# MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY AND SUBSIDIARIES

CONSOLIDATED STATUTORY FINANCIAL STATEMENTS

As of and for the years ended December 31, 2022 and 2021

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

| | December 31, 2022 | December 31, 2021 |
|---|---|---|
| | (In Millions) | |
| **Assets:** | | |
| Bonds | $ 140,394 | $ 128,494 |
| Preferred stocks | 458 | 563 |
| Common stocks – subsidiaries and affiliates | 22,926 | 23,029 |
| Common stocks – unaffiliated | 1,479 | 1,284 |
| Mortgage loans | 25,892 | 27,394 |
| Policy loans | 17,294 | 16,356 |
| Real estate | 355 | 395 |
| Partnerships and limited liability companies | 12,468 | 12,724 |
| Derivatives | 22,756 | 17,008 |
| Cash, cash equivalents and short-term investments | 5,737 | 6,210 |
| Other invested assets | 2,199 | 1,577 |
| Total invested assets | 251,958 | 235,034 |
| Investment income due and accrued | 4,332 | 3,696 |
| Federal income taxes | 262 | 73 |
| Net deferred income taxes | 1,254 | 743 |
| Other than invested assets | 4,236 | 4,683 |
| Total assets excluding separate accounts | 262,042 | 244,229 |
| Separate account assets | 59,537 | 83,264 |
| Total assets | $ 321,579 | $ 327,493 |
| **Liabilities and Surplus:** | | |
| Policyholders' reserves | $ 157,063 | $ 142,293 |
| Liabilities for deposit-type contracts | 18,170 | 17,129 |
| Contract claims and other benefits | 702 | 800 |
| Policyholders' dividends | 1,927 | 1,828 |
| General expenses due or accrued | 1,108 | 1,385 |
| Asset valuation reserve | 5,774 | 6,525 |
| Repurchase agreements | 3,042 | 2,802 |
| Commercial paper | 250 | 250 |
| Collateral | 4,268 | 6,330 |
| Derivatives | 14,483 | 11,507 |
| Funds held under coinsurance | 21,916 | 19,255 |
| Other liabilities | 5,528 | 7,294 |
| Total liabilities excluding separate accounts | 234,231 | 217,398 |
| Separate account liabilities | 59,407 | 83,116 |
| Total liabilities | 293,638 | 300,514 |
| Surplus | 27,941 | 26,979 |
| Total liabilities and surplus | $ 321,579 | $ 327,493 |

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

| | Years Ended December 31, 2022 | 2021 |
|---|---|---|
| | (In Millions) | |
| **Revenue:** | | |
| Premium income | $ 23,749 | $ 20,180 |
| Net investment income | 9,396 | 8,938 |
| Fees and other income | 1,195 | 1,341 |
| Total revenue | 34,340 | 30,459 |
| **Benefits, expenses and other deductions:** | | |
| Policyholders' benefits | 17,644 | 12,215 |
| Change in policyholders' reserves | 9,899 | 11,392 |
| General insurance expenses | 2,257 | 2,341 |
| Commissions | 1,350 | 1,255 |
| State taxes, licenses and fees | 320 | 337 |
| Other deductions | 653 | 802 |
| Total benefits and expenses | 32,123 | 28,342 |
| Net gain from operations before dividends and federal income taxes | 2,217 | 2,117 |
| Dividends to policyholders | 1,906 | 1,808 |
| Net gain from operations before federal income taxes | 311 | 309 |
| Federal income tax (benefit) expense | (45) | 86 |
| Net gain from operations | 356 | 223 |
| Net realized capital gains (losses) | 342 | (533) |
| Net income (loss) | $ 698 | $ (310) |

See accompanying notes to consolidated statutory financial statements

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

| | Years Ended December 31, 2022 | Years Ended December 31, 2021 |
|---|---|---|
| | (In Millions) | |
| Surplus, beginning of year | $ 26,979 | $ 24,327 |
| Net increase due to: | | |
| Net income (loss) | 698 | (310) |
| Change in net unrealized capital gains, net of tax | 959 | 3,469 |
| Change in net unrealized foreign exchange capital losses, net of taxes | (1,789) | (691) |
| Change in other net deferred income taxes | 695 | 557 |
| Change in nonadmitted assets | (603) | 23 |
| Change in asset valuation reserve | 751 | (1,210) |
| Change in reserve valuation basis | (12) | - |
| Change in surplus notes | 413 | 841 |
| Change in minimum pension liability | 40 | 21 |
| Prior period adjustments | (45) | 31 |
| Other | (145) | (79) |
| Net increase | 962 | 2,652 |
| Surplus, end of year | $ 27,941 | $ 26,979 |

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, 2022 | 2021 |
|---|---|---|
| | ($ In Millions) | |
| **Cash from operations:** | | |
| Premium and other income collected | $ 25,018 | $ 20,632 |
| Net investment income | 8,434 | 9,537 |
| Benefit payments | (17,379) | (12,081) |
| Net transfers from separate accounts | 5,137 | 1,371 |
| Commissions and other expenses | (5,407) | (4,689) |
| Dividends paid to policyholders | (1,806) | (1,688) |
| Federal and foreign income taxes recovered | (28) | (876) |
| Net cash from operations | 13,969 | 12,206 |
| **Cash from investments:** | | |
| Proceeds from investments sold, matured or repaid: | | |
| Bonds | 29,231 | 38,818 |
| Preferred and common stocks – unaffiliated | 427 | 591 |
| Common stocks – affiliated | 72 | 45 |
| Mortgage loans | 3,946 | 5,019 |
| Real estate | 177 | 75 |
| Partnerships and limited liability companies | 2,951 | 1,648 |
| Derivatives | (552) | (511) |
| Other | (702) | 262 |
| Total investment proceeds | 35,550 | 45,947 |
| Cost of investments acquired: | | |
| Bonds | (43,530) | (48,153) |
| Preferred and common stocks – unaffiliated | (573) | (521) |
| Common stocks – affiliated | (625) | (3,968) |
| Mortgage loans | (2,132) | (5,404) |
| Real estate | (13) | (174) |
| Partnerships and limited liability companies | (3,965) | (4,057) |
| Derivatives | (278) | (73) |
| Other | 11 | 87 |
| Total investments acquired | (51,105) | (62,263) |
| Net increase in policy loans | (938) | (513) |
| Net cash used in investing activities | (16,493) | (16,829) |
| **Cash from financing and miscellaneous sources:** | | |
| Net deposits on deposit-type contracts | 797 | 2,362 |
| Cash provided by surplus note issuance | 413 | 607 |
| Change in repurchase agreements | 241 | (1,204) |
| Change in collateral | (2,053) | 491 |
| Other cash provided | 2,653 | 2,401 |
| Net cash provided from financing and miscellaneous sources | 2,051 | 4,657 |
| Net change in cash, cash equivalents and short-term investments | (473) | 34 |
| Cash, cash equivalents and short-term investments: | | |
| Beginning of year | 6,210 | 6,176 |
| End of year | $ 5,737 | $ 6,210 |

See accompanying notes to consolidated statutory financial statements

## 1. Nature of operations

Massachusetts Mutual Life Insurance Company (MassMutual), a mutual life insurance company domiciled in the Commonwealth of Massachusetts, and its domestic life insurance subsidiaries domiciled in the State of Connecticut (collectively, the Company), provide individual and group life insurance, disability insurance (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 MassMutual Financial Advisors (MMFA), MassMutual Strategic Distributors (MMSD), Digital Distribution (DD), Institutional Solutions (IS) and Worksite distribution channels.

MMFA is a sales force of financial professionals that operate in the U.S. MMFA sells individual life, individual annuities, hybrid life and long-term care (LTC) and DI. The Company's MMSD channel sells life insurance, disability, annuity, and hybrid life and LTC solutions through a network of third-party distribution partners. The Company's DD channel sells individual life and supplemental health insurance primarily through digital media, search engine optimization and search engine marketing. 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, critical illness, 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 (HTM)
- 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 underlying 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
- Certain majority-owned subsidiaries and variable interest entities are accounted for using the equity method, whereas U.S. GAAP would consolidate these entities

- Starting on January 1, 2022, the Company adopted the current expected credit loss (CECL) impairment model for U.S. GAAP, which only applies to financial assets carried at amortized cost, including mortgage loans, equipment loans, HTM debt securities, and trade, lease, reinsurance and other receivables. CECL is based on expected credit losses rather than incurred losses. All financial assets within scope of CECL will have a credit loss allowance. Refer to *Note 2dd. "Net realized capital gains (losses) including other-than-temporary impairments and unrealized capital gains (losses)"* for information on the Company's policy for determining OTTI

*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 gains (losses)*

- After-tax realized capital gains (losses) that result from changes in the overall level of interest rates for all types of fixed-income investments and interest-related hedging activities are deferred into the interest maintenance reserve (IMR) and amortized into revenue, whereas U.S. GAAP reports these gains and losses as revenue

*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 reported these changes in net realized capital gains (losses) in 2021 and adopted the CECL impairment model in 2022
- 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
- Surplus notes 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(s) (OTTI), the value of the investment in MassMutual Holding LLC (MMHLLC), the liabilities for policyholders’ reserves, the determination of admissible deferred tax assets (DTA), the liability for taxes and the liability for litigation or other contingencies. Future events including, but not limited to, changes in the level of mortality, morbidity, interest rates, persistency, asset valuations and defaults could cause results to differ from the estimates used in these consolidated statutory financial statements. Although some variability is inherent in these estimates, management believes the amounts presented are appropriate.

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

***b. Corrections of errors and reclassifications***

For the years ended December 31, 2022 and 2021, corrections of prior years’ errors were recorded in surplus, net of tax:

| | Years Ended December 31, 2022 and 2021 Increase (Decrease) to: | | | | | |
|---|---|---|---|---|---|---|
| | Prior Years' Net Income | | Current Year Surplus | | Asset or Liability Balances | |
| | (In Millions) | | | | | |
| | 2022 | 2021 | 2022 | 2021 | 2022 | 2021 |
| Common stocks -subsidiaries and affiliates[1] | $ - | $ - | $ - | $ (2) | $ - | $ (2) |
| Net deferred income taxes[1] | - | - | - | 50 | - | 50 |
| Policyholders' reserves | (66) | (12) | (66) | (12) | 66 | 12 |
| Other Liabilities | 25 | 17 | 25 | 17 | (25) | (17) |
| Liabilities for deposit-type contracts | - | 26 | - | 26 | - | (26) |
| Cash, cash equivalents and short-term investments | (4) | - | (4) | - | (4) | - |
| Total | $ (45) | $ 31 | $ (45) | $ 79 | $ 37 | $ 17 |

[1] The change in common stocks subsidiaries and affiliates and net deferred income taxes were recorded through surplus as a change in unrealized capital losses, net of tax.

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

***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 gains (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***

On May 28, 2021, the Company, through a wholly owned subsidiary, Glidepath Holdings Inc. (Glidepath), acquired MassMutual Ascend Life Insurance Company (formerly known as Great American Life Insurance Company) and other subsidiaries and affiliated entities (MM Ascend) for $3,570 million in cash. MM Ascend primarily offers traditional fixed and fixed indexed annuity products.

Common stocks of unconsolidated subsidiaries, primarily MassMutual Holding LLC (MMHLLC), 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 $1,572 million as of December 31, 2022 for a portion of its noncontrolling interests (NCI). Glidepath is valued on it is underlying GAAP equity with adjustment to recognize its investment in MM Ascend based on MM Ascend's underlying statutory surplus, adjusted for any unamortized goodwill that would have been 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 5c. "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 gains (losses) including other-than-temporary impairments and unrealized capital gains (losses)"* for information on the Company's policy for determining OTTI.

***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.

***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 gains (losses).

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.

***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.

***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 gains (losses). 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 gains (losses) 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.

***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 DTAs (subject to certain limitations) that will not be realized by the end of the third calendar year following the current year end, furniture and equipment, certain other receivables and uncollected premium greater than 90 days past due. Due and accrued income is nonadmitted on: (a) bonds delinquent more than 90 days or where collection of interest is improbable; (b) impaired bonds more than 60 days past due; (c) bonds in default; (d) mortgage loans in default where interest is 180 days past due; (e) rent in arrears for more than 90 days; and (f) policy loan interest due and accrued more than 90 days past due and included in the unpaid balance of the policy loan in excess of the cash surrender value of the underlying contract. Assets that are designated as nonadmitted are excluded from the Consolidated Statutory Statements of Financial Position through a change in nonadmitted assets on the Consolidated Statutory Statements of Changes in Surplus.

***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 (PBR) under Valuation Manual (VM)-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 GMDBs and other guarantees is included in policyholders' reserves and the related change in this liability is included in change in policyholders' reserves in the Consolidated Statutory Statements of Operations.

Certain individual variable annuity and fixed annuity products have a variety of additional guarantees such as GMDBs and variable annuity guaranteed living benefits (VAGLB). The primary types of VAGLBs include guaranteed minimum accumulation benefits (GMAB), guaranteed minimum income benefits (GMIB) including GMIB Basic and GMIB Plus and guaranteed 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 GMDBs and VAGLBs are included in policyholders' reserves in the Consolidated Statements of Financial Position and the related changes in these liabilities are included in change in policyholders' reserves in the Consolidated Statutory Statements of Operations.

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.

Unpaid claims and claim expense reserves are related to disability and LTC claims. Unpaid disability claim liabilities are projected based on the average of the last three disability payments. LTC unpaid claim liabilities are projected using policy specific daily benefit amounts and aggregate utilization factors. Claim expense reserves are based on an analysis of the unit expenses related to the processing and examination of new and ongoing claims. Interest accrued on reserves is calculated by applying NAIC prescribed interest rates to the average reserves by year incurred.

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

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

***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 55% of the Company's policyholders' reserves and liabilities for deposit-type contracts as of December 31, 2022 and 57% as of December 31, 2021.

***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.

***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 recorded as a nonadmitted asset.

***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 five years after the date of grant. Vested PSARs may be exercised during quarterly two-week exercise periods prior to expiration. The compensation expense for an individual award is recognized over the service period.

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

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

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

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

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

***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. Disability income and LTC premium is recognized as revenue when due.

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

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

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

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

*Bonds - general*

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

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

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

*Bonds – corporate*

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

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.

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

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

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

*Common and preferred stock*

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

*Mortgage loans*

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

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

*Real estate*

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

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

*Partnerships and 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 November 2021, the NAIC adopted modifications to SSAP No. 43R, *Loan-Backed and Structured Securities*, effective December 31, 2022. The modifications require investments in residual tranches to be reported as partnerships and limited liability companies. Residual tranches will be carried at the lower of amortized cost or fair value, with changes in value recorded as unrealized gains or losses. The modifications did not have a material effect on the Company's financial statements.

In June 2022, the NAIC adopted modifications to SSAP No. 25, Affiliates and Other Related Parties and SSAP No. 43R, Loan-Backed and Structured Securities, effective December 31, 2022. The modifications clarify application of the existing affiliate definition and incorporate disclosure requirements for all investments that involve related parties, regardless of whether they meet the affiliate definition. The revisions to SSAP No. 43R also included additional clarifications that the investments from any arrangements that results in direct or indirect control, which include but are not limited to control through a servicer, shall be reported as affiliated investments. The modifications did not have a material effect on the Company's financial statements.

