

**MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY**

INTERIM STATUTORY FINANCIAL STATEMENTS

As of March 31, 2023 and December 31, 2022 and for the three months ended  
March 31, 2023 and 2022

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
INTERIM STATUTORY FINANCIAL STATEMENTS  
(UNAUDITED)

Table of Contents

	<u>Page</u>
Interim Statutory Statements of Financial Position.....	2
Interim Statutory Statements of Operations .....	3
Interim Statutory Statements of Changes in Surplus .....	4
Interim Statutory Statements of Cash Flows .....	5
Notes to Interim Statutory Financial Statements:	
1. Nature of operations .....	6
2. Summary of significant accounting policies .....	6
3. New accounting standards .....	7
4. Fair value of financial instruments.....	8
5. Investments	
a. Bonds .....	13
b. Common stocks – subsidiaries and affiliates.....	14
c. Mortgage loans.....	14
d. Partnerships and limited liability companies.....	16
e. Derivatives .....	16
f. Net investment income.....	19
g. Net realized capital gains (losses).....	20
6. Federal income taxes .....	21
7. Other than invested assets.....	21
8. Policyholders’ liabilities .....	21
9. Reinsurance .....	22
10. Withdrawal characteristics .....	22
11. Debt .....	22
12. Employee benefit plans .....	22
13. Employee compensation plans.....	22
14. Surplus notes .....	22
15. Presentation of the Interim Statutory Statements of Cash Flows .....	23
16. Business risks, commitments and contingencies .....	23
17. Related party transactions .....	25
18. Subsequent events.....	25
19. Impairment listing for loan-backed and structured securities.....	26

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
INTERIM STATUTORY STATEMENTS OF FINANCIAL POSITION  
(UNAUDITED)

	March 31, 2023	December 31, 2022
(In Millions)		
<b>Assets:</b>		
Bonds	\$ 138,749	\$ 136,445
Preferred stocks	368	451
Common stocks – subsidiaries and affiliates	24,566	24,683
Common stocks – unaffiliated	1,618	1,477
Mortgage loans	24,842	24,972
Policy loans	17,408	17,054
Real estate	348	355
Partnerships and limited liability companies	12,715	12,296
Derivatives	19,323	22,032
Cash, cash equivalents and short-term investments	5,725	5,568
Other invested assets	1,987	1,865
Total invested assets	247,649	247,198
Investment income due and accrued	4,387	4,223
Federal income taxes	-	231
Net deferred income taxes	1,484	1,229
Other than invested assets	4,289	4,285
Total assets excluding separate accounts	257,809	257,166
Separate account assets	54,398	53,414
Total assets	\$ 312,207	\$ 310,580
 <b>Liabilities and Surplus:</b>		
Policyholders' reserves	\$ 156,686	\$ 153,216
Liabilities for deposit-type contracts	18,765	18,089
Contract claims and other benefits	842	701
Policyholders' dividends	1,957	1,927
General expenses due or accrued	818	1,108
Federal income taxes	112	-
Asset valuation reserve	5,471	5,674
Repurchase agreements	3,017	3,042
Commercial paper	249	250
Collateral	2,720	4,065
Derivatives	11,728	14,003
Funds held under coinsurance	22,553	21,916
Other liabilities	5,366	5,364
Total liabilities excluding separate accounts	230,284	229,355
Separate account liabilities	54,265	53,284
Total liabilities	284,549	282,639
Surplus	27,658	27,941
Total liabilities and surplus	\$ 312,207	\$ 310,580

See accompanying notes to interim statutory financial statements

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
INTERIM STATUTORY STATEMENTS OF OPERATIONS  
(UNAUDITED)

	Three Months Ended March 31,	
	2023	2022
	(\$ In Millions)	
<b>Revenue:</b>		
Premium income	\$ 5,482	\$ 5,145
Net investment income	2,734	1,946
Fees and other income	235	240
Total revenue	8,451	7,331
<b>Benefits, expenses and other deductions:</b>		
Policyholders' benefits	3,445	3,674
Change in policyholders' reserves	3,077	2,245
General insurance expenses	506	495
Commissions	329	315
State taxes, licenses and fees	88	96
Other deductions	286	162
Total benefits, expenses and other deductions	7,731	6,987
Net gain from operations before dividends and federal income taxes	720	344
Dividends to policyholders	443	419
Net gain (loss) from operations before federal income taxes	277	(75)
Federal income tax (benefit) expense	170	36
Net gain (loss) from operations	107	(111)
Net realized capital losses	(354)	(122)
Net loss	\$ (247)	\$ (233)

See accompanying notes to interim statutory financial statements

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
INTERIM STATUTORY STATEMENTS OF CHANGES IN SURPLUS  
(UNAUDITED)

	Three Months Ended	
	March 31,	
	2023	2022
	<u>(In Millions)</u>	
Surplus, beginning of year	\$ 27,941	\$ 26,979
Net (decrease)/increase due to:		
Net loss	(247)	(233)
Change in net unrealized capital (losses) gains, net of tax	(512)	553
Change in net unrealized foreign exchange capital		
gains (losses), net of tax	120	(350)
Change in other net deferred income taxes	240	148
Change in nonadmitted assets	(110)	(5)
Change in asset valuation reserve	203	225
Change in surplus notes	(25)	(25)
Prior period adjustments	34	-
Other	14	(31)
Net (decrease)/increase	<u>(283)</u>	<u>282</u>
Surplus, end of period	<u>\$ 27,658</u>	<u>\$ 27,261</u>

See accompanying notes to interim statutory financial statements

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
INTERIM STATUTORY STATEMENTS OF CASH FLOWS  
(UNAUDITED)

	Three Months Ended	
	March 31,	
	2023	2022
	<u>(In Millions)</u>	
<b>Cash from operations:</b>		
Premium and other income collected	\$ 5,962	\$ 5,667
Net investment income	2,939	2,276
Benefit payments	(3,383)	(3,740)
Net transfers from separate accounts	272	383
Net receipts from group annuity reserves assumed		
Commissions and other expenses	(1,443)	(1,525)
Dividends paid to policyholders	(418)	(401)
Federal and foreign income taxes recovered	198	4
Net cash provided from operations	<u>4,127</u>	<u>2,664</u>
<b>Cash from investments:</b>		
Proceeds from investments sold, matured or repaid:		
Bonds	4,702	8,105
Preferred and common stocks – unaffiliated	21	88
Common stocks – affiliated	-	1
Mortgage loans	838	1,415
Real estate	-	97
Partnerships and limited liability companies	76	240
Derivatives	(91)	(245)
Other	(99)	(262)
Total investment proceeds	<u>5,447</u>	<u>9,439</u>
Cost of investments acquired:		
Bonds	(6,888)	(10,467)
Preferred and common stocks – unaffiliated	(71)	(128)
Common stocks – affiliated	(190)	(94)
Mortgage loans	(656)	(732)
Real estate	(1)	(14)
Partnerships and limited liability companies	(548)	(769)
Derivatives	(23)	(39)
Other	487	289
Total investments acquired	<u>(7,890)</u>	<u>(11,954)</u>
Net increase in policy loans	<u>(354)</u>	<u>(72)</u>
Net cash used in investing activities	<u>(2,797)</u>	<u>(2,587)</u>
<b>Cash from financing and miscellaneous sources:</b>		
Net deposits (withdrawals) on deposit-type contracts	600	911
Cash provided (applied to) by surplus note issuance	(25)	(25)
Change in repurchase agreements	(240)	(319)
Change in collateral	(1,449)	(2,263)
Other cash (used) provided	(59)	1,326
Net cash from financing and miscellaneous sources	<u>(1,173)</u>	<u>(370)</u>
Net change in cash, cash equivalents and short-term investments	157	(293)
Cash, cash equivalents and short-term investments:		
Beginning of year	5,568	5,943
End of period	<u>\$ 5,725</u>	<u>\$ 5,650</u>

