024 and 2023, the Company had approximately \$800 million of these unsecured funding commitments to its subsidiaries. The unsecured commitments are included in private placements in the table below. As of December 31, 2024 and 2023, 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 \$77 million and \$77 million as of December 31, 2024 and 2023, respectively. As of December 31, 2024 and 2023, 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, 2024, the Company had the following outstanding commitments:

	2025	2026	2027	2028	2029	Thereafter	Total
	(In Millions)						
Private placements	\$ 522	\$ 2,497	\$ 3,185	\$ 2,166	\$ 992	\$ 4,997	\$ 14,359
Mortgage loans	343	421	206	194	139	79	1,382
Partnerships and limited liability companies	2,414	1,091	1,353	658	934	1,244	7,694
LIHTCs (including equity contributions)	—	1	—	1	1	27	30
Preferred stock	\$ 56	\$ —	\$ —	\$ —	\$ —	\$ 16	\$ 72
Total	<u>\$ 3,335</u>	<u>\$ 4,010</u>	<u>\$ 4,744</u>	<u>\$ 3,019</u>	<u>\$ 2,066</u>	<u>\$ 6,363</u>	<u>\$ 23,537</u>

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, 2024 and 2023, 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, 2024 and 2023, the Company had no outstanding obligations to any obligor attributable to these guarantees.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

The following details contingent guarantees that are made on behalf of the Company's subsidiaries and affiliates as of December 31, 2024.

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 its wholly-owned subsidiary Barings, if the subsidiary is unable to pay.	—	The liabilities for these plans of \$599 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 and MML Bay State).	—	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 Guarantee	The construction lender for an office building in London, UK required a cost overrun guarantee equivalent to 8% of the total budgeted cost (£6 million). The Company will only be responsible for its pro rata share of any cost overruns with a maximum additional commitment of approximately £2 million. This will remain in place until June 2025.	—	£8 million
Deferred Equity Guaranty	The lender for the Kimpton Tryon Park hotel has required a "Deferred Equity Guaranty" in the anticipated amount of \$3 million. The Guaranteed Equity Amount is equal to the sum of the remaining costs and expenses necessary to complete a planned renovation project at the hotel, less any amounts over \$0.5 million deposited in the FF&E Reserve. The Guaranty will remain in place until the renovation project at the hotel is completed, which is anticipated to occur in April 2025.	—	\$3 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.	—	\$156 million with the right to increase the line to \$345 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 MML Investment Advisers LLC, The MassMutual Private Wealth & Trust, FSB, 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, MML Investment Advisers LLC and MassMutual Intellectual Property LLC, 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,	
	2024	2023
	(In Millions)	
Fee income:		
Management and service contracts and cost-sharing arrangements	\$ 373	\$ 354
Investment advisory income	18	17
Recordkeeping and other services	12	11
Fee expense:		
Investment advisory services	277	222
Royalty and licensing fees	83	84

The Company reported amounts due from subsidiaries and affiliates of \$115 million and \$133 million as of December 31, 2024 and 2023, respectively. The Company reported amounts due to subsidiaries and affiliates of \$133 million and \$59 million as of December 31, 2024 and 2023, respectively. Terms generally require settlement of these amounts within 30 to 90 days.

The Company held debt issued by MMHLLC that amounted to \$2,144 million as of December 31, 2024 and \$2,144 million as of December 31, 2023. The Company recorded interest income on MMHLLC debt of \$168 million in 2024 and \$125 million in 2023.

As of December 31, 2024, MMIH provided financing of \$7,500 million for MassMutual Asset Finance (MMAF) that can be used to finance ongoing asset purchases. During 2024, MMAF borrowed \$2,790 million and repaid \$1,806 million under the credit facility. During 2023, MMAF borrowed \$2,350 million and repaid \$1,176 million under the credit facility. Outstanding borrowings under the facility were \$6,035 million as of December 31, 2024 and \$5,050 million as of December 31, 2023. Interest for these borrowings was \$207 million for the year ended December 31, 2024 and \$137 million for the year ended December 31, 2023. The floating rate borrowings bear interest at a spread over the 30-day SOFR. The fixed rate borrowings bear an interest at a spread over average life Treasuries.

Together, MassMutual and C.M. Life, provide a credit facility to Jefferies Finance, LLC (Jefferies) whereby Jefferies borrows cash through short-term approved financings to fund the purchase of loans for securitization. During 2024, there were no borrowings or repayments recorded. During 2023, Jefferies borrowed \$88 million and repaid \$88 million under the credit facility. As of December 31, 2024, there were no outstanding borrowings under this facility. All outstanding interest due under the facility, as of December 31, 2024, had been paid. The interest of this facility is calculated based on a full pass through of interest accrued on the underlying loans purchased.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