## *4. Fair value of financial instruments*

The following presents a summary of the carrying values and fair values of the Company's financial instruments:

| | December 31, 2022 | | | | |
|---|---|---|---|---|---|
| | Carrying Value | Fair Value | Level 1 | Level 2 | Level 3 |
| | (In Millions) | | | | |
| Financial assets: | | | | | |
| Bonds: | | | | | |
| U. S. government and agencies | $ 4,772 | $ 4,435 | $ - | $ 4,435 | $ - |
| All other governments | 1,636 | 1,385 | - | 1,323 | 62 |
| States, territories and possessions | 261 | 254 | - | 254 | - |
| Political subdivisions | 418 | 402 | - | 402 | - |
| Special revenue | 4,263 | 4,187 | - | 4,178 | 9 |
| Industrial and miscellaneous | 120,641 | 109,053 | - | 47,235 | 61,818 |
| Parent, subsidiaries and affiliates | 8,403 | 8,151 | - | 1,052 | 7,099 |
| Preferred stocks | 458 | 453 | 46 | - | 407 |
| Common stocks - subsidiaries and affiliates | 483 | 483 | 128 | - | 355 |
| Common stocks - unaffiliated | 1,479 | 1,479 | 507 | 1 | 971 |
| Mortgage loans - commercial | 21,484 | 19,832 | - | - | 19,832 |
| Mortgage loans - residential | 4,408 | 4,066 | - | - | 4,066 |
| Derivatives: | | | | | |
| Interest rate swaps | 18,889 | 19,066 | - | 19,066 | - |
| Options | 654 | 654 | 30 | 624 | - |
| Currency swaps | 3,175 | 3,175 | - | 3,175 | - |
| Forward contracts | 16 | 16 | - | 16 | - |
| Credit default swaps | - | 1 | - | 1 | - |
| Financial futures | 22 | 22 | 22 | - | - |
| Cash, cash equivalents and short-term investments | 5,737 | 5,737 | 442 | 5,295 | - |
| Separate account assets | 59,537 | 59,440 | 37,498 | 20,242 | 1,700 |
| Financial liabilities: | | | | | |
| GICs | 14,701 | 13,803 | - | - | 13,803 |
| Group annuity contracts and other deposits | 2,162 | 1,890 | - | - | 1,890 |
| Individual annuity contracts | 19,874 | 18,986 | - | - | 18,986 |
| Supplementary contracts | 1,211 | 1,213 | - | - | 1,213 |
| Repurchase agreements | 3,042 | 3,042 | - | 3,042 | - |
| Commercial paper | 250 | 250 | - | 250 | - |
| Derivatives: | | | | | |
| Interest rate swaps | 13,506 | 18,870 | - | 18,870 | - |
| Options | 12 | 12 | 7 | 5 | - |
| Currency swaps | 710 | 362 | - | 362 | - |
| Forward contracts | 239 | 239 | - | 239 | - |
| Credit default swaps | 13 | 13 | - | 13 | - |
| Financial futures | 3 | 3 | 3 | - | - |

Common stocks - subsidiaries and affiliates do not include unconsolidated subsidiaries, which had statutory carrying values of $22,443 million.

| | December 31, 2021 | | | | |
|---|---|---|---|---|---|
| | Carrying Value | Fair Value | Level 1 | Level 2 | Level 3 |
| | (In Millions) | | | | |
| Financial assets: | | | | | |
| Bonds: | | | | | |
| U. S. government and agencies | $ 4,133 | $ 4,776 | $ - | $ 4,776 | $ - |
| All other governments | 1,846 | 1,970 | - | 1,909 | 61 |
| States, territories and possessions | 311 | 367 | - | 367 | - |
| Political subdivisions | 457 | 523 | - | 523 | - |
| Special revenue | 4,835 | 5,694 | - | 5,685 | 9 |
| Industrial and miscellaneous | 110,186 | 116,603 | 36 | 58,002 | 58,565 |
| Parent, subsidiaries and affiliates | 6,726 | 6,761 | - | 50 | 6,711 |
| Preferred stocks | 563 | 679 | 43 | - | 636 |
| Common stocks - subsidiaries and affiliates | 414 | 414 | 157 | - | 257 |
| Common stocks - unaffiliated | 1,284 | 1,284 | 526 | - | 758 |
| Mortgage loans - commercial | 22,309 | 23,060 | - | - | 23,060 |
| Mortgage loans - residential | 5,085 | 5,127 | - | - | 5,127 |
| Derivatives: | | | | | |
| Interest rate swaps | 15,556 | 16,794 | - | 16,794 | - |
| Options | 354 | 354 | 15 | 339 | - |
| Currency swaps | 984 | 984 | - | 984 | - |
| Forward contracts | 69 | 69 | - | 69 | - |
| Credit default swaps | - | 1 | - | 1 | - |
| Financial futures | 45 | 45 | 45 | - | - |
| Cash, cash equivalents and short-term investments | 6,210 | 6,210 | 1,552 | 4,658 | - |
| Separate account assets | 83,264 | 83,283 | 55,912 | 25,468 | 1,903 |
| Financial liabilities: | | | | | |
| GICs | 13,832 | 13,828 | - | - | 13,828 |
| Group annuity contracts and other deposits | 1,755 | 1,812 | - | - | 1,812 |
| Individual annuity contracts | 15,151 | 18,169 | - | - | 18,169 |
| Supplementary contracts | 1,246 | 1,248 | - | - | 1,248 |
| Repurchase agreements | 2,802 | 2,802 | - | 2,802 | - |
| Commercial paper | 250 | 250 | - | 250 | - |
| Derivatives: | | | | | |
| Interest rate swaps | 11,210 | 12,043 | - | 12,043 | - |
| Options | 14 | 14 | 4 | 10 | - |
| Currency swaps | 206 | 206 | - | 206 | - |
| Forward contracts | 71 | 71 | - | 71 | - |
| Credit default swaps | 1 | 2 | - | 2 | - |
| Financial futures | 5 | 5 | 5 | - | - |

Common stocks - subsidiaries and affiliates do not include unconsolidated subsidiaries, which had statutory carrying values of $22,615 million.

Fair value is defined as the price that would be received from selling an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. The authoritative guidance for fair value establishes a measurement framework that includes a hierarchy used to classify the inputs used in measuring fair value. The hierarchy prioritizes the inputs to valuation techniques into three levels. Each level reflects a unique description of the inputs that are significant to the fair value measurements. The levels of the fair value hierarchy are as follows:

Level 1 – Observable inputs in the form of quoted prices for identical instruments in active markets.

Level 2 – Observable inputs other than Level 1 prices, such as quoted prices for similar assets or liabilities, quoted prices in markets that are not active or other inputs that are observable or can be derived from observable market data for substantially the full term of the assets or liabilities.

Level 3 – One or more unobservable inputs that are supported by little or no market activity and are significant to the fair value of the assets or liabilities. Level 3 assets and liabilities include financial instruments whose value is determined using internal models, as well as instruments for which the determination of fair value requires significant management judgment or estimation.

When available, the Company generally uses unadjusted quoted market prices from independent sources to determine the fair value of investments and classifies such items within Level 1 of the fair value hierarchy. If quoted prices are not available, prices are derived from observable market data for similar assets in an active market or obtained directly from brokers for identical assets traded in inactive markets. Investments that are priced using these inputs are classified within Level 2 of the fair value hierarchy. When some of the necessary observable inputs are unavailable, fair value is based upon internally developed models. These models use inputs not directly observable or correlated with observable market data. Typical inputs, which are integrated in the Company’s internal discounted cash flow models and discounted earnings models include, but are not limited to, issuer spreads derived from internal credit ratings and benchmark yields such as LIBOR, cash flow estimates and earnings before interest, taxes, depreciation and amortization estimates. Investments that are priced with such unobservable inputs are classified within Level 3 of the fair value hierarchy.

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

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

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

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

| | December 31, 2022 | | | |
|---|---|---|---|---|
| | Level 1 | Level 2 | Level 3 | Total |
| | (In Millions) | | | |
| Financial assets: | | | | |
| Bonds: | | | | |
| All other governments | $ - | $ 6 | $ - | $ 6 |
| Special revenue | - | 1 | - | 1 |
| Industrial and miscellaneous | - | 85 | 230 | 315 |
| Preferred stocks | 21 | - | 51 | 72 |
| Common stocks - subsidiaries and affiliates | 128 | - | 355 | 483 |
| Common stocks - unaffiliated | 507 | 1 | 971 | 1,479 |
| Derivatives: | | | | |
| Interest rate swaps | - | 18,889 | - | 18,889 |
| Options | 30 | 624 | - | 654 |
| Currency swaps | - | 3,175 | - | 3,175 |
| Forward contracts | - | 16 | - | 16 |
| Financial futures | 22 | - | - | 22 |
| Separate account assets | 37,498 | 19,130 | 1,693 | 58,321 |
| Total financial assets carried at fair value | $ 38,206 | $ 41,927 | $ 3,300 | $ 83,433 |
| Financial liabilities: | | | | |
| Derivatives: | | | | |
| Interest rate swaps | $ - | $ 13,506 | $ - | $ 13,506 |
| Options | 7 | 5 | - | 12 |
| Currency swaps | - | 122 | - | 122 |
| Forward contracts | - | 239 | - | 239 |
| Credit default swaps | - | 13 | - | 13 |
| Financial futures | 3 | - | - | 3 |
| Total financial liabilities carried at fair value | $ 10 | $ 13,885 | $ - | $ 13,895 |

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

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

| | December 31, 2021 | | | |
|---|---|---|---|---|
| | Level 1 | Level 2 | Level 3 | Total |
| | (In Millions) | | | |
| Financial assets: | | | | |
| Bonds: | | | | |
| Special revenue | $ - | $ 2 | $ - | $ 2 |
| Industrial and miscellaneous | 45 | 252 | 206 | 503 |
| Preferred stocks | 43 | - | 18 | 61 |
| Common stocks - subsidiaries and affiliates | 157 | - | 257 | 414 |
| Common stocks - unaffiliated | 526 | - | 758 | 1,284 |
| Derivatives: | | | | |
| Interest rate swaps | - | 15,556 | - | 15,556 |
| Options | 15 | 339 | - | 354 |
| Currency swaps | - | 984 | - | 984 |
| Forward contracts | - | 69 | - | 69 |
| Financial futures | 45 | - | - | 45 |
| Separate account assets | 55,912 | 24,226 | 1,894 | 82,032 |
| Total financial assets carried at fair value | $ 56,743 | $ 41,428 | $ 3,133 | $ 101,304 |
| Financial liabilities: | | | | |
| Derivatives: | | | | |
| Interest rate swaps | $ - | $ 11,210 | $ - | $ 11,210 |
| Options | 4 | 10 | - | 14 |
| Currency swaps | - | 206 | - | 206 |
| Forward contracts | - | 71 | - | 71 |
| Credit default swaps | - | 1 | - | 1 |
| Financial futures | 5 | - | - | 5 |
| Total financial liabilities carried at fair value | $ 9 | $ 11,498 | $ - | $ 11,507 |

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:

*Separate account assets* – These assets primarily include bonds (industrial and miscellaneous; U.S. government and agencies), and derivatives. Their fair values are determined as follows:

> *Bonds (Industrial and miscellaneous)* – These securities are principally valued using the market or the income approaches. Level 2 valuations are based primarily on quoted prices in markets that are not active, broker quotes, matrix pricing or other similar techniques that use standard market observable inputs such as benchmark yields, spreads versus benchmark yields, new issuances, issuer ratings, duration, and trades of identical or comparable securities. Privately placed securities are valued using discounted cash flow models using standard market observable inputs and inputs derived from, or corroborated by, market observable data including market yield curve, duration, call provisions, observable prices and spreads for similar publicly traded or privately traded issuances that incorporate the credit quality and industry sector of the issuer. This level also includes securities priced by independent pricing services that use observable inputs. Valuations based on matrix pricing or other similar techniques that utilize significant unobservable inputs or inputs that cannot be derived principally from, or corroborated by, observable market data, including adjustments for illiquidity, delta spread adjustments or spreads to reflect industry trends or specific credit-related issues are classified as Level 3. In addition, inputs including quoted prices for identical or similar securities that are less liquid and based on lower levels of trading activity than securities classified in Level 2 are classified as Level 3.
>
> *Bonds (U.S. government and agencies)* – These securities are principally valued using the market approach. Level 2 valuations are based primarily on quoted prices in markets that are not active, or using matrix pricing or other similar techniques using standard market observable inputs such as the benchmark U.S. Treasury yield curve, the spreads versus the U.S. Treasury yield curve for the identical security and comparable securities that are actively traded.

*Derivative assets and liabilities* – These financial instruments are primarily valued using the market approach. The estimated fair value of derivatives is based primarily on quotations obtained from counterparties and independent sources, such as quoted market values received from brokers. These quotations are compared to internally derived prices and a price challenge is lodged with the counterparties and an independent source when a significant difference cannot be explained by appropriate adjustments to the internal model. When quoted market values are not reliable or available, the value is based upon an internal valuation process using market observable inputs that other market participants would use. Significant inputs to the valuation of derivative financial instruments include overnight index swaps (OIS) and LIBOR basis curves, interest rate volatility, swap yield curve, currency spot rates, cross currency basis curves and dividend yields. Due to the observability of the significant inputs to these fair value measurements, they are classified as Level 2.

The use of different assumptions or valuation methodologies may have a material impact on the estimated fair value amounts. For the periods presented, there were no significant changes to the Company's valuation techniques.

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

| | Balance as of 1/1/22 | Gains (Losses) in Net Income | Losses (Gains) in Surplus | Purchases | Issuances | Sales | Settlements | Transfers In | Transfers Out | Other | Balance as of 12/31/22 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | (In Millions) | | | | | | | | | | |
| Financial assets: | | | | | | | | | | | |
| Bonds: | | | | | | | | | | | |
| Industrial and miscellaneous | $ 206 | $ 2 | $ (10) | $ 19 | $ 10 | $ - | $ (52) | $ - | $ - | $ 55 | $ 230 |
| Preferred stocks | 18 | - | (19) | - | - | - | - | - | - | 52 | 51 |
| Common stocks - subsidiaries and affiliates | 258 | (13) | 128 | (792) | 963 | (65) | (6) | - | - | (118) | 355 |
| Common stocks - unaffiliated | 758 | 29 | - | 327 | 3 | (27) | (114) | - | (4) | (1) | 971 |
| Separate account assets | 1,894 | (174) | - | 282 | - | (296) | - | - | (13) | - | 1,693 |
| Total financial assets | $ 3,134 | $ (156) | $ 99 | $ (164) | $ 976 | $ (388) | $ (172) | $ - | $ (17) | $ (12) | $ 3,300 |

| | Balance as of 1/1/21 | Gains (Losses) in Net Income | Losses (Gains) in Surplus | Purchases | Issuances | Sales | Settlements | Transfers In | Transfers Out | Other | Balance as of 12/31/21 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | (In Millions) | | | | | | | | | | |
| Financial assets: | | | | | | | | | | | |
| Bonds: | | | | | | | | | | | |
| Industrial and miscellaneous | $ 122 | $ (23) | $ 4 | $ - | $ 109 | $ - | $ (1) | $ - | $ - | $ (5) | $ 206 |
| Preferred stocks | 19 | - | (1) | - | - | - | - | - | - | - | 18 |
| Common stocks - subsidiaries and affiliates | 193 | 1 | (378) | 26 | 422 | - | (6) | - | - | - | 258 |
| Common stocks - unaffiliated | 417 | 8 | 117 | 244 | 4 | (29) | (3) | - | - | - | 758 |
| Separate account assets | 1,834 | 15 | - | 363 | - | (294) | - | 2 | (26) | - | 1,894 |
| Total financial assets | $ 2,585 | $ 1 | $ (258) | $ 633 | $ 535 | $ (323) | $ (10) | $ 2 | $ (26) | $ (5) | $ 3,134 |

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.

## 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, 2022 | | | |
|---|---|---|---|---|
| | Carrying Value | Gross Unrealized Gains | Gross Unrealized Losses | Fair Value |
| | (In Millions) | | | |
| U.S. government and agencies | $ 4,772 | $ 58 | $ 395 | $ 4,435 |
| All other governments | 1,636 | 15 | 266 | 1,385 |
| States, territories and possessions | 261 | 2 | 9 | 254 |
| Political subdivisions | 418 | 7 | 23 | 402 |
| Special revenue | 4,263 | 109 | 185 | 4,187 |
| Industrial and miscellaneous | 120,641 | 406 | 11,994 | 109,053 |
| Parent, subsidiaries and affiliates | 8,403 | 1 | 253 | 8,151 |
| Total | $ 140,394 | $ 598 | $ 13,125 | $ 127,867 |

The December 31, 2022 gross unrealized losses exclude $108 million of losses included in the carrying value. These losses include $106 million from NAIC Class 6 bonds and $2 million from residential mortgage-backed securities (RMBS) and commercial mortgage-backed securities (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, 2021 | | | |
|---|---|---|---|---|
| | Carrying Value | Gross Unrealized Gains | Gross Unrealized Losses | Fair Value |
| | (In Millions) | | | |
| U.S. government and agencies | $ 4,133 | $ 655 | $ 12 | $ 4,776 |
| All other governments | 1,846 | 144 | 20 | 1,970 |
| States, territories and possessions | 311 | 56 | - | 367 |
| Political subdivisions | 457 | 66 | - | 523 |
| Special revenue | 4,835 | 863 | 4 | 5,694 |
| Industrial and miscellaneous | 110,186 | 7,072 | 655 | 116,603 |
| Parent, subsidiaries and affiliates | 6,726 | 56 | 21 | 6,761 |
| Total | $ 128,494 | $ 8,912 | $ 712 | $ 136,694 |

The December 31, 2021 gross unrealized losses exclude $76 million of losses included in the carrying value. These losses include $75 million from NAIC Class 6 bonds and $1 million from RMBS and CMBS whose ratings were obtained from outside modelers. These losses were primarily included in industrial and miscellaneous or parent, subsidiaries and affiliates.