See accompanying notes to interim statutory financial statements

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
NOTES TO INTERIM STATUTORY FINANCIAL STATEMENTS  
(UNAUDITED)

**1. *Nature of operations***

Massachusetts Mutual Life Insurance Company (MassMutual or the Company), a mutual life insurance company domiciled in the Commonwealth of Massachusetts, and its domestic life insurance subsidiaries provide individual and group life insurance, disability insurance (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***

The interim 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 interim statutory financial statements and notes as of March 31, 2023 and December 31, 2022, and for the three months ended March 31, 2023 and 2022, are unaudited. The Interim Statutory Statement of Financial Position as of December 31, 2022 has been derived from the audited financial statements at that date, but do not include all of the information and footnotes required by statutory accounting practices for complete financial statements. These interim statutory financial statements, in the opinion of management, reflect the fair presentation of the financial position, results of operations, changes in surplus and cash flows for the interim periods. These interim statutory financial statements and notes should be read in conjunction with the statutory financial statements and notes thereto included in the Company's 2022 audited yearend financial statements as these interim statutory financial statements disclose only significant changes from yearend 2022. The results of operations for the interim periods should not be considered indicative of results to be expected for the full year.

For the full description of accounting policies, see *Note 2. "Summary of significant accounting policies"* of Notes to Statutory Financial Statements included in the Company's 2022 audited yearend financial statements.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
NOTES TO INTERIM STATUTORY FINANCIAL STATEMENTS, continued  
(UNAUDITED)

***b. Common stocks – subsidiaries and affiliates***

Common stocks of unconsolidated subsidiaries, primarily C.M. Life Insurance Company, MML Bay State Life Insurance Company, MassMutual Holding LLC (MMHLLC), Glidepath Holdings Inc. (Glidepath) and MM Investment Holding (MMIH), are accounted for using the statutory equity method. The Company accounts for the value of MMHLLC at its underlying U.S. generally accepted accounting principles (U.S. GAAP) equity value less adjustments for the limited statutory basis of accounting related to foreign insurance subsidiaries and controlled affiliates entities as well as an adjustment of \$1,611 million as of March 31, 2023 for a portion of its noncontrolling interests. Glidepath is valued on its underlying GAAP equity with adjustment to recognize its investment in MassMutual Ascend Life Insurance Company (formerly known as Great American Life Insurance Company) and other subsidiaries and affiliated entities (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.

***3. New accounting standards***

***Adoption of new accounting standards***

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.



MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
NOTES TO INTERIM STATUTORY FINANCIAL STATEMENTS, continued  
(UNAUDITED)

**4. Fair value of financial instruments**

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

	March 31, 2023				
	Carrying	Fair			
	Value	Value	Level 1	Level 2	Level 3
(In Millions)					
Financial assets:					
Bonds:					
U. S. government and agencies	\$ 4,688	\$ 4,512	\$ -	\$ 4,512	\$ -
All other governments	1,615	1,394	-	1,335	59
States, territories and possessions	248	247	-	247	-
Political subdivisions	403	397	-	397	-
Special revenue	4,228	4,255	-	4,249	6
Industrial and miscellaneous	119,422	109,730	98	47,810	61,822
Parent, subsidiaries and affiliates	8,145	7,535	-	1,098	6,437
Preferred stocks	368	375	64	-	311
Common stocks - subsidiaries and affiliates	967	967	343	-	624
Common stocks - unaffiliated	1,618	1,618	674	-	944
Mortgage loans - commercial	20,421	19,094	-	-	19,094
Mortgage loans - residential	4,421	4,165	-	-	4,165
Derivatives:					
Interest rate swaps	15,554	15,672	-	15,672	-
Options	549	549	21	528	-
Currency swaps	3,012	3,014	-	3,014	-
Forward contracts	82	82	-	82	-
Financial futures	126	126	126	-	-
Cash, cash equivalents and short-term investments	5,725	5,725	365	5,360	-
Separate account assets	54,398	54,398	35,790	16,908	1,700
Financial liabilities:					
GICs	15,368	14,692	-	-	14,692
Group annuity contracts and other deposits	2,233	1,974	-	-	1,974
Individual annuity contracts	18,612	18,234	-	-	18,234
Supplementary contracts	1,062	1,063	-	-	1,063
Repurchase agreements	3,017	3,017	-	3,017	-
Commercial paper	249	249	-	249	-
Derivatives:					
Interest rate swaps	10,705	15,290	-	15,290	-
Options	4	4	4	-	-
Currency swaps	917	522	-	522	-
Forward contracts	60	60	-	60	-
Credit default swaps	18	17	-	17	-
Financial futures	24	24	24	-	-

Common stocks - subsidiaries and affiliates do not include unconsolidated subsidiaries, which had statutory carrying values of \$23,599 million.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
NOTES TO INTERIM STATUTORY FINANCIAL STATEMENTS, continued  
(UNAUDITED)

	December 31, 2022				
	Carrying Value	Fair Value	Level 1	Level 2	Level 3
	(In Millions)				
Financial assets:					
Bonds:					
U. S. government and agencies	\$ 4,764	\$ 4,428	\$ -	\$ 4,428	\$ -
All other governments	1,635	1,385	-	1,323	62
States, territories and possessions	248	241	-	241	-
Political subdivisions	405	388	-	388	-
Special revenue	4,187	4,111	-	4,102	9
Industrial and miscellaneous	117,023	105,791	-	45,812	59,979
Parent, subsidiaries and affiliates	8,183	7,956	-	1,015	6,941
Preferred stocks	451	446	45	-	401
Common stocks - subsidiaries and affiliates	460	460	110	-	350
Common stocks - unaffiliated	1,477	1,477	507	-	970
Mortgage loans - commercial	20,756	19,152	-	-	19,152
Mortgage loans - residential	4,216	3,892	-	-	3,892
Derivatives:					
Interest rate swaps	18,287	18,456	-	18,456	-
Options	639	639	31	608	-
Currency swaps	3,071	3,071	-	3,071	-
Forward contracts	14	14	-	14	-
Financial futures	21	21	21	-	-
Cash, cash equivalents and short-term investments	5,568	5,568	420	5,148	-
Separate account assets	53,414	53,414	34,931	16,790	1,693
Financial liabilities:					
GICs	14,701	13,803	-	-	13,803
Group annuity contracts and other deposits	2,162	1,890	-	-	1,890
Individual annuity contracts	17,000	16,214	-	-	16,214
Supplementary contracts	1,139	1,140	-	-	1,140
Repurchase agreements	3,042	3,042	-	3,042	-
Commercial paper	250	250	-	250	-
Derivatives:					
Interest rate swaps	13,036	18,165	-	18,165	-
Options	6	6	6	-	-
Currency swaps	709	362	-	362	-
Forward contracts	236	236	-	236	-
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 \$24,223 million.