Capital Contributions from MassMutual

- \$70 million and \$92 million to ITPS Holdings LLC in 2024 and 2023, respectively
- \$135 million to DPI Acres Capital LLC in 2024
- \$300 million to DPI Ares Mortgage Lending LLC in 2024
- \$64 million and \$96 million to MassMutual Mortgage Lending LLC in 2024 and 2023, respectively
- \$27 million to MMV Europe APAC LP in 2024
- \$98 million to MM Ascend in 2024
- \$15 million to MMV SEA III in 2024
- \$14 million to MassMutual International LLC in 2023
- \$50 million to MassMutual Investment Holding LLC in 2023
- \$18 million to MML CM LLC in 2023

Non-Cash Capital Contributions from MassMutual

- Investments valued at \$1.2 billion to MM Vine Street LLC
- Investments valued at \$404 million to Stillings Street LLC

Return of Capital to MassMutual

- MMIH paid \$50 million in 2024
- MM/Barings Multifamily paid \$20 million in 2024
- Glidepath Holdings paid \$100 million in 2024
- MM Mortgage Lending paid \$10 million in 2024
- Berkshire Way paid \$141 million in 2023
- EM Opportunities LLC paid \$185 million in 2023

Dividends paid to MassMutual

- MMLIA paid \$33 million in 2024
- MM/Barings Multifamily paid \$22 million in 2024
- MM Mortgage Lending paid \$39 million in 2024
- Insurance Road LLC paid \$199 million and \$181 million in 2024 and 2023, respectively
- Berkshire Way paid \$139 million in 2023
- Glidepath Holdings Inc paid \$200 million in 2023
- DPI Acres Capital LLC paid \$155 million in 2023

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.

The Company currently has one longevity swap agreement with Rothesay Life Plc on certain inforce annuity products. Under this agreement, the Company is the reinsurer and Rothesay Life Plc is the cedent.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

The following summarizes the related party transactions between the Company and Rothesay Life Plc:

	December 31,	
	2024	2023
	(In Millions)	
Premium assumed	\$ (351)	\$ (248)
Policyholders' benefits	334	235

18. Subsequent events

Management of the Company has evaluated subsequent events through March 03, 2025, the date the financial statements were available to be issued to state regulators and subsequently on the Company's website. No events have occurred subsequent to the date of the financial statements, except for:

On January 14, 2025, MassMutual issued a \$600 million funding agreement with a 4.95% fixed rate and a 5-year maturity.

On February 13, 2025, Barings LLC entered into a definitive agreement to acquire Artemis Real Estate Partners, a US-based real estate debt and equity investment manager with gross assets under management of approximately \$11 billion. The total purchase price includes an upfront payment of approximately \$392 million and a final payment to be made in 2030 of approximately \$208 million. The transaction is subject to customary closing conditions, including regulatory approvals and client consents, and is expected to close on or before March 31, 2025. The acquisition is expected to bolster Barings LLC's position as a key player in the real estate asset management sector. Management is currently evaluating the impact of this acquisition on its consolidated statutory financial statements.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED STATUTORY FINANCIAL STATEMENTS, continued

Glossary of Terms

<u>Term</u>	<u>Description</u>
ALM	Asset liability management
AVR	Asset valuation reserve
CDHS	Clearly Defined Hedging Strategy
CDO	Collateralized Debt Obligations
CMBS	Commercial mortgage-backed securities
C.M. Life	C.M. Life Insurance Company
CP	Commercial Paper
DI	Disability Insurance
DTA	Deferred tax asset
DTL	Deferred tax liability
FHA	Federal Housing Administration
FHLB	Federal Home Loan Bank
FWH	Funding Withheld
GIA	General Investment Account
GIC	Guaranteed interest contracts
GMAB	Guaranteed minimum accumulation benefits
GMDB	Guaranteed minimum death benefits
GMIB	Guaranteed minimum income benefits
Glidepath	Glidepath Holdings Inc.
GLWB	Guaranteed lifetime withdrawal benefits
IMR	Interest maintenance reserve
IS	Institutional Solutions
Jefferies	Jefferies Finance, LLC
LIHTC	Low-income housing tax credits
LLC	Limited liability companies
LTC	Long-term Care
MassMutual	Massachusetts Mutual Life Insurance Company
MMAF	MassMutual Asset Finance
MM Ascend	MassMutual Ascend Life Insurance Company and other subsidiaries and affiliated entities
MMHLLC	MassMutual Holding LLC
MMIH	MM Investment Holding
MML Bay State	MML Bay State Life Insurance Company
MMSD	MassMutual Strategic Distributors
Modco	Modified coinsurance
NAIC	National Association of Insurance Commissioners
NAV	Net Asset Value
OTTI	Other-than-temporary impairment(s)
PRS	Phantom Restricted Stock
PSAR	Phantom Stock Appreciation Rights
RHRA	Retiree Health Reimbursement Account
RMBS	Residential mortgage-backed securities
SOFR	Secured Overnight Financing Rate
SSAP	Statements of Statutory Accounting Principles
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
U.S.	United States of America
U.S. GAAP	U.S. Generally Accepted Accounting Principles
VA	Veterans Administration
VAGLB	Variable annuity guaranteed living benefits
YRT	Yearly renewable term