The quality of the bond portfolio is determined by the use of SVO ratings and the equivalent rating agency designations, except for RMBS and CMBS that use third-party modelers. The following sets forth the NAIC class ratings for the bond portfolio including RMBS and CMBS:

| | | December 31, | | | |
|---|---|---|---|---|---|
| | | 2022 | | 2021 | |
| NAIC Class | Equivalent Rating Agency Designation | Carrying Value | % of Total | Carrying Value | % of Total |
| | | ($ In Millions) | | | |
| 1 | Aaa/Aa/A | $ 75,263 | 54 % | $ 64,729 | 50 % |
| 2 | Baa | 53,320 | 38 | 51,183 | 40 |
| 3 | Ba | 5,789 | 4 | 5,699 | 4 |
| 4 | B | 2,925 | 2 | 3,464 | 3 |
| 5 | Caa and lower | 2,644 | 2 | 2,572 | 2 |
| 6 | In or near default | 453 | - | 847 | 1 |
| | Total | $ 140,394 | 100 % | $ 128,494 | 100 % |

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

| | December 31, | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2022 | | | | 2021 | | | |
| | RMBS | | CMBS | | RMBS | | CMBS | |
| NAIC Class | Carrying Value | % of Total | Carrying Value | % of Total | Carrying Value | % of Total | Carrying Value | % of Total |
| | ($ In Millions) | | | | | | | |
| 1 | $ 409 | 82 % | $ 1,818 | 77 % | $ 606 | 88 % | $ 1,811 | 77 % |
| 2 | 30 | 6 | 210 | 9 | 12 | 2 | 120 | 5 |
| 3 | 33 | 7 | 162 | 7 | 26 | 4 | 219 | 9 |
| 4 | 15 | 3 | 84 | 3 | 14 | 2 | 100 | 4 |
| 5 | 10 | 2 | 84 | 3 | 29 | 4 | 77 | 3 |
| 6 | 2 | - | 13 | 1 | 2 | - | 45 | 2 |
| | $ 499 | 100 % | $ 2,371 | 100 % | $ 689 | 100 % | $ 2,372 | 100 % |

The following is a summary of the carrying value and fair value of bonds as of December 31, 2022 by contractual maturity. Expected maturities may differ from contractual maturities because issuers may have the right to call or prepay obligations with or without prepayment penalties. Securities with more than one maturity date are included in the table using the final maturity date.

| | Carrying Value | Fair Value |
|---|---|---|
| | (In Millions) | |
| Due in one year or less | $ 4,364 | $ 4,312 |
| Due after one year through five years | 32,093 | 31,178 |
| Due after five years through ten years | 39,540 | 37,117 |
| Due after ten years | 64,397 | 55,260 |
| Total | $ 140,394 | $ 127,867 |

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

| | Years Ended December 31, 2022 | Years Ended December 31, 2021 |
|---|---|---|
| | (In Millions) | |
| Proceeds from sales | $ 16,520 | $ 21,971 |
| Gross realized capital gains from sales | 152 | 417 |
| Gross realized capital losses from sales | (627) | (128) |

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, 2022 | | | | | |
|---|---|---|---|---|---|---|
| | Less Than 12 Months | | | 12 Months or Longer | | |
| | Fair Value | Unrealized Losses | Number of Issuers | Fair Value | Unrealized Losses | Number of Issuers |
| | ($ In Millions) | | | | | |
| U.S. government and agencies | $ 1,609 | $ 243 | 17 | $ 1,120 | $ 153 | 9 |
| All other governments | 447 | 46 | 34 | 737 | 220 | 27 |
| States, territories and possessions | 95 | 4 | 17 | 74 | 6 | 3 |
| Political subdivisions | 162 | 14 | 24 | 62 | 10 | 4 |
| Special revenue | 1,518 | 126 | 213 | 292 | 59 | 69 |
| Industrial and miscellaneous | 53,191 | 5,500 | 4,196 | 28,395 | 6,613 | 2,277 |
| Parent, subsidiaries and affiliates | 2,600 | 85 | 39 | 1,216 | 168 | 20 |
| Total | $ 59,622 | $ 6,018 | 4,540 | $ 31,896 | $ 7,229 | 2,409 |

The December 31, 2022 gross unrealized losses include $104 million of losses included in the carrying value. These losses include $106 million from NAIC Class 6 bonds and $2 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, 2021 | | | | | |
|---|---|---|---|---|---|---|
| | Less Than 12 Months | | | 12 Months or Longer | | |
| | Fair Value | Unrealized Losses | Number of Issuers | Fair Value | Unrealized Losses | Number of Issuers |
| | ($ In Millions) | | | | | |
| U.S. government and agencies | $ 747 | $ 5 | 7 | $ 74 | $ 7 | 6 |
| All other governments | 240 | 7 | 21 | 166 | 13 | 10 |
| States, territories and possessions | - | - | 2 | 6 | - | 1 |
| Political subdivisions | 1 | - | 2 | - | - | - |
| Special revenue | 205 | 3 | 22 | 32 | 2 | 24 |
| Industrial and miscellaneous | 17,356 | 322 | 1,713 | 6,248 | 412 | 810 |
| Parent, subsidiaries and affiliates | 755 | 12 | 6 | 316 | 9 | 1 |
| Total | $ 19,304 | $ 349 | 1,773 | $ 6,842 | $ 443 | 852 |

The December 31, 2021 gross unrealized losses include $76 million of losses included in the carrying value. These losses include $75 million from NAIC Class 6 bonds and $1 million from RMBS and CMBS whose ratings were obtained from outside modelers. These losses were primarily included in industrial and miscellaneous or parent, subsidiaries and affiliates.

As of December 31, 2022 and 2021, 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, 2022, investments in structured and loan-backed securities that had unrealized losses, which were not recognized in earnings, had a fair value of $20,895 million. Securities in an unrealized loss position for less than 12 months had a fair value of $15,107 million and unrealized losses of $918 million. Securities in an unrealized loss position for greater than 12 months had a fair value of $5,786 million and unrealized losses of $918 million. These securities were primarily categorized as industrial and miscellaneous or parent, subsidiaries and affiliates.

As of December 31, 2021, investments in structured and loan-backed securities that had unrealized losses, which were not recognized in earnings, had a fair value of $8,463 million. Securities in an unrealized loss position for less than 12 months had a fair value of $6,536 million and unrealized losses of $67 million. Securities in an unrealized loss position for greater than 12 months had a fair value of $1,926 million and unrealized losses of $136 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, 2022 or 2021 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 $17 million as of December 31, 2022 and December 31, 2021.

*Residential mortgage-backed exposure*

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

As of December 31, 2022, RMBS had a total carrying value of $2,337 million and a fair value of $2,292 million, of which approximately 8%, based on carrying value, was classified as Alt-A. Alt-A and subprime RMBS had a total carrying value of $1,018 million and a fair value of $1,010 million. As of December 31, 2021, RMBS had a total carrying value of $2,108 million and a fair value of $2,199 million, of which approximately 16%, based on carrying value, was classified as Alt-A. Alt-A and subprime RMBS had a total carrying value of $1,000 million and a fair value of $1,052 million.

During the year ended December 31, 2022, 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, 2022, total leveraged loans and leveraged loan CDOs had a carrying value of $27,085 million and a fair value of $26,391 million, of which approximately 81%, based on carrying value, were domestic leveraged loans and CDOs. As of December 31, 2021, total leveraged loans and leveraged loan CDOs had a carrying value of $20,431 million and a fair value of $20,575 million, of which approximately 77%, based on carrying value, were domestic leveraged loans and CDOs.

*Commercial mortgage-backed exposure*

The Company holds bonds backed by pools of commercial mortgages. The mortgages in these pools have varying risk characteristics related to underlying collateral type, borrower's risk profile and ability to refinance and the return provided to the borrower from the underlying collateral. These investments had a carrying value of $2,837 million and fair value of $2,404 million as of December 31, 2022 and a carrying value of $2,834 million and fair value of $2,848 million as of December 31, 2021.

***b. Preferred stocks***

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

| | December 31, | |
|---|---|---|
| | 2022 | 2021 |
| | (In Millions) | |
| Carrying value | $ 458 | $ 563 |
| Gross unrealized gains | 9 | 117 |
| Gross unrealized losses | (14) | - |
| Fair value | $ 453 | $ 680 |

As of December 31, 2022, investments in preferred stocks in an unrealized loss position included holdings with a fair value of $249 million in 24 issuers, $59 million of which was in an unrealized loss position for more than 12 months. As of December 31, 2021, investments in preferred stocks in an unrealized loss position included holdings with a fair value of $37 million in 3 issuers, $11 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 gains (losses) including other-than-temporary impairments and unrealized capital gains (losses)"* the decline in value of these securities was not considered to be other than temporary as of December 31, 2022 or 2021.

The Company held preferred stocks for which the transfer of ownership was restricted by contractual requirements with carrying values of $325 million as of December 31, 2022 and $412 million as of December 31, 2021.

***c. 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 $151 million of nonadmitted asset adjustments as of December 31, 2022 and $17.2 billion as of December 31, 2021, which included $58 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, | |
|---|---|---|
| | 2022 | 2021 |
| | (In Billions) | |
| Total revenue | $ 3.6 | $ 4.9 |
| Net income | 0.6 | 1.7 |
| Assets | 27.2 | 25.5 |
| Liabilities | 8.2 | 7.6 |
| Member's equity | 18.9 | 17.9 |

MMHLLC paid $604 million in dividends to MassMutual for the year ended December 31, 2022, $344 million of which were declared in 2021, and paid $1,200 million in dividends to MassMutual for the year ended December 31, 2021, $1,000 million of which were declared in 2020.

MMHLLC declared an additional $450 million in dividends to MassMutual for the year ended December 31, 2022.

MassMutual contributed capital of $660 million to MMHLLC for the year ended December 31, 2022 and $389 million for the year ended December 31, 2021.

On May 28, 2021, the Company, through a wholly owned subsidiary, Glidepath, acquired MM Ascend for $3,570 million in cash. MM Ascend primarily offers traditional fixed and fixed indexed annuity products.

The Glidepath statutory carrying value was $3.5 billion as of December 31, 2022 and $3.6 billion as of December 31, 2021.

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

| | As of and for the Years Ended December 31, | |
|---|---|---|
| | 2022 | 2021 |
| | (In Billions) | |
| Total revenue | $ 1.2 | $ 0.6 |
| Net income (loss) | 1.0 | (0.1) |
| Assets | 51.0 | 50.3 |
| Liabilities | 48.8 | 46.9 |
| Member's equity | 2.2 | 3.4 |

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

| | As of and for the Years Ended December 31, | |
|---|---|---|
| | 2022 | 2021 |
| | (In Billions) | |
| Total revenue | $ 0.3 | $ 0.3 |
| Net income | 0.1 | 0.1 |
| Assets | 9.3 | 8.8 |
| Liabilities | 7.6 | 7.0 |
| Member's equity | 1.7 | 1.8 |

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 $1,780 million as of December 31, 2022 was subject to dividend restrictions imposed by the State of Connecticut.

For further information on related party transactions with subsidiaries and affiliates, see *Note 17. "Related party transactions"*.

***d. Common stocks – unaffiliated***

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

| | December 31, | |
|---|---|---|
| | 2022 | 2021 |
| | (In Millions) | |
| Adjusted cost basis | $ 1,200 | $ 985 |
| Gross unrealized gains | 317 | 317 |
| Gross unrealized losses | (38) | (18) |
| Carrying value | $ 1,479 | $ 1,284 |

As of December 31, 2022, investments in unaffiliated common stocks in an unrealized loss position included holdings with a fair value of $268 million in 77 issuers, $78 million of which were in an unrealized loss position for more than 12 months. As of December 31, 2021, investments in unaffiliated common stocks in an unrealized loss position included holdings with a fair value of $272 million in 141 issuers, $243 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 gains (losses) including other-than-temporary impairments and unrealized capital gains (losses)"* the decline in value of these securities was not considered to be other than temporary as of December 31, 2022 or 2021.

The Company held common stocks, for which the transfer of ownership was restricted by contractual requirements, with carrying values of $134 million as of December 31, 2022 and $164 million as of December 31, 2021.

***e. 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 substantially backed by Federal Housing Administration (FHA) and Veterans Administration (VA) guarantees. As of December 31, 2022 and 2021, 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, 2022 or 2021.

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

| | December 31, 2022 | | December 31, 2021 | |
|---|---|---|---|---|
| | Carrying Value | Fair Value | Carrying Value | Fair Value |
| | (In Millions) | | | |
| Commercial mortgage loans: | | | | |
| Primary lender | $ 21,390 | $ 19,745 | $ 22,192 | $ 22,942 |
| Mezzanine loans | 94 | 87 | 117 | 118 |
| Total commercial mortgage loans | 21,484 | 19,832 | 22,309 | 23,060 |
| Residential mortgage loans: | | | | |
| FHA insured and VA guaranteed | 2,461 | 2,273 | 4,348 | 4,381 |
| Other residential loans | 1,947 | 1,793 | 737 | 746 |
| Total residential mortgage loans | 4,408 | 4,066 | 5,085 | 5,127 |
| Total mortgage loans | $ 25,892 | $ 23,898 | $ 27,394 | $ 28,187 |

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

| | December 31, 2022 | | | | |
|---|---|---|---|---|---|
| | Less Than 81% | 81% to 95% | Above 95% | Total | % of Total |
| | ($ In Millions) | | | | |
| Office | $ 7,092 | $ - | $ 34 | $ 7,126 | 33 % |
| Apartments | 5,625 | 465 | - | 6,090 | 28 |
| Industrial and other | 3,538 | 29 | - | 3,567 | 17 |
| Retail | 2,543 | - | - | 2,543 | 12 |
| Hotels | 2,063 | 95 | - | 2,158 | 10 |
| Total | $ 20,861 | $ 589 | $ 34 | $ 21,484 | 100 % |

| | December 31, 2021 | | | | |
|---|---|---|---|---|---|
| | Less Than 81% | 81% to 95% | Above 95% | Total | % of Total |
| | ($ In Millions) | | | | |
| Office | $ 7,303 | $ 130 | $ - | $ 7,433 | 33 % |
| Apartments | 5,833 | 98 | 175 | 6,106 | 27 |
| Industrial and other | 3,670 | 30 | 28 | 3,728 | 17 |
| Retail | 2,650 | - | 15 | 2,665 | 12 |
| Hotels | 2,181 | 121 | 75 | 2,377 | 11 |
| Total | $ 21,637 | $ 379 | $ 293 | $ 22,309 | 100 % |

More than 97% of the Company’s commercial mortgage loans’ loan-to-value ratios are below 81% for the years ended December 31, 2022 and 2021.

The Company uses an internal rating system as its primary method of monitoring credit quality. The following illust the Company’s mortgage loan portfolio rating, translated into the equivalent rating agency designation:

| | December 31, 2022 | | | | | |
|---|---|---|---|---|---|---|
| | AAA/AA/A | BBB | BB | B | CCC and Lower | Total |
| | (In Millions) | | | | | |
| Commercial mortgage loans: | | | | | | |
| Primary lender | $ 7,950 | $ 10,631 | $ 2,370 | $ 369 | $ 70 | $ 21,390 |
| Mezzanine loans | - | 37 | 57 | - | - | 94 |
| Total commercial mortgage loans | 7,950 | 10,668 | 2,427 | 369 | 70 | 21,484 |
| Residential mortgage loans: | | | | | | |
| FHA insured and VA guaranteed | 2,456 | 5 | - | - | - | 2,461 |
| Other residential loans | 62 | 1,864 | 21 | - | - | 1,947 |
| Total residential mortgage loans | 2,518 | 1,869 | 21 | - | - | 4,408 |
| Total mortgage loans | $ 10,468 | $ 12,537 | $ 2,448 | $ 369 | $ 70 | $ 25,892 |

| | December 31, 2021 | | | | | |
|---|---|---|---|---|---|---|
| | AAA/AA/A | BBB | BB | B | CCC and Lower | Total |
| | (In Millions) | | | | | |
| Commercial mortgage loans: | | | | | | |
| Primary lender | $ 7,669 | $ 10,445 | $ 3,653 | $ 307 | $ 118 | $ 22,192 |
| Mezzanine loans | - | 42 | 75 | - | - | 117 |
| Total commercial mortgage loans | 7,669 | 10,487 | 3,728 | 307 | 118 | 22,309 |
| Residential mortgage loans: | | | | | | |
| FHA insured and VA guaranteed | 4,348 | - | - | - | - | 4,348 |
| Other residential loans | 3 | 614 | 120 | - | - | 737 |
| Total residential mortgage loans | 4,351 | 614 | 120 | - | - | 5,085 |
| Total mortgage loans | $ 12,020 | $ 11,101 | $ 3,848 | $ 307 | $ 118 | $ 27,394 |

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 100.0% as of December 31, 2022 and 100.0% as of December 31, 2021.

The geographic distribution of commercial mortgage loans was as follows:

| | December 31, 2022 | |
|---|---|---|
| | Carrying Value | Average Loan-to-Value Ratio |
| | ($ In Millions) | |
| California | $ 4,840 | 50 % |
| New York | 2,224 | 54 % |
| United Kingdom | 2,054 | 48 % |
| Texas | 1,927 | 54 % |
| Illinois | 1,545 | 50 % |
| Washington | 1,162 | 53 % |
| District of Columbia | 1,094 | 58 % |
| All other | 6,638 | 55 % |
| Total commercial mortgage loans | $ 21,484 | 59 % |

All other consists of 31 jurisdictions with no individual exposure exceeding $913 million.

| | December 31, 2021 | |
|---|---|---|
| | Carrying Value | Average Loan-to-Value Ratio |
| | ($ In Millions) | |
| California | $ 5,034 | 52 % |
| United Kingdom | 2,540 | 49 % |
| New York | 2,127 | 56 % |
| Texas | 2,026 | 58 % |
| Illinois | 1,675 | 66 % |
| Washington | 1,183 | 50 % |
| District of Columbia | 1,104 | 55 % |
| All other | 6,620 | 55 % |
| Total commercial mortgage loans | $ 22,309 | 55 % |

All other consists of 30 jurisdictions with no individual exposure exceeding $906 million.