The use of different assumptions or valuation methodologies may have a material impact on the estimated fair value amounts.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
NOTES TO INTERIM STATUTORY FINANCIAL STATEMENTS, continued  
(UNAUDITED)

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

March 31, 2023				
	Level 1	Level 2	Level 3	Total
(In Millions)				
Financial assets:				
Bonds:				
All other governments	-	5	-	5
Special revenue	\$ -	\$ 1	\$ -	\$ 1
Industrial and miscellaneous	65	92	122	279
Hybrid securities	-	1	-	1
Preferred stocks	24	-	55	79
Common stocks - subsidiaries and affiliates	343	-	624	967
Common stocks - unaffiliated	674	-	944	1,618
Derivatives:				
Interest rate swaps	-	15,554	-	15,554
Options	21	528	-	549
Currency swaps	-	3,012	-	3,012
Forward contracts	-	82	-	82
Financial futures	126	-	-	126
Separate account assets	35,790	16,908	1,700	54,398
Total financial assets carried at fair value	\$ 37,043	\$ 36,183	\$ 3,445	\$ 76,671
Financial liabilities:				
Derivatives:				
Interest rate swaps	\$ -	\$ 10,705	\$ -	\$ 10,705
Options	4	-	-	4
Currency swaps	-	135	-	135
Forward contracts	-	60	-	60
Credit default swaps	-	18	-	18
Financial futures	24	-	-	24
Total financial liabilities carried at fair value	\$ 28	\$ 10,918	\$ -	\$ 10,946

For the three months ended March 31, 2023 and the year ended December 31, 2022, the Company did not have any financial instruments that were carried at net asset value as a practical expedient.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
NOTES TO INTERIM STATUTORY FINANCIAL STATEMENTS, continued  
(UNAUDITED)

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	220	305
Preferred stocks	21	-	47	68
Common stocks - subsidiaries and affiliates	110	-	350	460
Common stocks - unaffiliated	507	-	970	1,477
Derivatives:				
Interest rate swaps	-	18,287	-	18,287
Options	31	608	-	639
Currency swaps	-	3,071	-	3,071
Forward contracts	-	14	-	14
Financial futures	21	-	-	21
Separate account assets	34,931	16,790	1,693	53,414
Total financial assets carried at fair value	\$ 35,621	\$ 38,862	\$ 3,280	\$ 77,763
Financial liabilities:				
Derivatives:				
Interest rate swaps	\$ -	\$ 13,036	\$ -	\$ 13,036
Options	6	-	-	6
Currency swaps	-	122	-	122
Forward contracts	-	236	-	236
Credit default swaps	-	13	-	13
Financial futures	3	-	-	3
Total financial liabilities carried at fair value	\$ 9	\$ 13,407	\$ -	\$ 13,416

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.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
NOTES TO INTERIM STATUTORY FINANCIAL STATEMENTS, continued  
(UNAUDITED)

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

	Balance as of 1/1/23	Gains (Losses) in Net Income	Losses (Gains) in Surplus	Purchases	Issuances	Sales	Settlements	Transfers			Balance as of 03/31/23
								In	Out	Other	
(In Millions)											
Financial assets:											
Bonds:											
Industrial and miscellaneous	\$ 220	\$ (2)	\$ 2	\$ 3	\$ -	\$ (6)	\$ -	\$ -	\$ -	\$ (95)	\$ 122
Preferred stocks	47	-	4	2	-	-	-	-	-	2	55
Common stocks - subsidiaries and affiliates	350	-	271	-	9	-	-	-	-	(6)	624
Common stocks - unaffiliated	970	-	(65)	21	19	-	(1)	-	-	-	944
Separate account assets	1,693	31	-	18	-	(33)	-	5	(14)	-	1,700
Total financial assets	\$ 3,280	\$ 29	\$ 212	\$ 44	\$ 28	\$ (39)	\$ (1)	\$ 5	\$ (14)	\$ (99)	\$ 3,445

	Balance as of 1/1/22	Gains (Losses) in Net Income	Losses (Gains) in Surplus	Purchases	Issuances	Sales	Settlements	Transfers			Balance as of 12/31/22
								In	Out	Other	
(In Millions)											
Financial assets:											
Bonds:											
Industrial and miscellaneous	\$ 187	\$ 3	\$ (9)	\$ 19	\$ 9	\$ -	\$ (52)	\$ -	\$ -	\$ 63	\$ 220
Preferred stocks	18	-	(18)	-	-	-	-	-	-	47	47
Common stocks - subsidiaries and affiliates	253	(13)	110	(793)	980	(65)	(6)	-	-	(116)	350
Common stocks - unaffiliated	753	28	2	327	3	(27)	(112)	-	(3)	(1)	970
Separate account assets	1,894	(174)	-	282	-	(296)	-	-	(13)	-	1,693
Total financial assets	\$ 3,105	\$ (156)	\$ 85	\$ (165)	\$ 992	\$ (388)	\$ (170)	\$ -	\$ (16)	\$ (7)	\$ 3,280

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

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

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
NOTES TO INTERIM STATUTORY FINANCIAL STATEMENTS, continued  
(UNAUDITED)

**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:

	March 31, 2023			
	Carrying	Gross	Gross	Fair
	Value	Unrealized Gains	Unrealized Losses	Value
(In Millions)				
U.S. government and agencies	\$ 4,688	\$ 97	\$ 272	\$ 4,512
All other governments	1,615	17	238	1,394
States, territories and possessions	248	5	6	247
Political subdivisions	403	9	15	397
Special revenue	4,228	157	129	4,255
Industrial and miscellaneous	119,422	489	10,179	109,730
Parent, subsidiaries and affiliates	8,145	2	612	7,535
Total	\$ 138,749	\$ 776	\$ 11,451	\$ 128,070

The March 31, 2023 gross unrealized losses exclude \$90 million of losses included in the carrying value. These losses include \$82 million from NAIC Class 6 bonds and \$8 million from residential mortgage-backed securities (RMBS) and commercial mortgage-backed securities (CMBS) whose ratings were obtained from outside modelers. These losses were primarily included in industrial and miscellaneous or parent, subsidiaries and affiliates.