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

| | Years Ended December 31, 2022 | | 2021 | |
|---|---|---|---|---|
| | Low | High | Low | High |
| Commercial mortgage loans | 1.7 % | 11.7 % | 1.6 % | 9.0 % |
| Residential mortgage loans | 2.2 % | 11.7 % | 2.7 % | 10.0 % |
| Mezzanine mortgage loans | 5.3 % | 13.3 % | 3.3 % | 6.6 % |

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

| | Years Ended December 31, 2022 | | 2021 | |
|---|---|---|---|---|
| | Low | High | Low | High |
| Commercial mortgage loans | 2.6 % | 11.7 % | 1.6 % | 5.9 % |
| Residential mortgage loans | 2.6 % | 11.7 % | 2.8 % | 8.5 % |
| Mezzanine mortgage loans | 12.2 % | 13.3 % | 3.3 % | 5.9 % |

As of December 31, 2022, 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.

The following presents a summary of the Company's impaired mortgage loans as of December 31, 2022 and as of December 31, 2021:

| | December 31, 2022 | | | | |
|---|---|---|---|---|---|
| | Carrying Value | Average Carrying Value | Unpaid Principal Balance | Valuation Allowance | Interest Income |
| | (In Millions) | | | | |
| With no allowance recorded: | | | | | |
| Commercial mortgage loans: | | | | | |
| Primary lender | $ 14 | $ 15 | $ 17 | $ - | $ 1 |
| Total | 14 | 15 | 17 | - | 1 |
| Total impaired commercial mortgage loans | $ 14 | $ 15 | $ 17 | $ - | $ 1 |

| | December 31, 2021 | | | | |
|---|---|---|---|---|---|
| | Carrying Value | Average Carrying Value | Unpaid Principal Balance | Valuation Allowance | Interest Income |
| | (In Millions) | | | | |
| With no allowance recorded: | | | | | |
| Commercial mortgage loans: | | | | | |
| Primary lender | $ 52 | $ 55 | $ 113 | $ - | $ - |
| Total | 52 | 55 | 113 | - | - |
| Total impaired commercial mortgage loans | $ 52 | $ 55 | $ 113 | $ - | $ - |

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, 2022 or 2021. The carrying value of commercial mortgage loans subject to a participant or co-lender mortgage loan agreement was $1,264 million as of December 31, 2022 and $1,279 million as of December 31, 2021.

***f. Real estate***

The carrying value of real estate was as follows:

| | December 31, 2022 | December 31, 2021 |
|---|---|---|
| | (In Millions) | |
| Held for the production of income | $ 351 | $ 1,755 |
| Accumulated depreciation | (78) | (846) |
| Encumbrances | (285) | (892) |
| Held for the production of income, net | (12) | 17 |
| Held for sale | 76 | - |
| Accumulated depreciation | (74) | - |
| Held for sale, net | 2 | - |
| Occupied by the Company | 574 | 641 |
| Accumulated depreciation | (209) | (263) |
| Occupied by the Company, net | 365 | 378 |
| Total real estate | $ 355 | $ 395 |

Depreciation expense on real estate was $36 million for the year ended December 31, 2022 and $91 million for the year ended December 31, 2021.

***g. Partnerships and limited liability companies***

| | December 31, 2022 | December 31, 2021 |
|---|---|---|
| | (In Millions) | |
| Joint venture interests: | | |
| Common stocks - subsidiaries and affiliates | $ 3,435 | $ 2,495 |
| Common stocks - unaffiliated | 2,082 | 3,310 |
| Real estate | 2,264 | 1,975 |
| Bonds/preferred stock | 1,060 | 1,142 |
| Other | 1,164 | 1,592 |
| LIHTCs | 120 | 160 |
| Mortgage loans | 1,938 | 1,676 |
| Surplus notes | 405 | 374 |
| Total | $ 12,468 | $ 12,724 |

The Company held eight affiliated partnerships and limited liability companies in a loss position with accumulated losses of $79 million as of December 31, 2022, and five affiliated partnerships and limited liability companies in a loss position with accumulated losses of $52 million, as of December 31, 2021.

The Company's unexpired tax credits expire within a range of less than 1 year to 15 years.

The Company recorded tax credits on these investments of $52 million for the year ended December 31, 2022 and $47 million for the year ended December 31, 2021. 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 4.26% for future benefits of two years to 3.61% for future benefits of ten or more years, and compares the result to its current carry value. The Company recorded impairments of $2 million for the year ended December 31, 2022. LIHTC impairments of $3 million were recorded for the year ended December 31, 2021.

There were no write-downs or reclassifications of LIHTC partnerships made during the fourth quarter ended December 31, 2022 or December 31, 2021 due to forfeiture or ineligibility of tax credits or similar issues. There are no LIHTC investments subject to regulatory review for the years ended December 31, 2022 or 2021.

In 2021, the Company recognized a $411 million OTTI from one investment.

***h. Derivatives***

The Company uses derivative financial instruments in the normal course of business to manage risks, primarily to reduce currency, interest rate and duration imbalances determined in asset/liability analyses. The Company also uses a combination of derivatives and fixed income investments to create 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 $32,084 million as of December 31, 2022 and $22,623 million as of December 31, 2021, as defined under statutory accounting practices as the result of pairing of a long derivative contract with cash instruments.

The Company’s derivative strategy employs a variety of derivative financial instruments, including: interest rate, currency, equity, bond, and credit default swaps; options; forward contracts and financial futures. Investment risk is assessed on a portfolio basis and individual derivative financial instruments are not generally designated in hedging relationships; therefore, as allowed by statutory accounting practices, the Company intentionally has not applied hedge accounting.

Interest rate swaps are primarily used to more closely match the cash flows of assets and liabilities. Interest rate swaps are also used to mitigate changes in the value of assets anticipated to be purchased and other anticipated transactions and commitments. The Company uses currency swaps for the purpose of managing currency exchange risks in its assets and liabilities.

The Company does not sell credit default swaps as a participant in the credit insurance market. The Company does, however, use credit default swaps as part of its investment management process. The Company buys credit default swaps as an efficient means to reduce credit exposure to particular issuers or sectors in the Company’s investment portfolio. The Company sells credit default swaps in order to create synthetic investment positions that enhance the return on its investment portfolio by providing comparable exposure to fixed income securities that might not be available in the primary market.

Options grant the purchaser the right to buy or sell a security or enter a derivative transaction at a stated price within a stated period. The Company’s option contracts have terms of up to 15 years. A swaption is an option to enter an interest rate swap to either receive or pay a fixed rate at a future date. The Company purchases these options for the purpose of managing interest rate risks in its assets and liabilities.

The Company adopted a clearly defined hedging strategy (CDHS) to enable the Company to incorporate currently held hedges in risk-based capital (RBC) calculations. The CDHS is used to significantly mitigate the impact that movements in capital markets have on the liabilities associated with annuity guarantees. The hedge portfolio consists mainly of interest rate swaps, equity swaps, interest rate swaptions and equity futures, and provides protection in the stress scenarios under which RBC is calculated. The hedge portfolio has offsetting impacts relative to the total asset requirement for RBC and surplus for GMDB and VAGLB.

The Company utilizes certain other agreements including forward contracts and financial futures. In addition, the Company also uses “to be announced” forward contracts (TBAs) to hedge interest rate risk and participate in the mortgage-backed securities market in an efficient and cost effective way. Typically, the price is agreed upon at contract inception and payment is made at a specified future date. The Company usually does not purchase TBAs with settlement by the first possible delivery date and thus, accounts for these TBAs as derivatives. TBAs that settle on the first possible delivery date are accounted for as bonds. The Company’s futures contracts are exchange traded and have credit risk. Margin requirements are met with the deposit of securities. Futures contracts are generally settled with offsetting transactions. Forward contracts and financial futures are used by the Company to reduce exposures to various risks including interest rates and currency rates.

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

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

Net collateral pledged by the counterparties was $2,336 million as of December 31, 2022 and $5,288 million as of December 31, 2021. In the event of default, the full market value exposure at risk in a net gain position, net of offsets and collateral, was $659 million as of December 31, 2022 and $238 million as of December 31, 2021. The statutory net amount at risk, defined as net collateral pledged and statement values excluding accrued interest, was $5,702 million as of December 31, 2022 and $616 million as of December 31, 2021.

The Company had the right to rehypothecate or repledge securities totaling $771 million of the $2,336 million as of December 31, 2022 and $718 million of the $5,288 million as of December 31, 2021 of net collateral pledged by counterparties. There were no securities rehypothecated to other counterparties as of December 31, 2022 or December 31, 2021.

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

| | December 31, 2022 | | | |
|---|---|---|---|---|
| | Assets | | Liabilities | |
| | Carrying Value | Notional Amount | Carrying Value | Notional Amount |
| | (In Millions) | | | |
| Interest rate swaps | $ 18,889 | $ 139,716 | $ 13,506 | $ 143,074 |
| Options | 654 | 14,944 | 12 | 359 |
| Currency swaps | 3,175 | 28,282 | 710 | 14,841 |
| Forward contracts | 16 | 1,289 | 239 | 7,457 |
| Credit default swaps | - | - | 13 | 1,580 |
| Financial futures | 22 | 2,784 | 3 | 369 |
| Total | $ 22,756 | $ 187,015 | $ 14,483 | $ 167,680 |

| | December 31, 2021 | | | |
|---|---|---|---|---|
| | Assets | | Liabilities | |
| | Carrying Value | Notional Amount | Carrying Value | Notional Amount |
| | (In Millions) | | | |
| Interest rate swaps | $ 15,556 | $ 119,034 | $ 11,210 | $ 129,332 |
| Options | 354 | 16,388 | 14 | 356 |
| Currency swaps | 984 | 13,167 | 206 | 5,535 |
| Forward contracts | 69 | 4,634 | 71 | 5,230 |
| Credit default swaps | - | 60 | 1 | 35 |
| Financial futures | 45 | 2,753 | 5 | 373 |
| Total | $ 17,008 | $ 156,036 | $ 11,507 | $ 140,861 |

The average fair value of outstanding derivative assets was $19,371 million for the year ended December 31, 2022 and $17,526 million for the year ended December 31, 2021. The average fair value of outstanding derivative liabilities was $11,393 million for the year ended December 31, 2022 and $13,029 million for the year ended December 31, 2021.

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

| | December 31, 2022 | December 31, 2021 |
|---|---|---|
| | (In Millions) | |
| Due after one year through five years | $ 1,580 | $ 95 |
| Total | $ 1,580 | $ 95 |

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

| | December 31, 2022 | December 31, 2021 |
|---|---|---|
| | (In Millions) | |
| Open interest rate swaps in a fixed pay position | $ 133,356 | $ 118,042 |
| Open interest rate swaps in a fixed receive position | 144,038 | 126,990 |
| Other interest related swaps | 5,396 | 3,335 |
| Total interest rate swaps | $ 282,790 | $ 248,367 |

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:

| | Years Ended December 31, 2022 | | 2021 | |
|---|---|---|---|---|
| | 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 | $ (717) | $ 1,038 | $ (451) | $ 386 |
| Currency swaps | 72 | 2,275 | (25) | 1,129 |
| Options | (9) | 373 | (118) | 68 |
| Credit default swaps | 2 | (17) | 2 | - |
| Forward contracts | 873 | (222) | 111 | 222 |
| Financial futures | (1,097) | (21) | (371) | 109 |
| Total | $ (876) | $ 3,426 | $ (852) | $ 1,914 |

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

| | December 31, 2022 Derivative Assets | Derivative Liabilities | Net | December 31, 2021 Derivative Assets | Derivative Liabilities | Net |
|---|---|---|---|---|---|---|
| | (In Millions) | | | | | |
| Gross | $ 22,756 | $ 14,483 | $ 8,273 | $ 17,008 | $ 11,507 | $ 5,501 |
| Due and accrued | 757 | 1,822 | (1,065) | 1,142 | 1,911 | (769) |
| Gross amounts offset | (15,793) | (15,793) | - | (13,023) | (13,023) | - |
| Net asset | 7,720 | 512 | 7,208 | 5,127 | 395 | 4,732 |
| Collateral posted | (5,025) | (2,689) | (2,336) | (7,046) | (1,759) | (5,287) |
| Net | $ 2,695 | $ (2,177) | $ 4,872 | $ (1,919) | $ (1,364) | $ (555) |

### *i. Repurchase agreements*

The Company had repurchase agreements with carrying values of $3,042 million as of December 31, 2022and $2,802 million as of December 31, 2021. As of December 31, 2022, the maturities of these agreements ranged from January 5, 2023 through February 2, 2023 and the interest rates ranged from 4.35 % to 4.55%. The outstanding amounts were collateralized by cash and bonds with a carrying value of $3,049 million as of December 31, 2022 and $2,803 million as of December 31, 2021.

The following presents the Company's maximum amount and ending balance for repurchase agreements accounted for as secured borrowing for the years ended:

| | December 31, | | | |
|---|---|---|---|---|
| | 2022 | | 2021 | |
| | Maximum balance | Ending balance | Maximum balance | Ending balance |
| | (In Millions) | | | |
| From 1 week to 1 month | $ 773 | $ 398 | $ 198 | $ - |
| Greater than 1 month to 3 months | 3,227 | 2,644 | 1,614 | 1,067 |
| Greater than 3 months to 1 year | 1,937 | - | 2,899 | 1,735 |
| Total | $ 5,937 | $ 3,042 | $ 4,711 | $ 2,802 |

The following presents the Company's cash collateral and the fair value of security collateral received for the years ended:

| | December 31, | | | |
|---|---|---|---|---|
| | 2022 | | 2021 | |
| | Cash | Securities | Cash | Securities |
| | (In Millions) | | | |
| Total | $ 88 | $ - | $ - | $ - |

### *j. Net investment income*

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

| | Year Ended December 31, 2022 | Year Ended December 31, 2021 |
|---|---|---|
| | (In Millions) | |
| Bonds | $ 5,376 | $ 4,606 |
| Preferred stocks | 22 | 17 |
| Common stocks - subsidiaries and affiliates | 715 | 544 |
| Common stocks - unaffiliated | 103 | 56 |
| Mortgage loans | 1,176 | 1,182 |
| Policy loans | 1,153 | 1,115 |
| Real estate | 79 | 162 |
| Partnerships and limited liability companies | 1,035 | 1,192 |
| Derivatives | 477 | 572 |
| Cash, cash equivalents and short-term investments | 84 | 62 |
| Other | 38 | 20 |
| Subtotal investment income | 10,258 | 9,528 |
| Amortization of the IMR | (48) | 156 |
| Investment expenses | (814) | (746) |
| Net investment income | $ 9,396 | $ 8,938 |

***k. Net realized capital gains (losses)***

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

| | Years Ended December 31, 2022 | Years Ended December 31, 2021 |
|---|---|---|
| | (In Millions) | |
| Bonds | $ (894) | $ 207 |
| Preferred stocks | (6) | 10 |
| Common stocks - subsidiaries and affiliates | (13) | 10 |
| Common stocks - unaffiliated | 67 | 148 |
| Mortgage loans | (41) | (8) |
| Real estate | 127 | 24 |
| Partnerships and limited liability companies | (355) | (416) |
| Derivatives | (876) | (852) |
| Other | (75) | 6 |
| Net realized capital losses before federal and state taxes and deferral to the IMR | (2,066) | (871) |
| Net federal and state tax benefit (expense) | 93 | (92) |
| Net realized capital losses before deferral to the IMR | (1,973) | (963) |
| Net after tax losses deferred to the IMR | 2,315 | 430 |
| Net realized capital gains (losses) | $ 342 | $ (533) |

The IMR liability balance was $1 million as of December 31, 2022 and $1,713 million as of December 31, 2021. The IMR liability is included in other liabilities on the Consolidated Statutory Statements of Financial Position. Refer to *Note 2z. "Interest maintenance reserve"* for information on the Company's policy for IMR.

OTTI, included in the realized capital gains (losses), consisted of the following:

| | Years Ended December 31, 2022 | Years Ended December 31, 2021 |
|---|---|---|
| | (In Millions) | |
| Bonds | $ (419) | $ (83) |
| Common stocks - unaffiliated | (3) | (11) |
| Preferred stocks | (6) | (1) |
| Mortgage loans | (4) | (18) |
| Partnerships and limited liability companies | (184) | (487) |
| Total OTTI | $ (616) | $ (600) |

The Company recognized OTTI of $14 million for the year ended December 31, 2022 and $8 million for the year ended December 31, 2021 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 1% of the $419 million of bond OTTI for the year ended December 31, 2022 and 1% of the$83 million of bond OTTI for the year ended December 31, 2021. 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 gains (losses) including other-than-temporary impairments and unrealized capital gains (losses)"* for more information on assumptions and inputs used in the Company's OTTI models.

## *6. Federal income taxes*

On August 16th, 2022, the Inflation Reduction Act ("IRA") was signed into law and includes certain corporate income tax provisions. Impacts to the Company include the imposition of a corporate alternative minimum tax ("CAMT") applicable to tax years beginning after December 31, 2022. 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 (2020-2022). As of the reporting date, the Company has not determined if it will be liable for CAMT in 2023. In accordance with INT 22-02: *Third Quarter 2022 through First Quarter 2023 Reporting of the Inflation Reduction Act – Corporate Alternative Minimum Tax*, the financial statements do not include an estimated impact of the CAMT because a reasonable estimate cannot be made. The United States Treasury Secretary has been authorized to issue guidance on the CAMT and pending such guidance the Company is not able to make a reasonable estimate.

In response to the COVID-19 pandemic, the Coronavirus Aid, Relief, and Economic Security (CARES) Act was signed into law on March 27, 2020 and the Consolidated Appropriations Act (CAA), 2021 was signed into law on December 27, 2020. The CARES Act, among other things, permits net operating loss (NOL) carryovers and carrybacks to offset 100% of taxable income for taxable years beginning before 2021. In addition, the CARES Act allows NOLs incurred in 2018, 2019, and 2020 to be carried back to each of the five preceding taxable years to generate a refund of previously paid income taxes. The CAA extends and expands certain tax provisions of the CARES Act. The CARES Act as well as the CAA did not have a material effect on the consolidated financial statements.

The Company provides for DTAs in accordance with statutory accounting practices. All of the companies included in these Consolidated Statutory Financial Statements have met the required threshold to utilize the three-year reversal period and 15% of surplus limitation.

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

| | December 31, 2022 | | |
|---|---|---|---|
| | Ordinary | Capital | Total |
| | | (In Millions) | |
| Gross DTAs | $ 3,525 | $ 784 | $ 4,309 |
| Statutory valuation allowance adjustment | - | - | - |
| Adjusted gross DTAs | 3,525 | 784 | 4,309 |
| DTAs nonadmitted | (4) | (14) | (18) |
| Subtotal net admitted DTA | 3,521 | 770 | 4,291 |
| Total gross DTLs | (2,099) | (938) | (3,037) |
| Net admitted DTA(L) | $ 1,422 | $ (168) | $ 1,254 |

| | December 31, 2021 | | |
|---|---|---|---|
| | Ordinary | Capital | Total |
| | | (In Millions) | |
| Gross DTAs | $ 3,220 | $ 403 | $ 3,623 |
| Statutory valuation allowance adjustment | - | - | - |
| Adjusted gross DTAs | 3,220 | 403 | 3,623 |
| DTAs nonadmitted | (2) | (9) | (11) |
| Subtotal net admitted DTA | 3,218 | 394 | 3,612 |
| Total gross DTLs | (2,145) | (724) | (2,869) |
| Net admitted DTA(L) | $ 1,073 | $ (330) | $ 743 |

| | Change | | |
|---|---|---|---|
| | Ordinary | Capital | Total |
| | | (In Millions) | |
| Gross DTAs | $ 305 | $ 381 | $ 686 |
| Statutory valuation allowance adjustment | - | - | - |
| Adjusted gross DTAs | 305 | 381 | 686 |
| DTAs nonadmitted | (2) | (5) | (7) |
| Subtotal net admitted DTA | 303 | 376 | 679 |
| Total gross DTLs | 46 | (214) | (168) |
| Net admitted DTA(L) | $ 349 | $ 162 | $ 511 |

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, 2022 | | |
|---|---|---|---|
| | Ordinary | Capital | Total |
| | (In Millions) | | |
| Admitted DTA 3 years: | | | |
| Federal income taxes that can be recovered | $ - | $ 65 | $ 65 |
| Remaining adjusted gross DTAs expected to be realized within 3 years (lesser of 1 or 2): | | | |
| 1. Adjusted gross DTA to be realized | 1,310 | - | 1,310 |
| 2. Adjusted gross DTA allowed per limitation threshold | 4,305 | - | 4,305 |
| Lesser of lines 1 or 2 | 1,310 | - | 1,310 |
| Adjusted gross DTAs offset by existing DTLs | 2,212 | 704 | 2,916 |
| Total admitted DTA realized within 3 years | $ 3,522 | $ 769 | $ 4,291 |

| | December 31, 2021 | | |
|---|---|---|---|
| | Ordinary | Capital | Total |
| | (In Millions) | | |
| Admitted DTA 3 years: | | | |
| Federal income taxes that can be recovered | $ - | $ 95 | $ 95 |
| Remaining adjusted gross DTAs expected to be realized within 3 years (lesser of 1 or 2): | | | |
| 1. Adjusted gross DTA to be realized | 1,157 | - | 1,157 |
| 2. Adjusted gross DTA allowed per limitation threshold | 4,217 | - | 4,217 |
| Lesser of lines 1 or 2 | 1,157 | - | 1,157 |
| Adjusted gross DTAs offset by existing DTLs | 2,061 | 299 | 2,360 |
| Total admitted DTA realized within 3 years | $ 3,218 | $ 394 | $ 3,612 |

| | Change | | |
|---|---|---|---|
| | Ordinary | Capital | Total |
| | (In Millions) | | |
| Admitted DTA 3 years: | | | |
| Federal income taxes that can be recovered | $ - | $ (30) | $ (30) |
| Remaining adjusted gross DTAs expected to be realized within 3 years (lesser of 1 or 2): | | | |
| 1. Adjusted gross DTA to be realized | 153 | - | 153 |
| 2. Adjusted gross DTA allowed per limitation threshold | 88 | - | 88 |
| Lesser of lines 1 or 2 | 153 | - | 153 |
| Adjusted gross DTAs offset by existing DTLs | 151 | 405 | 556 |
| Total admitted DTA realized within 3 years | $ 304 | $ 375 | $ 679 |

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, 2022 | | |
|---|---|---|---|
| | 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) | 68 % | - % | 68 % |

| | December 31, 2021 | | |
|---|---|---|---|
| | 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) | 45 % | - % | 45 % |

| | 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) | 23 % | - % | 23 % |

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, | |
|---|---|---|
| | 2022 | 2021 |
| | (In Millions) | |
| Federal income tax (benefit) expense on operating earnings | $ (73) | $ 83 |
| Foreign income tax expense on operating earnings | 28 | 3 |
| Total federal and foreign income tax expense (benefit) on operating earnings | (45) | 86 |
| Federal income tax expense (benefit) on net realized capital gains | (104) | 49 |
| Total federal and foreign income tax (benefit) expense | $ (149) | $ 135 |

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

| | December 31, 2022 | December 31, 2021 | Change |
|---|---|---|---|
| | (In Millions) | | |
| DTAs: | | | |
| Ordinary | | | |
| Reserve items | $ 1,539 | $ 1,382 | $ 157 |
| Policy acquisition costs | 894 | 795 | 99 |
| Nonadmitted assets | 305 | 296 | 9 |
| Policyholders' dividends | 218 | 208 | 10 |
| Pension and compensation related items | 49 | 71 | (22) |
| Investment items | 247 | 253 | (6) |
| Expense items | 59 | 67 | (8) |
| Unrealized investment losses | - | 12 | (12) |
| Other | 214 | 136 | 78 |
| Total ordinary DTAs | 3,525 | 3,220 | 305 |
| Nonadmitted DTAs | (4) | (2) | (2) |
| Admitted ordinary DTAs | 3,521 | 3,218 | 303 |
| Capital | | | |
| Unrealized investment losses | 413 | 41 | 372 |
| Expense items | 18 | 18 | - |
| Investment items | 353 | 344 | 9 |
| Total capital DTAs | 784 | 403 | 381 |
| Nonadmitted DTAs | (14) | (9) | (5) |
| Admitted capital DTAs | 770 | 394 | 376 |
| Admitted DTAs | 4,291 | 3,612 | 679 |
| DTLs: | | | |
| Ordinary | | | |
| Reserve items | 214 | 286 | (72) |
| Unrealized investment gains | 1,132 | 926 | 206 |
| Deferred and uncollected premium | 296 | 283 | 13 |
| Pension items | 68 | 61 | 7 |
| Investment items | 7 | 234 | (227) |
| Other | 381 | 355 | 26 |
| Total ordinary DTLs | 2,098 | 2,145 | (47) |
| Capital | | | |
| Unrealized investment gains | 844 | 560 | 284 |
| Investment items | 95 | 164 | (69) |
| Total capital DTLs | 939 | 724 | 215 |
| Total DTLs | 3,037 | 2,869 | 168 |
| Net admitted DTA | $ 1,254 | $ 743 | $ 511 |

The change in net deferred income taxes comprised the following:

| | Years Ended December 31, 2022 | 2021 |
|---|---|---|
| | (In Millions) | |
| Net DTA(L) | $ 517 | $ 220 |
| Less: Items not recorded in the change in net deferred income taxes: | | |
| Tax-effect of unrealized losses | 141 | 337 |
| Tax-effect of changes from asset transfers | 37 | - |
| Change in net deferred income taxes | $ 695 | $ 557 |

As of December 31, 2022, the Company had no net operating or capital loss carryforwards to include in deferred income taxes. The Company has $107 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, 2022 | 2021 |
|---|---|---|
| | (In Millions) | |
| Provision computed at statutory rate of 21% | $ (369) | $ (118) |
| Investment items | (157) | (102) |
| Nonadmitted assets | (9) | 3 |
| Tax credits | (293) | (95) |
| Expense items | 19 | (38) |
| Foreign governmental income taxes | 28 | - |
| Other | (65) | (72) |
| Total statutory income tax benefit | $ (846) | $ (422) |
| | | |
| Federal and foreign income tax (benefit) expense | $ (149) | $ 135 |
| Change in net deferred income taxes | (697) | (557) |
| Total statutory income tax benefit | $ (846) | $ (422) |

The Company made payments in the amount of $28 million in 2022 and in the amount of $876 million in 2021.

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 $0 million related to December 31, 2022, $130 million related to 2021 and $441 million related to 2020.

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.

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, 2022 | $ | 226 |
| Gross change related to positions taken in prior years | | - |
| Gross change related to positions taken in current year | | (4) |
| Gross change related to settlements | | - |
| Gross change related to lapse of statutes of limitations | | - |
| Balance, December 31, 2022 | $ | 222 |

Included in the liability for unrecognized tax benefits as of December 31, 2022, are $209 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, 2022 includes $8 million of unrecognized tax benefits that, if recognized, would impact the Company's effective tax rate.

The Company recognized an increase of $5 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 $25 million as of December 31, 2022 and $20 million as of December 31, 2021. The Company has no accrued penalties related to the liability for unrecognized tax benefits. In the next year, the Company does not anticipate the total amount of uncertain tax positions to significantly increase or decrease.

The Internal Revenue Service (IRS) has completed its examination of MassMutual and its subsidiaries for the year 2013 and prior. The 2014-2016 tax years are in Appeals for 3 carryforward issues. The IRS commenced its examination of years 2017-2018 in October 2020 and the expectation is to close out the audit in 2023. The adjustments resulting from these examinations are not expected to materially affect the position or liquidity of the Company.

As of December 31, 2022 and 2021, the Company did not recognize any protective deposits as admitted assets.

## 7. *Other than invested assets*

### *a. Corporate-owned life insurance*

MassMutual holds corporate-owned life insurance issued by unaffiliated third-party insurers to cover the lives of certain qualified senior employees. The primary purpose of the program is to offset future employee benefit expenses. MassMutual pays all premiums and is the owner and beneficiary of these policies. MassMutual had recorded cash surrender values of these policies of $2,619 million as of December 31, 2022 and $2,666 million as of December 31, 2021.

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

| | December 31, | |
|---|---|---|
| | 2022 | 2021 |
| Other invested assets | 39 % | 33 % |
| Bonds | 32 | 33 |
| Stocks | 16 | 19 |
| Cash and short-term investments | 10 | 13 |
| Real estate | 3 | 2 |
| | 100 % | 100 % |

***b. Deferred and uncollected life insurance premium***

Deferred and uncollected life insurance premium, net of loading and reinsurance, are included in other than invested assets in the Company's Consolidated Statutory Statements of Financial Position. The following summarizes the deferred and uncollected life insurance premium on a gross basis, as well as, net of loading and reinsurance:

| | December 31, | | | |
|---|---|---|---|---|
| | 2022 | | 2021 | |
| | Gross | Net | Gross | Net |
| | (In Millions) | | | |
| Ordinary new business | $ 162 | $ 103 | $ 186 | $ 119 |
| Ordinary renewal | 1,149 | 1,129 | 987 | 1,012 |
| Group life | 10 | 10 | 11 | 11 |
| Total | $ 1,321 | $ 1,242 | $ 1,184 | $ 1,142 |

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 $63,760 million as of December 31, 2022 and $72,619 million as of December 31, 2021 for which gross premium was less than net premium.

## 8. *Policyholders' liabilities*

### *a. Policyholders' reserves*

The Company had life insurance in force of $944,222 million as of December 31, 2022 and $888,313 million as of December 31, 2021.

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

| | December 31, | | | |
|---|---|---|---|---|
| | 2022 | | 2021 | |
| | Amount | Interest Rates | Amount | Interest Rates |
| | ($ In Millions) | | | |
| Individual life | $ 75,072 | 2.5 % - 6.0 % | $ 70,011 | 2.5 % - 6.0 % |
| Group annuities | 18,692 | 1.0 % - 11.8 % | 16,948 | 1.0 % - 11.8 % |
| Individual universal and variable life | 26,033 | 3.5 % - 6.0 % | 23,976 | 3.5 % - 6.0 % |
| Individual annuities | 26,455 | 1.0 % - 11.8 % | 21,349 | 1.0 % - 11.8 % |
| Group life | 6,384 | 3.0 % - 4.0 % | 5,960 | 2.5 % - 4.5 % |
| Disabled life claim reserves | 1,831 | 3.0 % - 6.0 % | 1,840 | 3.5 % - 6.0 % |
| Disability active life reserves | 2,118 | 3.0 % - 6.0 % | 1,760 | 3.5 % - 6.0 % |
| Other | 478 | 2.5 % - 6.0 % | 449 | 2.5 % - 6.0 % |
| Total | $ 157,063 | | $ 142,293 | |

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

### *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, | | | |
|---|---|---|---|---|
| | 2022 | | 2021 | |
| | Amount | Interest Rates | Amount | Interest Rates |
| | ($ In Millions) | | | |
| GICs: | | | | |
| Note programs | $ 10,813 | 0.5 % - 5.6 % | $ 10,864 | - % - 5.6 % |
| Federal Home Loan Bank of Boston | 2,111 | 0.8 % - 3.4 % | 1,505 | 0.8 % - 3.4 % |
| Municipal contracts | 1,777 | 0.2 % - 7.3 % | 1,463 | 0.2 % - 7.3 % |
| Supplementary contracts | 2,990 | 1.0 % - 6.5 % | 2,799 | 1.0 % - 11.3 % |
| Dividend accumulations | 455 | 3.0 % - 3.0 % | 472 | 3.0 % - 3.5 % |
| Other deposits | 24 | 4.0 % - 8.0 % | 26 | 4.0 % - 8.0 % |
| Total | $ 18,170 | | $ 17,129 | |

*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 of Boston (FHLB Boston) in an investment spread strategy, consistent with its other funding agreements. These funding agreements are collateralized by securities with estimated fair values of $1,903 million as of December 31, 2022. MassMutual's borrowing capacity with FHLB Boston is subject to the lower of the limitation on the pledge of collateral for a loan set forth by law or by MassMutual's internal limit. MassMutual's unused capacity was $3,889 million as of December 31, 2022. As a member of FHLB Boston, MassMutual held common stock of FHLB Boston with a statement value of $92 million as of December 31, 2022 and $75 million as of December 31, 2021.