	December 31, 2022			
	Carrying	Gross	Gross	Fair
	Value	Unrealized Gains	Unrealized Losses	Value
(In Millions)				
U.S. government and agencies	\$ 4,764	\$ 59	\$ 395	\$ 4,428
All other governments	1,635	15	265	1,385
States, territories and possessions	248	2	9	241
Political subdivisions	405	6	23	388
Special revenue	4,187	106	182	4,111
Industrial and miscellaneous	117,023	391	11,623	105,791
Parent, subsidiaries and affiliates	8,183	1	228	7,956
Total	\$ 136,445	\$ 580	\$ 12,725	\$ 124,300

The December 31, 2022 gross unrealized losses exclude \$102 million of losses included in the carrying value. These losses include \$104 million from NAIC Class 6 bonds and \$(2) million from RMBS and CMBS whose ratings were obtained from outside modelers. These losses were primarily included in industrial and miscellaneous or parent, subsidiaries and affiliates.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
NOTES TO INTERIM STATUTORY FINANCIAL STATEMENTS, continued  
(UNAUDITED)

As of March 31, 2023, investments in structured and loan-backed securities that had unrealized losses, which were not recognized in earnings, had a fair value of \$19,874 million. Securities in an unrealized loss position for less than 12 months had a fair value of \$18,613 million and unrealized losses of \$1,475 million. Securities in an unrealized loss position for greater than 12 months had a fair value of \$1,261 million and unrealized losses of \$115 million. These securities were primarily categorized as industrial and miscellaneous or parent, subsidiaries and affiliates.

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 \$20,311 million. Securities in an unrealized loss position for less than 12 months had a fair value of \$14,684 million and unrealized losses of \$892 million. Securities in an unrealized loss position for greater than 12 months had a fair value of \$5,626 million and unrealized losses of \$894 million. These securities were primarily categorized as industrial and miscellaneous or parent, subsidiaries and affiliates.

In the course of the Company's investment management activities, securities may be sold and reacquired within 30 days to enhance the Company's yield on its investment portfolio. The Company did not sell any securities with the NAIC Designation 3 or below for the three months ended March 31, 2023 or 2022, that were reacquired within 30 days of the sale date.

*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 March 31, 2023, RMBS had a total carrying value of \$2,384 million and a fair value of \$2,351 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 \$1,094 million and a fair value of \$1,091 million. As of December 31, 2022, RMBS had a total carrying value of \$2,308 million and a fair value of \$2,266 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 \$999 million and a fair value of \$933 million.

***b. Common stocks – subsidiaries and affiliates***

MMHLLC paid \$450 million in dividends to MassMutual for the three months ended March 31, 2023, which were declared in 2022, and paid \$344 million in dividends to MassMutual for the three months ended March 31, 2022, which were declared in 2021.

MMHLLC declared an additional \$280 million in dividends to MassMutual for the three months ended March 31, 2023.

MassMutual contributed capital of \$44 million to MMHLLC for the three months ended March 31, 2023 and \$65 million for the three months ended March 31, 2022.

***c. 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. Residential mortgage loans are primarily seasoned pools of homogeneous residential mortgage loans substantially backed by Federal Housing Administration (FHA) and Veterans Administration (VA) guarantees.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
NOTES TO INTERIM STATUTORY FINANCIAL STATEMENTS, continued  
(UNAUDITED)

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

	March 31, 2023		December 31, 2022	
	Carrying Value	Fair Value	Carrying Value	Fair Value
(In Millions)				
Commercial mortgage loans:				
Primary lender	\$ 20,328	\$ 19,010	\$ 20,662	\$ 19,065
Mezzanine loans	93	84	94	87
Total commercial mortgage loans	<u>20,421</u>	<u>19,094</u>	<u>20,756</u>	<u>19,152</u>
Residential mortgage loans:				
FHA insured and VA guaranteed	2,162	2,023	2,304	2,128
Other residential loans	2,259	2,142	1,912	1,764
Total residential mortgage loans	<u>4,421</u>	<u>4,165</u>	<u>4,216</u>	<u>3,892</u>
Total mortgage loans	<u>\$ 24,842</u>	<u>\$ 23,259</u>	<u>\$ 24,972</u>	<u>\$ 23,044</u>

As of March 31, 2023, 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 March 31, 2023 and as of December 31, 2022:

	March 31, 2023				
	Average Carrying Value	Unpaid Carrying Value	Unpaid Principal Balance	Valuation Allowance	Interest Income
(In Millions)					
With no allowance recorded:					
Commercial mortgage loans:					
Primary lender	\$ 14	\$ 14	\$ 17	\$ -	\$ -
Total	<u>14</u>	<u>14</u>	<u>17</u>	<u>-</u>	<u>-</u>
Total impaired commercial mortgage loans	<u>\$ 14</u>	<u>\$ 14</u>	<u>\$ 17</u>	<u>\$ -</u>	<u>\$ -</u>
	December 31, 2022				
	Average Carrying Value	Unpaid 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	<u>14</u>	<u>15</u>	<u>17</u>	<u>-</u>	<u>1</u>
Total impaired commercial mortgage loans	<u>\$ 14</u>	<u>\$ 15</u>	<u>\$ 17</u>	<u>\$ -</u>	<u>\$ 1</u>



MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
NOTES TO INTERIM STATUTORY FINANCIAL STATEMENTS, continued  
(UNAUDITED)

*d. Partnerships and limited liability companies*

No significant changes

*e. 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 \$31,475 million as of March 31, 2023 and \$31,264 million as of December 31, 2022, as defined under statutory accounting practices as the result of pairing of a long derivative contract with cash instruments.

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

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

Net collateral pledged by the counterparties was \$2,280 million as of March 31, 2023 and \$2,427 million as of December 31, 2022. In the event of default, the full market value exposure at risk in a net gain position, net of offsets and collateral, was \$619 million as of March 31, 2023 and \$634 million as of December 31, 2022. The statutory net amount at risk, defined as net collateral pledged and statement values excluding accrued interest, was \$5,215 million as of March 31, 2023 and \$5,518 million as of December 31, 2022.

The Company had the right to rehypothecate or repledge securities totaling \$2,094 million of the \$2,280 million as of March 31, 2023 and \$770 million of the \$2,427 million as of December 31, 2022 of net collateral pledged by counterparties. There were no securities rehypothecated to other counterparties as of March 31, 2023 or December 31, 2022.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
NOTES TO INTERIM STATUTORY FINANCIAL STATEMENTS, continued  
(UNAUDITED)

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

	March 31, 2023			
	Assets		Liabilities	
	Carrying Value	Notional Amount	Carrying Value	Notional Amount
	(In Millions)			
Interest rate swaps	\$ 15,554	\$ 139,361	\$ 10,705	\$ 129,978
Options	549	13,229	4	-
Currency swaps	3,012	28,085	917	14,933
Forward contracts	82	4,547	60	4,985
Credit default swaps	-	-	18	1,580
Financial futures	126	2,435	24	257
Total	\$ 19,323	\$ 187,657	\$ 11,728	\$ 151,733

	December 31, 2022			
	Assets		Liabilities	
	Carrying Value	Notional Amount	Carrying Value	Notional Amount
	(In Millions)			
Interest rate swaps	\$ 18,287	\$ 134,714	\$ 13,036	\$ 136,705
Options	639	14,529	6	-
Currency swaps	3,071	27,615	709	14,814
Forward contracts	14	1,250	236	7,287
Credit default swaps	-	-	13	1,580
Financial futures	21	2,334	3	369
Total	\$ 22,032	\$ 180,442	\$ 14,003	\$ 160,755

The average fair value of outstanding derivative assets was \$20,345 million for the three months ended March 31, 2023 and \$15,124 million for the three months ended March 31, 2022. The average fair value of outstanding derivative liabilities was \$4,716 million for the three months ended March 31, 2023 and \$9,069 million for the three months ended March 31, 2022.

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

	March 31,	December 31,
	2023	2022
	(In Millions)	
Due after one year through five years	\$ 20	\$ 1,580
Due after five years through ten years	1,560	-
Total	\$ 1,580	\$ 1,580

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
NOTES TO INTERIM STATUTORY FINANCIAL STATEMENTS, continued  
(UNAUDITED)

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:

	Three Months Ended March 31,			
	2023		2022	
	Net Realized (Losses) Gains on Closed Contracts	Change In Net Unrealized Gains (Losses) on Open Contracts	Net Realized (Losses) Gains on Closed Contracts	Change In Net Unrealized (Losses) Gains on Open Contracts
	(In Millions)			
Interest rate swaps	\$ (18)	\$ (403)	\$ 24	\$ 421
Currency swaps	34	(266)	11	332
Options	2	(55)	(6)	137
Credit default swaps	(18)	12	(10)	-
Forward contracts	(240)	244	47	25
Financial futures	(6)	84	(157)	(159)
Total	\$ (246)	\$ (384)	\$ (91)	\$ 756

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

	March 31, 2023			December 31, 2022		
	Derivative Assets	Derivative Liabilities	Net	Derivative Assets	Derivative Liabilities	Net
	(In Millions)					
Gross	\$ 19,323	\$ 11,728	\$ 7,595	\$ 22,032	\$ 14,003	\$ 8,029
Due and accrued	830	1,881	(1,051)	733	1,689	(956)
Gross amounts	(14,170)	(14,170)	-	(15,378)	(15,378)	-
Net asset	5,983	(561)	6,544	7,387	314	7,073
Collateral posted	(4,801)	(2,521)	(2,280)	(4,821)	(2,394)	(2,427)
Net	\$ 1,182	\$ (3,082)	\$ 4,264	\$ 2,566	\$ (2,080)	\$ 4,646

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
NOTES TO INTERIM STATUTORY FINANCIAL STATEMENTS, continued  
(UNAUDITED)

*f. Net investment income*

Net investment income, including interest maintenance reserve (IMR) amortization, comprised the following:

	Three Months Ended	
	March 31,	
	2023	2022
	<u>(In Millions)</u>	
Bonds	\$ 1,794	\$ 1,132
Preferred stocks	7	11
Common stocks - subsidiaries and affiliates	280	-
Common stocks - unaffiliated	27	30
Mortgage loans	260	301
Policy loans	307	282
Real estate	18	56
Partnerships and limited liability companies	93	153
Derivatives	102	116
Cash, cash equivalents and short-term investments	76	11
Other	36	32
Subtotal investment income	<u>3,000</u>	<u>2,124</u>
Amortization of the IMR	(10)	23
Investment expenses	<u>(256)</u>	<u>(201)</u>
Net investment income	<u>\$ 2,734</u>	<u>\$ 1,946</u>

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
NOTES TO INTERIM STATUTORY FINANCIAL STATEMENTS, continued  
(UNAUDITED)

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

Net realized capital (losses), which include other-than-temporary impairments (OTTI) and are net of deferral to the IMR, comprised the following:

	Three Months Ended March 31,	
	2023	2022
<u>(In Millions)</u>		
Bonds	\$ (150)	\$ (368)
Preferred stocks	-	(6)
Common stocks - unaffiliated	6	29
Mortgage loans	(33)	(1)
Real estate	-	55
Partnerships and limited liability companies	(74)	(2)
Derivatives	(246)	(91)
Other	6	(19)
Net realized capital losses before federal and state taxes and deferral to the IMR	(491)	(403)
Net federal and state tax benefit	34	16
Net realized capital losses before deferral to the IMR	(457)	(387)
Net after tax losses deferred to the IMR	103	265
Net realized capital (losses)	<u>\$ (354)</u>	<u>\$ (122)</u>

The IMR liability balance was \$0 million as of March 31, 2023 and \$0 million as of December 31, 2022 and was included in other liabilities on the Statutory Statements of Financial Position.

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

	Three Months Ended March 31,	
	2023	2022
<u>(In Millions)</u>		
Bonds	\$ (41)	\$ (236)
Preferred stocks	-	(6)
Partnerships and limited liability companies	(75)	(6)
Total OTTI	<u>\$ (116)</u>	<u>\$ (248)</u>

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
NOTES TO INTERIM STATUTORY FINANCIAL STATEMENTS, continued  
(UNAUDITED)

**6. Federal income taxes**

No significant changes.

**7. Other than invested assets**

No significant changes.

**8. Policyholders' liabilities**

**a. Liabilities for deposit-type contracts**

On 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.

**b. Additional liability for annuity contracts**

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

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

Liability as of January 1, 2022	\$	42
Incurred guarantee benefits		18
Paid guarantee benefits		(5)
Liability as of December 31, 2022		55
Paid guarantee benefits		(1)
Liability as of March 31, 2023	\$	54

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.

	March 31, 2023			December 31, 2022		
	Account Value	Net Amount at Risk	Weighted Average Attained	Account Value	Net Amount at Risk	Weighted Average Attained
	(\$ In Millions)					
GMDB	\$ 8,746	\$ 156	66	\$ 8,685	\$ 199	66
GMIB Basic	467	14	72	466	21	72
GMIB Plus	1,228	475	68	1,198	505	68
GMAB	1,538	59	62	1,552	84	62
GLWB	97	19	74	97	22	74

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
NOTES TO INTERIM STATUTORY FINANCIAL STATEMENTS, continued  
(UNAUDITED)

As of March 31, 2023, the GMDB account value above consists of \$1,222 million within the general account and \$7,524 million within separate accounts. As of December 31, 2022, the GMDB account value above consists of \$1,259 million within the general account and \$7,426 million within separate accounts.

**9. Reinsurance**

No significant changes.

**10. Withdrawal characteristics**

No significant changes.

**11. Debt**

No significant changes

**12. Employee benefit plans**

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

*Net periodic cost*

The net periodic cost represents the annual accounting income or expense recognized by the Company and is included in general insurance expenses in the Interim Statutory Statements of Operations. The net periodic cost recognized is as follows:

	Three Months Ended March 31,			
	2023	2022	2023	2022
	Pension Benefits		Other Postretirement Benefits	
	(In Millions)			
Service cost	\$ 22	\$ 24	\$ 2	\$ 2
Interest cost	31	21	3	3
Expected return on plan assets	(42)	(48)	-	-
Amortization of unrecognized (gains) and losses	7	2	(2)	-
Amortization of unrecognized prior service benefit	-	-	(1)	(1)
Total net periodic expense/(benefit)	<u>\$ 18</u>	<u>\$ (1)</u>	<u>\$ 2</u>	<u>\$ 4</u>

**13. Employee compensation plans**

No significant changes.