*Municipal contracts*

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

Certain municipal contracts contain make-whole provisions, which document the formula for full contract payout. Certain municipal contracts have ratings-based triggers that allow the trustee to declare the entire balance due and payable. Municipal contracts may also have terms that require the Company to post collateral to a third party based on the contract balance in the event of a downgrade in ratings below certain levels under certain circumstances. When the collateral is other than cash, the collateral value is required to be greater than the account balance. The collateral was $339 million as of December 31, 2022 and $146 million as of December 31, 2021. 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, 2022, the Company's GICs by expected maturity year were as follows (in millions):

| | | |
|---|---|---|
| 2023 | $ | 1,936 |
| 2024 | | 2,596 |
| 2025 | | 2,815 |
| 2026 | | 2,074 |
| 2027 | | 1,380 |
| Thereafter | | 3,900 |
| Total | $ | 14,701 |

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

### *c. Unpaid claims and claim expense reserves*

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

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

| | December 31, 2022 | December 31, 2021 |
|---|---|---|
| | (In Millions) | |
| Claim reserves, beginning of year | $ 2,174 | $ 2,119 |
| Less: Reinsurance recoverables | 308 | 259 |
| Net claim reserves, beginning of year | 1,866 | 1,860 |
| Claims paid related to: | | |
| Current year | (14) | (14) |
| Prior years | (335) | (336) |
| Total claims paid | (349) | (350) |
| Incurred related to: | | |
| Current year's incurred | 324 | 258 |
| Current year's interest | 8 | 6 |
| Prior year's incurred | (54) | (5) |
| Prior year's interest | 69 | 71 |
| Total incurred | 347 | 330 |
| Adjustments through surplus | - | 26 |
| Net claim reserves, end of year | 1,864 | 1,866 |
| Reinsurance recoverables | 367 | 308 |
| Claim reserves, end of year | $ 2,231 | $ 2,174 |

The changes in reserves for incurred claims related to prior years are generally the result of recent loss development trends. The $54 million decrease in the prior years' incurred claims for 2022 and the $5 million decrease in the prior years' incurred claims for 2021 were generally the result of differences between actual termination experience and statutorily prescribed termination tables. In 2022, claim experience included normal claim volume with higher terminations, resulting in a reduction to the incurred reserve from favorable experience, while 2021 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, 2022 | December 31, 2021 |
|---|---|---|
| | (In Millions) | |
| Disabled life claim reserves | $ 1,831 | $ 1,840 |
| Accrued claim liabilities | 33 | 26 |
| Net claim reserves, end of year | $ 1,864 | $ 1,866 |

***d. Additional liability for annuity contracts***

Certain individual variable annuity and fixed index annuity products have additional death or other insurance benefit features, such as GMDBs, GMIBs, GMABs and GLWBs. 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.

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

| | |
|---|---|
| Liability as of January 1, 2021 | $ 212 |
| Incurred guarantee benefits | (165) |
| Paid guarantee benefits | (3) |
| Liability as of December 31, 2021 | 44 |
| Incurred guarantee benefits | 18 |
| Paid guarantee benefits | (6) |
| Liability as of December 31, 2022 | $ 56 |

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, 2022 | | | December 31, 2021 | | |
|---|---|---|---|---|---|---|
| | Account Value | Net Amount at Risk | Weighted Average Attained Age | Account Value | Net Amount at Risk | Weighted Average Attained Age |
| | ($ In Millions) | | | | | |
| GMDB | $ 10,035 | $ 242 | 66 | $ 13,191 | $ 60 | 66 |
| GMIB Basic | 466 | 21 | 72 | 675 | 4 | 71 |
| GMIB Plus | 1,198 | 505 | 68 | 1,565 | 158 | 68 |
| GMAB | 1,553 | 84 | 62 | 2,219 | 1 | 62 |
| GLWB | 97 | 22 | 74 | 136 | 6 | 73 |

As of December 31, 2022, the GMDB account value above consists of $1,594 million within the general account and $8,441 million within separate accounts that includes $3,600 million of Modco assumed. As of December 31, 2021, the GMDB account value above consists of $1,619 million within the general account and $11,572 million within separate accounts that includes $4,830 million of Modco assumed.

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

| | December 31, 2022 | | | December 31, 2021 | | |
|---|---|---|---|---|---|---|
| | Separate Account | General Account | Total | Separate Account | General Account | Total |
| | (In Millions) | | | | | |
| GMDB | $ 8,441 | $ 1,594 | $ 10,035 | $ 11,572 | $ 1,619 | $ 13,191 |
| GMIB Basic | 445 | 21 | 466 | 652 | 23 | 675 |
| GMIB Plus | 1,198 | - | 1,198 | 1,565 | - | 1,565 |
| GMAB | 1,516 | 37 | 1,553 | 2,177 | 42 | 2,219 |
| GLWB | 97 | - | 97 | 136 | - | 136 |

***e. Additional liability for individual life contracts***

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

The following presents the changes in the liability, net of reinsurance, for guarantees on universal life and variable universal life type contracts:

| | December 31, | |
|---|---|---|
| | 2022 | 2021 |
| | (In Millions) | |
| Beginning balance | $ 4,729 | $ 4,429 |
| Net liability increase | 665 | 300 |
| Ending balance | $ 5,394 | $ 4,729 |

## *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.

If all reinsurance agreements were terminated by either party as of December 31, 2022, the resulting reduction in surplus due to loss of reinsurance reserve credits, net of unearned premium, would be approximately $11,961 million assuming no return of the assets, excluding assets in trust, backing these reserves from the reinsurer to the Company.

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

| | Years Ended December 31, 2022 | Years Ended December 31, 2021 |
|---|---|---|
| | (In Millions) | |
| Direct premium | $ 36,499 | $ 32,007 |
| Premium assumed | 970 | 1,063 |
| Premium ceded | (13,720) | (12,890) |
| Total net premium | $ 23,749 | $ 20,180 |
| Ceded reinsurance recoveries | $ 1,778 | $ 1,928 |
| Assumed losses | $ 249 | $ 222 |

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

| | December 31, 2022 | December 31, 2021 |
|---|---|---|
| | (In Millions) | |
| Reinsurance reserves | | |
| Assumed | $ 6,458 | $ 6,790 |
| Ceded | (52,329) | (48,272) |
| Ceded amounts recoverable | $ 380 | $ 439 |
| Benefits payable on assumed business | $ 16 | $ 16 |
| Funds held under coinsurance | | |
| Ceded | $ 21,916 | $ 19,255 |

Reinsurance reserves ceded to unaffiliated reinsurers as of December 31, 2022 include $9,893 million associated with life insurance policies, $5,997 million for LTC, $36,418 million for annuity, $15 million for disability and $6 million for group life and health. Reinsurance reserves ceded to unaffiliated reinsurers as of December 31, 2021 include $9,669 million associated with life insurance policies, $6,220 million for LTC, $32,362 million for annuity, $15 million for disability and $6 million for group life and health.

For the year ended December 31, 2022, the Company decreased its gross LTC policyholders' reserve by $165 million 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 an unaffiliated reinsurer resulting in the ceded policyholders' reserves decreasing by $345 million. The total net impact of the change is $180 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.

For the year ended December 31, 2021, the Company increased its gross LTC policyholders' reserve by $2,465 million through a combination of various assumption changes to reflect the risk inherent in the cash flows of this business, totaling $2,821 million, offset by a prior year error correction of $356 million. The majority of the risk is ceded to an unaffiliated reinsurer resulting in the ceded policyholders' reserves increasing by an additional $2,165 million. The total net impact of the change is $300 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, 2022 | | |
|---|---|---|---|
| | (In Millions) | | |
| | Direct | Ceded | Net |
| LTC premium deficiency reserves, beginning of year | $ 4,555 | $ (4,255) | $ 300 |
| Assumption changes | (165) | 345 | 180 |
| LTC premium deficiency reserves, end of year | $ 4,390 | $ (3,910) | $ 480 |

As of December 31, 2022, one reinsurer accounted for 30% 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 32% of the reserves are held in trust.

The Company holds invested assets associated with funds withheld that are managed externally, as of December 31, 2022 and 2021, these assets, at carry value, included:

| | December 31, | |
|---|---|---|
| | 2022 | 2021 |
| | (In Millions) | |
| Bonds | $ 14,955 | $ 12,820 |
| Preferred stocks | 70 | 116 |
| Mortgage loans | 1,473 | 1,285 |
| Partnerships and LLCs | 126 | 247 |
| Cash, cash equivalents and short-term investments | 361 | 268 |
| Total | $ 16,985 | $ 14,736 |

## 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, 2022 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 | $ 39 | $ - | $ - | $ 39 | - % |
| At book value less current surrender charge of 5% or more | 27,557 | - | - | 27,557 | 55 |
| At fair value | - | - | 8,970 | 8,970 | 18 |
| Total with market value adjustment or at fair value | 27,596 | - | 8,970 | 36,566 | 73 |
| At book value without adjustment (minimal or no charge or | 6,481 | - | - | 6,481 | 13 |
| Not subject to discretionary withdrawal | 6,719 | - | - | 6,719 | 14 |
| Total | $ 40,796 | $ - | $ 8,970 | $ 49,766 | 100 % |
| Reinsurance ceded | 14,396 | - | - | 14,396 | |
| Total, net of reinsurance | $ 26,400 | $ - | $ 8,970 | $ 35,370 | |
| Amount included in book value moving to at book value without adjustment after statement date | 767 | - | - | 767 | |

*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 | $ 13,836 | $ - | $ - | $ 13,836 | 20 % |
| At book value less current surrender charge of 5% or more | - | - | - | - | - |
| At fair value | - | 12,029 | 20,080 | 32,109 | 46 |
| Total with market value adjustment or at fair value | 13,836 | 12,029 | 20,080 | 45,945 | 66 |
| At book value without adjustment (minimal or no charge or | 2,109 | 488 | - | 2,597 | 4 |
| Not subject to discretionary withdrawal | 21,666 | - | - | 21,666 | 31 |
| Total | $ 37,611 | $ 12,517 | $ 20,080 | $ 70,208 | 100 % |
| Reinsurance ceded | 18,944 | - | - | 18,944 | |
| Total, net of reinsurance | $ 18,667 | $ 12,517 | $ 20,080 | $ 51,264 | |

*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 | $ 2,528 | $ - | $ - | $ 2,528 | 8 % |
| At fair value | - | - | 9,432 | 9,432 | 31 |
| Total with market value adjustment or at fair value | 2,528 | - | 9,432 | 11,960 | 39 |
| At book value without adjustment (minimal or no charge or | 3,473 | - | - | 3,473 | 11 |
| Not subject to discretionary withdrawal | 15,243 | - | - | 15,243 | 50 |
| Total | $ 21,244 | $ - | $ 9,432 | $ 30,676 | 100 % |
| Reinsurance ceded | 3,074 | - | - | 3,074 | |
| Total | $ 18,170 | $ - | $ 9,432 | $ 27,602 | |

The following is a summary of total annuity actuarial reserves and liabilities for deposit-type contracts as of December 31, 2022 (in millions):

| | |
|---|---|
| Consolidated Statutory Statements of Financial Position: | |
| Policyholders' reserves – group annuities | $ 18,667 |
| Policyholders' reserves – individual annuities | 26,400 |
| Liabilities for deposit-type contracts | 18,170 |
| Subtotal | 63,237 |
| Separate Account Annual Statement: | |
| Annuities | 41,567 |
| Other annuity contract deposit-funds and GICs | 9,432 |
| Subtotal | 50,999 |
| Total | $ 114,236 |

***b. Analysis of life actuarial reserves by withdrawal characteristics***

The withdrawal characteristics of the Company's life actuarial reserves as of December 31, 2022 are illustrated below:

*General account*

| | Account Value | Cash Value | Reserve |
|---|---|---|---|
| Subject to discretionary withdrawal, surrender values, or policy loans: | | | |
| Universal life | $ 22,615 | $ 22,611 | $ 22,677 |
| Universal life with secondary guarantees | 2,647 | 2,418 | 8,622 |
| Other permanent cash value life insurance | - | 78,109 | 81,924 |
| Variable life | 4 | 4 | 2 |
| Variable universal life | 604 | 599 | 671 |
| Not subject to discretionary withdrawal or no cash values: | | | |
| Term policies without cash value | - | - | 2,910 |
| Accidental death benefits | - | - | 3 |
| Disability - active lives | - | - | 184 |
| Disability - disabled lives | - | - | 325 |
| Miscellaneous reserves | - | - | 1,087 |
| Total (gross: direct + assumed) | $ 25,870 | $ 103,741 | $ 118,405 |
| Reinsurance Ceded | 5,035 | 5,520 | 10,436 |
| Total (net) | $ 20,835 | $ 98,221 | $ 107,969 |

*Separate account with guarantees*

| | Account Value | Cash Value | Reserve |
|---|---|---|---|
| Subject to discretionary withdrawal, surrender values, or policy loans: | | | |
| Variable universal life | $ 5,031 | $ 5,022 | $ 5,032 |
| Not subject to discretionary withdrawal or no cash values: | | | |
| Total (gross: direct + assumed) | 5,031 | 5,022 | 5,032 |
| Total (net) | $ 5,031 | $ 5,022 | $ 5,032 |

*Separate account nonguaranteed*

| | Account Value | Cash Value | Reserve |
|---|---|---|---|
| Subject to discretionary withdrawal, surrender values, or policy loans: | | | |
| Variable life | $ 9 | $ 9 | $ 13 |
| Variable universal life | 3,012 | 2,985 | 3,003 |
| Not subject to discretionary withdrawal or no cash values: | | | |
| Total (gross: direct + assumed) | 3,021 | 2,994 | 3,016 |
| Total (net) | $ 3,021 | $ 2,994 | $ 3,016 |

***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, 2022 is as follows:

| | Guaranteed | | | |
|---|---|---|---|---|
| | Indexed | Nonindexed Less than/ Equal to 4% | Non Guaranteed | Total |
| | (In Millions) | | | |
| Net premium, considerations or deposits for the year ended December 31, 2022 | $ - | $ - | $ 9,851 | $ 9,851 |
| Reserves at December 31, 2022: | | | | |
| For accounts with assets at: | | | | |
| Fair value | $ - | $ 12,518 | $ 41,499 | $ 54,017 |
| Amortized cost/book value | - | 5,032 | - | 5,032 |
| Subtotal SIA Reserves | - | 17,550 | 41,499 | 59,049 |
| Nonpolicy liabilities | - | - | 358 | 358 |
| Total Separate Account Liabilities | $ - | $ 17,550 | $ 41,857 | $ 59,407 |
| Reserves by withdrawal characteristics: | | | | |
| Subject to discretionary withdrawal: | | | | |
| At book value without market value adjustment and current surrender | | | | |
| At fair value | - | 12,518 | 41,499 | 54,017 |
| At book value without market value adjustment and current surrender charge of less than 5% | - | 5,032 | - | 5,032 |
| Subtotal | - | 17,550 | 41,499 | 59,049 |
| Not subject to discretionary withdrawal | - | - | - | - |
| Nonpolicy liabilities | - | - | 358 | 358 |
| Total Separate Account Liabilities | $ - | $ 17,550 | $ 41,857 | $ 59,407 |

As of December 31, 2022, the Company has $5 million of AVR related to book value separate accounts.

The following is a reconciliation of amounts reported as transfers (from) to separate accounts in the Summary of Operations of the Company's NAIC Separate Account Annual Statement to the amounts reported as net transfers (from) to separate accounts in change in policyholders' reserves in the accompanying Consolidated Statutory Statements of Operations:

| | Years Ended December 31, 2022 | 2021 |
|---|---|---|
| | (In Millions) | |
| From the Separate Account Annual Statement: | | |
| Transfers to separate accounts | $ 4,268 | $ 4,037 |
| Transfers from separate accounts | (14,484) | (11,457) |
| Subtotal | (10,216) | (7,420) |
| Reconciling adjustments: | | |
| Miscellaneous | 3,480 | 4,537 |
| Net deposits on deposit-type liabilities | 1,939 | 1,202 |
| Net transfers from separate accounts | $ (4,797) | $ (1,681) |

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 commercial paper 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 had a carrying value and face amount of $250 million as of December 31, 2022 and 2021. Notes issued in 2022 had interest rates ranging from 0.11% to 4.4% with maturity dates ranging from 1 to 62 days. Interest expense for commercial paper was $5 million for the year ended December 31, 2022 and $1 million for the year ended December 31, 2021.

MassMutual has a $1,500 million, five-year credit facility, with a syndicate of lenders that can be used for general corporate purposes and to support commercial paper borrowings. During December 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, 2022 and 2021, MassMutual was in compliance with all covenants under the credit facility. For the years ended December 31, 2022 and 2021, there were no draws on the credit facilities. Credit facility fees were less than $1 million for the years ended December 31, 2022 and December 31, 2021.

## *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 and agents. The qualified defined benefit plan provides benefits under a cash balance formula based on age, service and salary during the participants' careers. The Company's policy is to fund qualified pension costs in accordance with the Employee Retirement Income Security Act of 1974. There were no contributions in 2022 and 2021.

***b. Defined contribution plans***

The Company sponsors funded (qualified 401(k) thrift savings) and unfunded (nonqualified deferred compensation thrift savings) defined contribution plans for its employees, agents and retirees. The qualified 401(k) thrift savings plan's net assets available for benefits were $3,527 million as of December 31, 2022 and $4,104 million as of December 31, 2021. The Company match for the qualified 401(k) thrift savings plan is limited to 5% of eligible W-2 compensation. The Company's total matching thrift savings contributions included in general insurance expenses were $52 million for the year ended December 31, 2022 and $48 million for the year ended December 31, 2021.

The Company also maintains a defined contribution plan for agents, which was frozen in 2001. The net assets available for these benefits were $144 million as of December 31, 2022 and $179 million as of December 31, 2021.