**14. Surplus notes**

No significant changes

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
NOTES TO INTERIM STATUTORY FINANCIAL STATEMENTS, continued  
(UNAUDITED)

**15. Presentation of the Statutory Statements of Cash Flows**

The following table presents those transactions that have affected the Company's recognized assets or liabilities but have not resulted in cash receipts or payments during the three months ended March 31, 2023, 2022 and 2021. Accordingly, the Company has excluded these non-cash activities from the Statutory Statements of Cash Flows for the three months ended March 31, 2023, 2022 and 2021.

	Three Months Ended March 31,	
	2023	2022
	(In Millions)	
Stock conversion	\$ 163	\$ 52
Partnerships and LLCs transferred to bonds	63	-
Bond conversions and refinancing	60	127
Change in market value of corporate owned life insurance asset	38	(19)
Net investment income payment in-kind bonds	3	5
Transfer of stocks to partnerships	-	5

**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. The interim risks and uncertainties disclosure should be read in conjunction with the statutory disclosure in the Company's 2022 audited year-end financial statements.

*Insurance and underwriting risks*

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

*Investment and interest rate risks*

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



MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
NOTES TO INTERIM STATUTORY FINANCIAL STATEMENTS, continued  
(UNAUDITED)

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.

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.

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

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
NOTES TO INTERIM STATUTORY FINANCIAL STATEMENTS, continued  
(UNAUDITED)

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. Litigation and regulatory matters***

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

The Company evaluates the need for accruals of loss contingencies for each matter. When a liability for a matter is probable and can be estimated, the Company accrues an estimate of the loss 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.

***17. Related party transactions***

In February 2023, MassMutual made capital contributions of \$45 million to ITPS Holdings LLC.

In March 2023, MassMutual made capital contributions of \$88 million to MassMutual Mortgage Lending LLC, \$50 million to MMIH Bond Holdings LLC, and \$13 million to MML CM LLC.

***18. Subsequent events***

Management of the Company has evaluated subsequent events through May 16, 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 April 12, 2023, MassMutual issued a \$750 million funding agreement with a 4.50% fixed rate and a 3-year maturity.

On May 3, 2023, MassMutual issued a CHF 215 million funding agreement with 2.65% fixed rate and a 5-year maturity.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
NOTES TO INTERIM STATUTORY FINANCIAL STATEMENTS, continued  
(UNAUDITED)

**19. Impairment listing for loan-backed and structured securities**

The following are the total cumulative adjustments and impairments for loan-backed and structured securities since July 1, 2009:

Period Ended	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
March 31, 2023	\$ 56,797,193	\$ -	\$ 56,797,193	\$ 45,999,577	(10,797,614)	\$ 45,999,577	\$ 39,477,567
December 31, 2022	47,152,655	-	47,152,655	42,630,344	(4,522,311)	42,630,344	35,962,545
September 30, 2022	23,315,048	-	23,315,048	22,016,070	(1,298,978)	22,016,070	19,284,696
June 30, 2022	17,306,639	-	17,306,639	15,826,391	(1,480,248)	15,826,391	13,534,918
March 31, 2022	30,135,997	-	30,135,997	23,857,778	(6,278,218)	23,857,778	23,674,371
December 31, 2021	6,658,614	-	6,658,615	6,490,508	(168,107)	6,490,508	6,369,198
September 30, 2021	4,061,382	-	4,061,382	3,955,723	(105,659)	3,955,723	3,595,213
June 30, 2021	11,352,643	-	11,352,642	10,386,581	(966,063)	10,386,581	11,323,900
March 31, 2021	11,247,256	-	11,247,257	5,074,493	(6,172,764)	5,074,493	5,237,174
December 31, 2020	16,071,907	-	16,071,907	14,674,300	(1,397,607)	14,674,300	15,473,517
September 30, 2020	21,375,383	-	21,375,383	19,160,250	(2,215,134)	19,160,250	18,862,027
June 30, 2020	10,180,123	-	10,180,123	8,992,610	(1,187,513)	8,992,610	9,249,851
March 31, 2020	24,799,788	-	24,799,788	20,197,344	(4,602,443)	20,197,344	24,683,947
December 31, 2019	3,992,400	-	3,992,400	3,539,281	(453,119)	3,539,281	3,439,138
September 30, 2019	16,909,029	-	16,909,029	15,191,932	(1,717,097)	15,191,932	14,639,756
June 30, 2019	6,980,030	-	6,980,030	6,187,029	(793,001)	6,187,029	7,133,620
March 31, 2019	7,791,000	-	7,791,000	7,634,637	(156,363)	7,634,637	7,683,021
December 31, 2018	4,550,173	-	4,550,173	3,815,559	(734,614)	3,815,559	4,014,514
September 30, 2018	4,320,826	-	4,320,826	3,663,181	(657,645)	3,663,181	3,687,297
June 30, 2018	634,235	-	634,235	279,221	(355,014)	279,221	386,752
March 31, 2018	645,690	-	645,690	488,181	(157,509)	488,181	448,494
December 31, 2017	3,949,513	-	3,949,513	1,958,759	(1,990,754)	1,958,759	2,023,952
September 30, 2017	4,436,542	-	4,436,542	876,942	(3,559,600)	876,942	4,647,683
June 30, 2017	40,538,551	-	40,538,551	39,808,956	(729,595)	39,808,956	60,990,732
March 31, 2017	41,788,380	-	41,788,380	41,391,889	(396,491)	41,391,889	56,156,936
December 31, 2016	42,175,938	-	42,175,938	42,045,721	(130,217)	42,045,721	54,619,477
September 30, 2016	44,266,478	-	44,266,478	41,890,535	(2,375,942)	41,890,535	61,300,066
June 30, 2016	49,097,217	-	49,097,217	48,202,703	(894,514)	48,202,703	63,207,410
March 31, 2016	57,985,071	-	57,985,071	55,783,979	(2,201,092)	55,783,979	70,578,397
December 31, 2015	4,881,394	-	4,881,394	4,783,194	(98,200)	4,783,194	4,728,736
September 30, 2015	50,531,382	-	50,531,382	45,665,859	(4,865,524)	45,665,859	58,523,652
June 30, 2015	66,924,927	-	66,924,927	65,240,585	(1,684,341)	65,240,585	72,953,475
March 31, 2015	17,856,447	-	17,856,447	17,681,510	(174,937)	17,681,510	17,553,999
December 31, 2014	69,225,743	-	69,225,743	68,301,291	(924,452)	68,301,291	79,410,553
September 30, 2014	645,721	-	645,721	604,437	(41,284)	604,437	627,381
June 30, 2014	57,012,606	-	57,012,606	55,422,168	(1,590,438)	55,422,168	75,253,388
March 31, 2014	91,702,041	-	91,702,041	80,744,074	(10,957,967)	80,744,074	97,672,071
December 31, 2013	113,707,951	-	113,707,951	108,815,640	(4,892,311)	108,815,640	111,783,052
September 30, 2013	81,945,730	-	81,945,730	80,589,482	(1,356,248)	80,589,482	77,049,314
June 30, 2013	147,215,936	-	147,215,936	142,140,572	(5,075,365)	142,140,572	130,973,023
March 31, 2013	194,772,025	-	194,772,025	188,372,089	(6,399,936)	188,372,089	176,678,910
December 31, 2012	378,096,660	-	378,096,660	366,323,110	(11,773,550)	366,323,110	333,086,073
September 30, 2012	816,573,456	-	816,573,456	788,350,823	(28,222,633)	788,350,823	697,683,289
June 30, 2012	912,025,937	-	912,025,937	890,494,221	(21,531,716)	890,494,221	708,872,106
March 31, 2012	1,095,018,529	-	1,095,018,529	1,058,132,041	(36,886,488)	1,058,132,041	841,095,013
December 31, 2011	1,090,904,993	-	1,090,904,993	1,056,761,288	(34,143,705)	1,056,761,288	754,310,838
September 30, 2011	762,320,632	-	762,320,632	738,510,048	(23,810,584)	738,510,048	546,494,232
June 30, 2011	1,130,732,656	-	1,130,732,656	1,078,535,670	(52,196,986)	1,078,535,670	839,143,290
March 31, 2011	1,097,705,351	-	1,097,705,351	1,068,852,204	(28,853,147)	1,068,852,204	816,688,348
December 31, 2010	968,742,508	-	968,742,508	950,111,417	(18,631,091)	950,111,417	708,895,637
September 30, 2010	915,728,030	-	915,728,030	889,896,058	(25,831,972)	889,896,058	673,462,493