***c. Other postretirement benefits***

The Company provides certain life insurance and health care benefits (other postretirement benefits) for its retired employees and agents, their beneficiaries and covered dependents. MMHLLC has the obligation to pay the Company's other postretirement benefits. The transfer of this obligation to MMHLLC does not relieve the Company of its primary liability. MMHLLC is allocated other postretirement expenses related to interest cost, amortization of actuarial gains (losses) and expected return on plan assets, whereas service cost and prior service cost are recorded by the Company.

Substantially all of the Company's U.S. employees and agents may become eligible to receive other postretirement benefits. These benefits are funded as the benefits are provided to the participants. For employees who retire after 2009, except certain employees who were close to retirement in 2010, the Company's cost is limited to a retiree health reimbursement account (RHRA), which accumulates during an employee's career and can be drawn down by the retiree to purchase coverage outside of the Company or for other health care costs. Retired employees with a RHRA also may choose to purchase coverage through the private retiree exchange.

For other current and future retired employees, and current and future retired agents, the Company provides access to postretirement health care plans through a private retiree exchange. The Company's cost is limited to the fixed annual subsidy provided to retirees through a Health Reimbursement Account each year that the retiree can use to purchase coverage on the exchange or for other health care costs.

Company-paid basic life insurance is provided to retirees who retired before 2010 and certain employees who retire after 2009 but were close to retirement in 2010. Supplemental life insurance is available to certain retirees on a retiree-pay-all basis.

The Company provides retiree life insurance coverage for home office employees who, as of January 1, 2010, were age 50 with at least 10 years of service or had attained 75 points, generally age plus service, with a minimum 10 years of service.

***d. Benefit obligations***

Accumulated 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.

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, | | | |
|---|---|---|---|---|
| | 2022 | 2021 | 2022 | 2021 |
| | Pension Benefits | | Other Postretirement Benefits | |
| | (In Millions) | | | |
| Accumulated benefit obligation | $ 2,590 | $ 3,099 | $ 315 | $ 374 |

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

| | December 31, | | | |
|---|---|---|---|---|
| | 2022 | 2021 | 2022 | 2021 |
| | Pension Benefits | | Other Postretirement Benefits | |
| | (In Millions) | | | |
| Projected benefit obligation, beginning of year | $ 3,099 | $ 3,254 | $ 374 | $ 389 |
| Service cost | 97 | 109 | 10 | 10 |
| Interest cost | 86 | 77 | 11 | 9 |
| Actuarial (gains) losses | 44 | (22) | (10) | (9) |
| Benefits paid | (180) | (206) | (14) | (14) |
| Change in discount rate | (565) | (120) | (56) | (11) |
| Change in actuarial assumptions | 9 | 7 | - | - |
| Projected benefit obligation, end of year | $ 2,590 | $ 3,099 | $ 315 | $ 374 |

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 $57 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 through a MassMutual group annuity contract and investments held in a trust. The group annuity contract invests in the General Investment Account (GIA) of the Company and separate investment accounts. The separate investment accounts are managed by the Company, the Company's indirectly wholly owned asset manager, subsidiaries, as well as unaffiliated asset managers. The qualified pension plan ceased to invest in separate investment accounts on September 2, 2022, with the assets previously held in the separate investment accounts transferred to investments under the trust.

The Company's qualified pension plan assets managed by the Company and its indirectly wholly owned subsidiaries are as follows:

| | December 31, 2022 | December 31, 2021 |
|---|---|---|
| | (In Millions) | |
| General Investment Account | $ 168 | $ 196 |
| Separate Investment Accounts: | | |
| Barings Long Duration Bond Fund | - | 310 |
| | $ 168 | $ 506 |

The approximate amount of annual benefits to be paid to plan participants covered by a group annuity contract issued by the employer or related parties is $153 million for 2023.

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.

The target range allocations are based on two broad categories, return-seeking (i.e., generally equities and alternative investments) and liability-hedging (i.e., generally fixed income). The return-seeking allocation range is 48% - 58% and liability-hedging range is 42% - 52%. Of the return- seeking assets, the range is 35-55% global public equity and 45-65% alternatives. The pension plan assets invested in the GIA through the unallocated group annuity contract earn a fixed interest. These assets comprised approximately 7% of the plan assets as of December 31, 2022 and 6% as of December 31, 2021.

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

| | December 31, 2022 | 2021 | 2022 | 2021 |
|---|---|---|---|---|
| | Pension Benefits | | Other Postretirement Benefits | |
| | (In Millions) | | | |
| Fair value of plan assets, beginning of year | $ 3,053 | $ 2,964 | $ 2 | $ 2 |
| Actual return on plan assets | (415) | 266 | - | - |
| Employer contributions | 25 | 29 | 14 | 14 |
| Benefits paid | (180) | (206) | (14) | (14) |
| Fair value of plan assets, end of year | $ 2,483 | $ 3,053 | $ 2 | $ 2 |

The *General Investment Account* is designed to provide stable, long-term investment growth. The account value is maintained at a stable value (generally referred to as “book value”) regardless of financial market fluctuations; however, if the plan sponsor initiates a full or partial termination, the amount liquidated is subject to an adjustment that could result in an increase or decrease in the book value of the plan's investment.

The following presents the GIA allocation by type of investment:

| | December 31, 2022 | December 31, 2021 |
|---|---|---|
| Bonds | 60 % | 58 % |
| Mortgage loans | 11 | 13 |
| Common stocks - subsidiaries and affiliates | 11 | 11 |
| Other investments | 11 | 9 |
| Partnerships and limited liability companies | 5 | 6 |
| Cash and cash equivalents | 2 | 3 |
| | 100 % | 100 % |

During year-end December 31, 2022, the majority of the assets of the qualified pension plan were held in the MassMutual Pension Plan Trust. The MassMutual Pension Plan Trust is a trust account with a strategy of investing in traditional and alternative asset classes as directed by the Investment Fiduciary Committee which include public fixed income, public equity, private equity, infrastructure, private debt, hedge funds, and private real estate.

*Fair Value Measurements*

The Company's fair value hierarchy is defined in *Note 4. "Fair Value of financial instruments"*.

The following is a description of the valuation methodologies used to measure fair value for the investments in the qualified pension plan.

*Separate Investment Accounts:* There are two methods of determining unit value for the separate investment accounts. The portfolio method is used when the separate investment account invests in a portfolio of securities or two or more underlying mutual funds, bank collective trust funds or other investment vehicles (each an underlying fund). Under this method, the unit value of a separate investment account is determined by dividing the market value of such separate investment account on any valuation date by the total number of units in the separate investment account. The net investment factor method (NIF) is used when the separate investment account invests in shares or units of a single underlying fund. Under this method, the unit value of a separate investment account is determined by taking the unit value for the prior valuation day and multiplying it by the net investment factor for the current valuation day. Under both of these methods the separate investment accounts are therefore classified as Level 2. As of December 31, 2022, the Plan had no specific plans or intentions to sell investments at amounts other than NAV. These investments can be redeemed on a daily basis and have no lockups or funding commitments. These Separate Investment Accounts were exited during 2022 as such only disclosed in the 2021 Fair Value table.

*Corporate debt instruments:* If Level 1 valuations are not available, the fair value is determined using models such as matrix pricing and therefore, is classified as Level 2, which uses quoted market prices of debt securities with similar characteristics. Valued using the closing price reported on the active market on which the individual securities are traded.

*PIMCO bond funds:* Valued using the closing price reported on the active market on which the individual securities are traded and therefore classified as Level 1.

*Government securities*: Marked to market daily based on values provided by third-party vendors or market makers to the extent available or based on model prices. Valuations furnished by a pricing service take into account factors such as institutional-size trading in similar securities, yield, quality, coupon rate, maturity, type of issue, trading characteristics, and other market data and are therefore classified as Level 2.

*Common stocks*: Valued using the closing price reported on the active market on which the individual securities are traded and therefore classified as Level 1.

*Collective investment trust:* 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.

*Limited partnerships*: The Plan utilizes the practical expedient to calculate fair value of its investments based on the Plan's pro rata interest in net assets of each underlying partnership. All valuations utilize financial information supplied by the partnership, including income, expenses, gains and losses. The underlying investments of the partnership are accounted for at fair value as described in the partnership's audited financial statements. The multi-strategy hedge fund can be redeemed semi-annually with 95 day notice. The remaining funds can be redeemed periodically with notice that generally ranges from 45 to 90 days. There are no lockups or funding commitments.

*Other:* Valued using the closing price reported on the active market on which the individual securities are traded. If Level 1 valuations are not available, the fair value is determined using models such as matrix pricing and therefore, is classified as Level 2, which uses quoted market prices with similar characteristics. Investments included in this category include short term investments, real estate investment trusts, asset backed securities, mortgage backed securities, swaps, derivatives, futures and options. Investments in multi-strategy hedge fund and real estate are based on the Plan's pro rata interest in the net assets of the partnership and have a redemption period, therefore are based on NAV as a practical expedient and are reported in the NAV Practical Expedient column. The multi-strategy hedge fund is comprised of two funds, one of which has a quarterly redemption period and the other with a monthly redemption period. They both require 45 days notice. The real estate fund does not have a specific redemption period, but is dependent upon the liquidation of underlying assets. None of the funds have a lock up period or funding commitment.

*Cash and cash equivalents:* Stated at cost, which is equal to fair value, and held by an unaffiliated bank.

*General Investment Account option*: Liquidation value based on an actuarial formula as defined under the terms of the contract.

The following presents the fair value hierarchy of the Company's pension plan assets by asset class:

| | December 31, 2022 | | | | |
|---|---|---|---|---|---|
| | Level 1 | Level 2 | Level 3 | NAV Practical Expedient | Total |
| | (In Millions) | | | | |
| Investments in the qualified pension plan: | | | | | |
| Pension trust assets: | | | | | |
| Cash, cash equivalents, and short-term investments | 5 | 24 | - | - | 29 |
| Collective investment trust | - | 63 | - | - | 63 |
| Mutual funds | 458 | 293 | - | - | 751 |
| Hedge funds | - | - | - | 27 | 27 |
| Limited partnerships: | | | | | |
| Private equity/venture capital | - | - | - | 414 | 414 |
| Real estate | - | - | - | 135 | 135 |
| Hedge | - | - | - | 185 | 185 |
| Debt Instruments: | | | | | |
| Corporate and other bonds | - | 331 | - | - | 331 |
| Other: | | | | | |
| Government securities | - | 378 | - | - | 378 |
| Other | - | 2 | - | - | 2 |
| Total pension trust assets | 463 | 1,091 | - | 761 | 2,315 |
| Total General Investment Account | - | - | 168 | - | 168 |
| Total | $ 463 | $ 1,091 | $ 168 | $ 761 | $ 2,483 |

The following presents the fair value hierarchy of the Company's pension plan assets by asset class:

| | December 31, 2021 | | | | |
|---|---|---|---|---|---|
| | Level 1 | Level 2 | Level 3 | NAV Practical Expedient | Total |
| | (In Millions) | | | | |
| Investments in the qualified pension plan: | | | | | |
| Pooled separate accounts: | | | | | |
| Common stocks: | | | | | |
| U.S. large capitalization | $ - | $ 107 | $ - | $ - | $ 107 |
| International large capitalization | - | 101 | - | - | 101 |
| Total pooled separate accounts | - | 208 | - | - | 208 |
| Nonpooled separate accounts: | | | | | |
| Common stocks: | | | | | |
| U.S. large capitalization | - | 357 | 1 | - | 358 |
| U.S. small capitalization | 47 | - | - | - | 47 |
| U.S. mid capitalization | 27 | - | - | - | 27 |
| International small/mid capitalization | 1 | - | - | - | 1 |
| International large capitalization | - | 232 | - | - | 232 |
| International emerging markets | - | 81 | - | - | 81 |
| Total common stocks | 75 | 670 | 1 | - | 746 |
| Debt instruments: | | | | | |
| Corporate and other bonds | - | 469 | - | - | 469 |
| Long-term bond mutual funds | 155 | - | - | - | 155 |
| Short-term bond mutual funds | 33 | - | - | - | 33 |
| Total debt instruments | 188 | 469 | - | - | 657 |
| Other: | | | | | |
| Government securities | - | 397 | - | - | 397 |
| Collective investment trust | - | - | - | 88 | 88 |
| Other | - | 15 | - | - | 15 |
| Total other | - | 412 | - | 88 | 500 |
| Total nonpooled separate accounts | 263 | 1,551 | 1 | 88 | 1,903 |
| Total separate investment accounts | 263 | 1,759 | 1 | 88 | 2,111 |
| Pension trust assets: | | | | | |
| Common stocks: | | | | | |
| Cash Equivalent | 20 | - | - | - | 20 |
| Collective investment trust | - | 57 | - | - | 57 |
| Hedge fund | - | - | - | 24 | 24 |
| Limited partnerships: | | | | | |
| Private equity/venture capital | - | - | - | 361 | 361 |
| Real estate | - | - | - | 133 | 133 |
| Hedge | - | - | - | 173 | 173 |
| Total pension trust assets | 20 | 57 | - | 691 | 768 |
| Total General Investment Account | - | - | 196 | - | 196 |
| Total | $ 283 | $ 1,816 | $ 197 | $ 779 | $ 3,075 |

The Company evaluated the significance of transfers between levels based upon the nature of the financial instrument and size of the transfer relative to total net assets available for benefits. Based on these criteria, there were no significant transfers into or out of Level 1, 2, or 3 for the years ended December 31, 2022 and December 31, 2021.

***f. Amounts recognized in the Consolidated Statutory Statements of Financial Position***

Unrecognized prior service cost is the adjustment to the projected benefit obligation as a result of plan amendments. It represents the increase or decrease in benefits for service performed in prior periods. For pension benefits, this cost is amortized into net periodic benefit cost over the average remaining service years of active employees at the time of the amendment. For other postretirement benefits, this cost is amortized into net periodic benefit cost over the average remaining lifetime of eligible employees and retirees at the time of the amendment.

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

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, | | | |
|---|---|---|---|---|
| | 2022 | 2021 | 2022 | 2021 |
| | Pension Benefits | | Other Postretirement Benefits | |
| | (In Millions) | | | |
| Projected benefit obligation | $ 2,590 | $ 3,099 | $ 315 | $ 374 |
| Less: fair value of plan assets | 2,483 | 3,053 | 2 | 2 |
| Projected benefit obligation funded status | $ (107) | $ (46) | $ (313) | $ (372) |

The qualified pension plan was overfunded by $296 million as of December 31, 2022 and $383 million as of December 31, 2021. The nonqualified pension plans are not funded and have total projected benefit obligations of $403 million as of December 31, 2022 and $430 million as of December 31, 2021.

The qualified pension plan nonadmitted pension plan asset was $678 million as of December 31, 2022 and $636 million as of December 31, 2021.