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
NOTES TO INTERIM STATUTORY FINANCIAL STATEMENTS, continued  
(UNAUDITED)

June 30, 2010	1,362,887,892	-	1,362,887,892	1,335,628,212	(27,259,681)	1,335,628,212	975,241,506
March 31, 2010	1,471,905,696	-	1,471,905,696	1,391,337,543	(80,568,153)	1,391,337,543	1,015,645,802
December 31, 2009	1,349,124,214	-	1,349,124,214	1,290,817,168	(58,307,047)	1,290,817,168	852,088,739
September 30, 2009	2,953,442,689	(106,853,708)	2,846,588,981	2,700,948,264	(145,640,717)	2,700,948,264	1,692,409,640
Totals		\$ (106,853,708)			\$ (690,213,699)		

The following is the impairment listing for loan-backed and structured securities for the three months ended March 31, 2023:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
12624QAC7	\$ 3,512,422	\$ -	\$ 3,512,422	\$ 3,120,715	\$ (391,707)	\$ 3,120,715	\$ 1,664,875
12624SAE9	2,546,182	-	2,546,182	2,252,873	(293,309)	2,252,873	672,000
36192RAL6	2,950,000	-	2,950,000	1,475,000	(1,475,000)	1,475,000	527,313
040104RV5	1,466,218	-	1,466,218	1,404,587	(61,631)	1,404,587	1,357,561
040104TF8	44,673	-	44,673	40,179	(4,494)	40,179	34,156
040104TG6	471,373	-	471,373	395,907	(75,465)	395,907	442,138
04012XAC9	136,023	-	136,023	130,363	(5,660)	130,363	111,736
1248MBAF2	12,589,914	-	12,589,914	5,496,141	(7,093,773)	5,496,141	5,479,168
1248MGJ3	43,914	-	43,914	42,609	(1,305)	42,609	35,260
17311YAC7	1,273,018	-	1,273,018	1,228,216	(44,802)	1,228,216	1,264,914
30247DAD3	572,150	-	572,150	552,362	(19,788)	552,362	512,472
35729RAE6	3,632,752	-	3,632,752	3,523,491	(109,261)	3,523,491	3,272,827
40431KAE0	2,092,929	-	2,092,929	2,043,034	(49,895)	2,043,034	2,095,485
45071KDD3	419,880	-	419,880	359,858	(60,022)	359,858	365,022
46629NAC7	34,588	-	34,588	32,979	(1,610)	32,979	27,783
46630KAA4	158,523	-	158,523	155,152	(3,370)	155,152	149,476
617463AA2	8,734	-	8,734	7,949	(785)	7,949	6,705
61749BAB9	61,518	-	61,518	60,870	(648)	60,870	64,742
61750FAE0	412,694	-	412,694	394,112	(18,582)	394,112	366,377
61750MAB1	3,264	-	3,264	3,129	(136)	3,129	3,014
61755AAB2	3,183	-	3,183	2,639	(544)	2,639	2,526
86359DXD4	193,613	-	193,613	183,061	(10,552)	183,061	184,312
86363HAB8	36,193	-	36,193	34,244	(1,949)	34,244	30,923
92926SAB2	493	-	493	381	(111)	381	382
93934XAB9	137,528	-	137,528	122,528	(15,000)	122,528	129,850
12668ALV5	1,990,831	-	1,990,831	1,755,977	(234,854)	1,755,977	1,754,077
22540VG71	36,270	-	36,270	36,232	(38)	36,232	37,823
22943HAD8	3,510,613	-	3,510,613	3,380,974	(129,638)	3,380,974	1,886,340
32053LAA0	19,363	-	19,363	19,262	(101)	19,262	18,644
45254TRX4	23,933	-	23,933	23,574	(359)	23,574	23,161
45254TSM7	615,674	-	615,674	594,492	(21,182)	594,492	528,927
45660LAU3	57,004	-	57,004	56,426	(578)	56,426	55,897
45660LYW3	797,875	-	797,875	786,087	(11,788)	786,087	724,845
46624XE8	622,921	-	622,921	612,163	(10,758)	612,163	537,075
525221AJ6	561,909	-	561,909	502,260	(59,649)	502,260	551,875
61915RBZ8	178,926	-	178,926	178,879	(47)	178,879	164,881
65535VRK6	479,926	-	479,926	469,432	(10,494)	469,432	495,515
75115DAH8	3,502	-	3,502	3,266	(235)	3,266	3,118
761118FM5	1,722,865	-	1,722,865	1,583,656	(139,209)	1,583,656	1,584,522
76112BUE8	107,208	-	107,208	96,659	(10,549)	96,659	122,032
855541AC2	219,356	-	219,356	180,352	(39,005)	180,352	226,114
86359BLQ2	792,449	-	792,449	779,863	(12,586)	779,863	701,652
92978EAA2	83,791	-	83,791	81,555	(2,236)	81,555	79,259
92979DAA3	15,795	-	15,795	15,379	(416)	15,379	15,469
41161PWB5	723,595	-	723,595	713,315	(10,280)	713,315	587,280
45660N5H4	1,202,840	-	1,202,840	1,156,288	(46,553)	1,156,288	1,159,986

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
NOTES TO INTERIM STATUTORY FINANCIAL STATEMENTS, continued  
(UNAUDITED)