The Company intends to fund $53 million in 2023 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, | | | |
|---|---|---|---|---|
| | 2022 | 2021 | 2022 | 2021 |
| | Pension Benefits | | Other Postretirement Benefits | |
| | (In Millions) | | | |
| Service cost | $ 97 | $ 110 | $ 9 | $ 10 |
| Interest cost | 86 | 77 | 10 | 9 |
| Expected return on plan assets | (194) | (183) | - | - |
| Amortization of unrecognized (gains) and losses | 9 | 39 | (1) | - |
| Amortization of unrecognized prior service benefit | - | - | (6) | (6) |
| Total net periodic cost/(benefit) | $ (2) | $ 43 | $ 12 | $ 13 |
| Total expense/(benefit) | $ (2) | $ 43 | $ 12 | $ 13 |

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

| | Pension Benefits | Other Postretirement Benefits |
|---|---|---|
| | (In Millions) | |
| 2023 | $ 187 | $ 19 |
| 2024 | 192 | 19 |
| 2025 | 195 | 20 |
| 2026 | 197 | 20 |
| 2027 | 196 | 21 |
| 2028-2032 | 995 | 108 |

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

| | Years Ended December 31, 2022 | 2021 |
|---|---|---|
| | (In Millions) | |
| Health | $ 140 | $ 120 |
| Pension | (2) | 43 |
| Thrift | 52 | 48 |
| Postretirement | 12 | 13 |
| Disability | 3 | 3 |
| Life | 4 | 10 |
| Postemployment | - | (2) |
| Other benefits | 25 | 16 |
| Total | $ 234 | $ 251 |

***h. Assumptions***

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

| | December 31, 2022 | 2021 | 2022 | 2021 |
|---|---|---|---|---|
| | Pension Benefits | | Other Postretirement Benefits | |
| Weighted-average assumptions used to determine: | | | | |
| Benefit obligations: | | | | |
| Discount rate | 5.00 % | 2.85 % | 5.05 % | 2.80 % |
| Expected rate of compensation increase | 3.50 % | 3.50 % | 3.50 % | 3.50 % |
| Interest Crediting rate | 5.00 % | 5.00 % | 5.05 % | 2.80 % |
| Net periodic benefit cost: | | | | |
| Discount rate | 2.85 % | 2.50 % | 2.80 % | 2.45 % |
| Expected long-term rate of return on plan assets | 6.50 % | 6.50 % | 3.00 % | 3.00 % |
| Expected rate of compensation increase | 3.50 % | 3.50 % | 3.50 % | 3.50 % |
| Interest Crediting rate | 5.00 % | 5.00 % | 2.80 % | 2.45 % |

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

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

## *13. Employee compensation plans*

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

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

| | December 31, 2022 | December 31, 2021 |
|---|---|---|
| Weighted average grant date fair value: | | |
| PSARs granted during the year | $ 243.40 | $ 141.86 |
| PRS granted during the year | 238.54 | 153.38 |
| Intrinsic value (in thousands): | | |
| PSARs options exercised | 135,219 | 124,551 |
| PRS liabilities paid | 70,029 | 48,298 |
| Fair value of shares vested during the year | 136,945 | 246,047 |

A summary of PSARs and PRS shares is as follows:

| | PSARs | | | PRS | | |
|---|---|---|---|---|---|---|
| | | Weighted Average | | | Weighted Average | |
| | Number of Share Units (In Thousands) | Price | Remaining Contract Terms (In Years) | Number of Share Units (In Thousands) | Price | Remaining Contract Terms (In Years) |
| Outstanding as of December 31, 2020 | 5,168 | $ 114.55 | 4 | 1,157 | $ 105.37 | 2.5 |
| Granted | 1,539 | 141.86 | | 275 | 153.38 | |
| Exercised | (2,102) | 100.11 | | (337) | 89.01 | |
| Forfeited | (95) | 132.07 | | (25) | 124.02 | |
| Outstanding as of December 31, 2021 | 4,510 | 130.23 | 4.1 | 1,070 | 122.41 | 2.5 |
| Granted | 808 | 243.40 | | 168 | 238.54 | |
| Exercised | (1,616) | 119.34 | | (288) | 98.47 | |
| Forfeited | (308) | 155.09 | | (78) | 137.13 | |
| Outstanding as of December 31, 2022 | 3,394 | 160.09 | 4.0 | 872 | 151.41 | 2.4 |
| Exercisable as of December 31, 2022 | - | $ 243.46 | 5.2 | 3 | $ 314.85 | 0.6 |

The PSARs compensation was an expense of $(34) million for the year ended December 31, 2022 and an expense of $253 million for the year ended December 31, 2021. The PSARs accrued compensation liability was $99 million as of December 31, 2022 and $259 million as of December 31, 2021. The unrecognized compensation expense related to nonvested PSARs awards was $19 million as of December 31, 2022 and $108 million as of December 31, 2021. 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.

The PRS compensation expense was $31 million for the year ended December 31, 2022 and $77 million for the year ended December 31, 2021. The PRS accrued compensation liability was $99 million for the year ended December 31, 2022 and $137 million for year ended December 31, 2021. The unrecognized compensation expense related to nonvested PRS awards was $56 million as of December 31, 2022 and $77 million as of December 31, 2021. The weighted average period over which the expense is expected to be recognized is 2.4 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, 2022:

| Issue Date | Face Amount | Carrying Value | Interest Rate | Maturity Date | Scheduled Interest Payment Dates |
|---|---|---|---|---|---|
| | ($ In Millions) | | | | |
| 11/15/1993 | $ 125 | $ 125 | 7.625% | 11/15/2023 | May 15 & Nov 15 |
| 03/01/1994 | 75 | 75 | 7.500% | 03/01/2024 | Mar 1 & Sept 1 |
| 05/12/2003 | 193 | 193 | 5.625% | 05/15/2033 | May 15 & Nov 15 |
| 06/01/2009 | 130 | 129 | 8.875% | 06/01/2039 | Jun 1 & Dec 1 |
| 01/17/2012 | 263 | 263 | 5.375% | 12/01/2041 | Jun 1 & Dec 1 |
| 04/15/2015 | 258 | 254 | 4.500% | 04/15/2065 | Apr 15 & Oct 15 |
| 03/23/2017 | 475 | 471 | 4.900% | 04/01/2077 | Apr 1 & Oct 1 |
| 10/11/2019 | 838 | 592 | 3.729% | 10/15/2070 | Apr 15 & Oct 15 |
| 04/16/2020 | 700 | 697 | 3.375% | 04/15/2050 | Apr 15 & Oct 15 |
| 06/26/2020 | 600 | 825 | 5.077% | 02/15/2069 | Feb 15 & Aug 15 |
| 03/01/2021 | 200 | 232 | 5.077% | 02/15/2069 | Feb 15 & Aug 15 |
| 11/18/2021 | 675 | 670 | 3.200% | 12/01/2061 | Jun 1 & Dec 1 |
| 12/01/2022 | 500 | 500 | 5.672% | 12/01/2052 | Jun 1 & Dec 1 |
| Total | $ 5,032 | $ 5,026 | | | |

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, 2022, the unapproved interest was $47 million. Through December 31, 2022, MassMutual paid cumulative interest of $2,378 million on surplus notes. Interest of $209 million was approved and paid during the year ended December 31, 2022.

Anticipated sinking fund payments are due for the notes issued in 1993 and 1994 as follows: $150 million in 2023 and $50 million in 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, 2022 and 2021. Accordingly, the Company has excluded these non-cash activities from the Consolidated Statutory Statements of Cash Flows for the years ended December 31, 2022 and 2021.

| | Years Ended December 31, 2022 | Years Ended December 31, 2021 |
|---|---|---|
| | (In Millions) | |
| Bond conversions and refinancing | $ 1,205 | $ 746 |
| Bonds transferred to mortgage loans | 628 | - |
| Transfer of partnerships to partnerships | 620 | - |
| Transfer of bonds to partnerships and LLCs | 448 | - |
| Transfer of partnerships to common stocks - subsidiaries and affiliates | 227 | - |
| Transfer of partnerships to bonds | 187 | - |
| Transfer of common stocks unaffiliated to common stocks - subsidiaries and affiliates | 97 | - |
| Transfer of mortgage loans to partnerships and limited liability companies | 40 | 11 |
| Deferred gain on real estate | 16 | - |
| Stock conversion | 13 | 107 |
| Net investment income payment-in-kind bonds | 12 | 17 |
| Change in market value of corporate owned life insurance asset | (46) | 272 |
| Premium income recognized for group annuity contracts | - | 1,237 |
| Bonds received as consideration for group annuity contracts | - | (1,231) |
| Premium ceded in exchange for invested assets | - | (514) |
| Bonds Transferred in exchange for premium | - | 511 |
| Surplus notes issued in exchange for bonds | - | 233 |
| Bonds received as consideration for surplus notes | - | (233) |
| Transfer of bonds to cash equivalents | - | 150 |
| Exchange of mortgage loans for other assets | - | 18 |
| Partnership conversion | - | 4 |
| Preferred stock transferred in exchange for premium ceeded | - | 3 |
| Common stock received as consideration for group annuity contracts | - | (6) |

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

*Investment and interest rate risks*

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

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

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

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

*Currency exchange risk*

The Company has currency risk due to its non-U.S. dollar 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.

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.

The spread of the coronavirus had caused increased cases of COVID-19 and significant volatility in U.S. and international markets. There is significant uncertainty around the breadth and duration of business disruptions related to COVID-19, as well as its further impact on the U.S. and international economies. At this time, the Company is not able to reliably estimate the length and severity of the COVID-19 public health crises and, as such, cannot quantify its impact on the financial results, liquidity and capital resources and its operations in future periods.

*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.

***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 $91 million for the year ended December 31, 2022 and $91 million for the year ended December 31, 2021. Net operating leases are net of sublease receipts of $3 million for the year ended December 31, 2022 and $5 million for the year ended December 31, 2021.

For the year ended December 31, 2022, the company has not entered into any sale-leaseback transactions with any unrelated parties. The Company had entered into a sale-leaseback transaction with an unrelated party to sell and leaseback certain fixed assets with book value of $100 million, which resulted in no gain or loss. The lease had a five-year term, which expired in 2021 with annual lease payment of approximately $20 million.

Future minimum commitments for all lease obligations as of December 31, 2022 were as follows:

| | Gross | Affiliated Subleases | Nonaffiliated Subleases | Net |
|---|---|---|---|---|
| | (In Millions) | | | |
| 2023 | $ 91 | $ 3 | $ 1 | $ 87 |
| 2024 | 84 | 3 | 1 | 80 |
| 2025 | 74 | 3 | - | 71 |
| 2026 | 57 | 3 | - | 54 |
| 2027 | 48 | 2 | - | 46 |
| Thereafter | 342 | 9 | - | 333 |
| Total | $ 696 | $ 23 | $ 2 | $ 671 |

***c. Guaranty funds***

The Company is subject to state insurance guaranty fund laws. These laws assess insurance companies' amounts to be used to pay benefits to policyholders and policy claimants of insolvent insurance companies. Many states allow these assessments to be credited against future premium taxes. The Company believes such assessments in excess of amounts accrued will not materially impact its financial position, results of operations or liquidity.

### *d. Litigation and regulatory matters*

In the normal course of business, the Company is involved in disputes, litigation and governmental or regulatory inquiries, administrative proceedings, examinations and investigations, both pending and threatened. These matters, if resolved adversely against the Company or settled, may result in monetary damages, fines and penalties or require changes in the Company's business practices. The resolution or settlement of these matters is inherently difficult to predict. Based upon the Company's assessment of these pending matters, the Company does not believe that the amount of any judgment, settlement or other action arising from any pending matter is likely to have a material adverse effect on the consolidated statement of financial position. However, an adverse outcome in certain matters could have a material adverse effect on the consolidated results of operations for the period in which such matter is resolved, or an accrual is determined to be required, on the consolidated financial statement financial position, or on our reputation.

The Company evaluates the need for accruals of loss contingencies for each matter. When a liability for a matter is probable and can be estimated, the Company accrues an estimate of the loss 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, 2022, the Company had approximately $261 million of these unsecured funding commitments to its subsidiaries and $510 million as of December 31, 2021. The unsecured commitments are included in private placements in the table below. As of December 31, 2022 and 2021, 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 as of December 31, 2022 and approximately $84 million as of December 31, 2021. As of December 31, 2022 and 2021, 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, 2022, the Company had the following outstanding commitments:

| | 2023 | 2024 | 2025 | 2026 | 2027 | Thereafter | Total |
|---|---|---|---|---|---|---|---|
| | | | | (In Millions) | | | |
| Private placements | $ 2,455 | $ 3,112 | $ 1,188 | $ 715 | $ 1,938 | $ 4,333 | $ 13,741 |
| Mortgage loans | 363 | 372 | 196 | 366 | 8 | 113 | 1,418 |
| Partnerships and LLCs | 956 | 691 | 1,340 | 601 | 1,016 | 1,407 | 6,011 |
| LIHTCs (including equity contributions) | - | - | - | 1 | - | 30 | 31 |
| Total | $ 3,774 | $ 4,175 | $ 2,724 | $ 1,683 | $ 2,962 | $ 5,883 | $ 21,201 |

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, 2022 and 2021, 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, 2022 and 2021, the Company had no outstanding obligations to any obligor attributable to these guarantees.

The following details contingent guarantees that are made on behalf of the Company's subsidiaries and affiliates as of December 31, 2022.

| 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 $507 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 Life). | - | These guarantees are not limited and cannot be estimated. |
| Other Property Lease Arrangements | The Company guarantees the payment of various lease obligations on behalf of its subsidiaries and affiliates. | - | The future maximum potential obligations are immaterial to the Company. |
| Real Estate Development 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 £3 million. | - | £9 million |
| | The Company has reimbursement agreements with two companies for any incurred losses with respect to the financing of life sciences redevelopment project guaranteed obligations. The Company will reimburse its pro rata share of such losses. | - | These guarantees cannot be estimated. |
| 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. | - | $166 million with the right to increase the line to $215 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 Insurance Road LLC, Copper Hill LLC, MML Investment Advisers LLC, The MassMutual Trust Company, FSB, MassMutual International LLC 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, 2022 | 2021 |
|---|---|---|
| | (In Millions) | |
| Fee income: | | |
| Management and service contracts and cost-sharing arrangements | $ 282 | $ 273 |
| Investment advisory income | 20 | 25 |
| Recordkeeping and other services | 18 | 22 |
| Fee expense: | | |
| Investment advisory services | 236 | 241 |
| Royalty and licensing fees | 71 | 58 |

The Company reported amounts due from subsidiaries and affiliates of $106 million as of December 31, 2022 and $128 million as of December 31, 2021. The Company reported amounts due to subsidiaries and affiliates of $57 million as of December 31, 2022 and $85 million as of December 31, 2021. Terms generally require settlement of these amounts within 30 to 90 days.

The Company held debt issued by MMHLLC that amounted to $2,315 million as of December 31, 2022 and $2,059 million as of December 31, 2021. The Company recorded interest income on MMHLLC debt of $94 million in 2022 and $77 million in 2021. The notes maturing as of June 2022 were refinanced at 5.00% for $257 million. Notes maturing as of March 2021 were refinanced at 1.75% for $500 million.

As of December 31, 2022, MMIH and C.M. Life, together, provided financing of $5,500 million, $5,253 million and $247 million respectively, for MMAF that can be used to finance ongoing asset purchases. During 2022, MMAF borrowed $2,378 million and repaid $2,307 million under the credit facility. During 2021, MMAF borrowed $1,644 million and repaid $1,559 million under the credit facility. Outstanding borrowings under the facility were $3,877 million as of December 31, 2022 and $3,806 million as of December 31, 2021. Interest for these borrowings was $91 million for the year ended December 31, 2022 and $63 million for the year ended December 31, 2021. The floating rate borrowings bear interest at a spread over the 30-day LIBOR. 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 whereby Jefferies Finance, LLC (Jefferies) borrows cash through short-term approved financings to fund the purchase of loans for securitization. During 2022, Jefferies borrowed $250 million and repaid $250 million under the credit facility. During 2021, Jefferies borrowed $1,000 million and repaid $1,000 million under the credit facility. As of December 31, 2022, there were no outstanding borrowings under this facility. All outstanding interest due under the facility, as of December 31, 2022, had been paid. The interest of this facility is calculated based on a full pass through of interest accrued on the underlying loans purchased.

In 2022, Insurance Road LLC paid $90 million in dividends and a $123 million return of capital to MassMutual.

In 2022, MassMutual made capital contributions of $17 million to MassMutual International LLC.

In 2022, MassMutual made capital contributions of $35 million to ITPS Holding LLC.

In 2022, MassMutual transferred its ownership in Martello Re to MMHLLC of ($58) million.

In 2022, MassMutual transferred its ownership of partnerships and LLCs to MMHLLC of $194 million.

In 2022, MassMutual made contributions to DPI Acres Capital for $154 million.

In 2022, MassMutual made contributions of $27 million to downstream subsidiaries.

In 2021, Insurance Road LLC paid $389 million in dividends and a $111 million return of capital to MassMutual.

In 2021, MassMutual contributed capital of $15 million and $62 million of fixed assets to ITPS Holding LLC.

In 2021, MassMutual entered into an intercompany loan agreement with its indirectly owned subsidiary Fern Street LLC, whereby MassMutual borrowed $470 million with a rate of 0.2% and a 6-month maturity, for the partial funding of the Ascend acquisition.

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 16c. "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 these agreements, the Company is the reinsurer and Rothesay Life Plc is the cedent.

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

| | December 31, | |
|---|---|---|
| | 2022 | 2021 |
| | (In Millions) | |
| Premium assumed | $ (203) | $ (165) |
| Policyholders' benefits | 192 | 157 |

## *18. Subsequent events*

Management of the Company has evaluated subsequent events through March 7, 2023, 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 19, 2023, MassMutual issued a €500 million funding agreement with a 3.75% fixed rate and a 7-year maturity.

On February 3, 2023, MassMutual issued a NOK 1,000 million funding agreement with a 4.01% fixed rate and an 8-year maturity.

## Glossary of Terms

| Term | Description |
|---|---|
| CMBS | Commercial mortgage-backed securities |
| C.M. Life | C.M. Life Insurance Company |
| DD | Digital Distribution |
| DI | Disability Insurance |
| FHA | Federal Housing Administration |
| MM Ascend | MassMutual Ascend Life Insurance Company and other subsidiaries and affiliated entities |
| 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 |
| Invesco | Invesco Ltd |
| IS | Institutional Solutions |
| LLC | Limited liability companies |
| LTC | Long-term care |
| MassMutual | Massachusetts Mutual Life Insurance Company |
| MMFA | MassMutual Financial Advisors |
| MMHLLC | MassMutual Holding LLC |
| MMIH | MM Investment Holding |
| MMSD | MassMutual Strategic Distributors |
| NAIC | National Association of Insurance Commissioners |
| OAC | Oppenheimer Acquisition Corporation |
| OTTI | Other-than-temporary impairment(s) |
| RMBS | Residential mortgage-backed securities |
| 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 |