45660NT88	14,960	-	14,960	14,830	(130)	14,830	14,372
92922F5T1	1,438,953	-	1,438,953	1,412,027	(26,926)	1,412,027	1,244,390
939336X65	1,599,517	-	1,599,517	1,419,593	(179,925)	1,419,593	1,427,509
05949CCB0	34,367	-	34,367	34,278	(89)	34,278	35,010
32051DCJ9	44,524	-	44,524	44,461	(63)	44,461	43,405
36228FWU6	150,442	-	150,442	141,049	(9,393)	141,049	147,677
362341VU0	1,530,315	-	1,530,315	1,520,759	(9,556)	1,520,759	1,428,432
36298XAA0	4,788,213	-	4,788,213	4,743,999	(44,214)	4,743,999	4,501,267
5899292N7	48,660	-	48,660	47,935	(724)	47,935	46,874
589929N38	42,499	-	42,499	40,236	(2,263)	40,236	39,978
59020UNZ4	89,539	-	89,539	75,877	(13,662)	75,877	85,656
86359DME4	439,975	-	439,975	415,180	(24,794)	415,180	400,433
929227ZF6	6,804	-	6,804	883	(5,921)	883	3,055
Totals	\$ 56,797,193	\$ -	\$ 56,797,193	\$ 45,999,577	\$ (10,797,614)	\$ 45,999,577	\$ 39,477,567

The following is the impairment listing for loan-backed and structured securities for the three months ended December 31, 2022:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
12624QAC7	\$ 3,800,115	\$ -	\$ 3,800,115	\$ 3,420,115	\$ (380,000)	\$ 3,420,115	\$ 1,588,875
12624SAE9	2,716,498	-	2,716,498	2,435,538	(280,960)	2,435,538	835,883
36192RAL6	2,950,670	-	2,950,670	1,475,670	(1,475,000)	1,475,670	1,096,111
00442FAB8	54,320	-	54,320	42,042	(12,278)	42,042	9,321
02660CAH3	30,449	-	30,449	27,509	(2,940)	27,509	621
040104RV5	1,538,602	-	1,538,602	1,447,321	(91,281)	1,447,321	1,361,477
040104TF8	46,015	-	46,015	44,165	(1,850)	44,165	34,412
04012XAC9	140,344	-	140,344	134,035	(6,309)	134,035	114,094
04544TAB7	29,637	-	29,637	8,031	(21,606)	8,031	27,105
12479DAC2	1,754,671	-	1,754,671	1,705,748	(48,923)	1,705,748	1,321,385
1248MGAJ3	45,771	-	45,771	43,936	(1,835)	43,936	36,622
17311YAC7	1,339,319	-	1,339,319	1,249,956	(89,363)	1,249,956	1,251,680
30247DAD3	615,686	-	615,686	576,172	(39,514)	576,172	523,602
35729RAE6	3,769,442	-	3,769,442	3,620,540	(148,902)	3,620,540	3,166,561
40431KAE0	2,102,171	-	2,102,171	2,066,603	(35,567)	2,066,603	2,080,134
46630KAA4	163,709	-	163,709	160,394	(3,316)	160,394	150,262
57643LMP8	699,246	-	699,246	655,527	(43,720)	655,527	703,992
590212AB2	36,752	-	36,752	32,892	(3,860)	32,892	35,553
61749BAB9	25,730	-	25,730	18,784	(6,946)	18,784	19,869
61750FAE0	427,971	-	427,971	409,815	(18,156)	409,815	364,414
61750MAB1	3,966	-	3,966	3,252	(714)	3,252	3,061
84752CAE7	780,353	-	780,353	534,007	(246,346)	534,007	735,662
86359DXD4	207,910	-	207,910	194,222	(13,688)	194,222	192,670
86363HAB8	38,745	-	38,745	36,881	(1,864)	36,881	32,197
05535DAN4	815,322	-	815,322	781,142	(34,180)	781,142	668,809
12667GKG7	48,651	-	48,651	47,599	(1,052)	47,599	49,753
17025RAA3	274,474	-	274,474	222,741	(51,733)	222,741	264,605
22943HAD8	3,639,676	-	3,639,676	3,553,679	(85,998)	3,553,679	1,966,703
251563FB3	21,743	-	21,743	18,668	(3,075)	18,668	21,315
32053LAA0	20,430	-	20,430	19,665	(765)	19,665	19,195
362290AC2	165,551	-	165,551	119,985	(45,566)	119,985	163,292
43739EAP2	1,491,643	-	1,491,643	1,378,947	(112,696)	1,378,947	1,338,336
45254TRX4	27,269	-	27,269	24,861	(2,408)	24,861	24,629
45660LYW3	807,355	-	807,355	801,731	(5,623)	801,731	740,968
466247XE8	648,455	-	648,455	636,766	(11,689)	636,766	552,507
589929X29	476,677	-	476,677	442,351	(34,326)	442,351	455,505
59020UW43	96,706	-	96,706	67,631	(29,075)	67,631	81,213
61915RBZ8	182,035	-	182,035	180,158	(1,878)	180,158	165,479
65535VRK6	496,060	-	496,060	477,703	(18,357)	477,703	503,077

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
NOTES TO INTERIM STATUTORY FINANCIAL STATEMENTS, continued  
(UNAUDITED)

86358HHX0	185,982	-	185,982	180,224	(5,758)	180,224	138,376
86359BLQ2	912,392	-	912,392	860,886	(51,506)	860,886	788,258
92978EAA2	87,160	-	87,160	83,990	(3,170)	83,990	80,341
41161PHU0	1,288,335	-	1,288,335	1,111,121	(177,215)	1,111,121	1,242,875
41161PTP8	79,162	-	79,162	70,296	(8,866)	70,296	69,500
41161PWB5	748,794	-	748,794	743,267	(5,528)	743,267	642,772
45660N5H4	1,326,680	-	1,326,680	1,291,747	(34,933)	1,291,747	1,293,674
05949CCB0	37,242	-	37,242	34,365	(2,878)	34,365	35,868
36298XAA0	4,996,628	-	4,996,628	4,820,011	(176,617)	4,820,011	4,541,703
36298XAB8	4,960,140	-	4,960,140	4,317,655	(642,484)	4,317,655	4,428,229
Totals	\$ 47,152,655	\$ -	\$ 47,152,655	\$ 42,630,344	\$ (4,522,311)	\$ 42,630,344	\$ 35,962,545

The following is the impairment listing for loan-backed and structured securities for the three months ended September 30, 2022:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
01853GAB6	\$ 14,137	\$ -	\$ 14,137	\$ 14,133	\$ (4)	\$ 14,133	\$ 81,535
02660CAH3	30,416	-	30,416	30,133	(283)	30,133	520
040104RV5	1,615,798	-	1,615,798	1,524,246	(91,552)	1,524,246	1,400,628
040104TF8	51,554	-	51,554	45,567	(5,987)	45,567	35,698
040104TG6	548,457	-	548,457	448,751	(99,706)	448,751	462,045
04012XAC9	158,236	-	158,236	138,996	(19,240)	138,996	114,648
1248MGAJ3	48,376	-	48,376	46,059	(2,317)	46,059	37,828
14454AAB5	676,443	-	676,443	675,900	(543)	675,900	797,469
35729RAE6	4,081,381	-	4,081,381	3,766,230	(315,151)	3,766,230	3,254,010
40431KAE0	2,165,192	-	2,165,192	2,079,404	(85,788)	2,079,404	2,080,910
46629NAC7	37,064	-	37,064	34,532	(2,532)	34,532	28,639
46630KAA4	168,908	-	168,908	166,176	(2,733)	166,176	156,211
57643LMP8	794,964	-	794,964	695,958	(99,006)	695,958	707,626
617463AA2	9,759	-	9,759	8,712	(1,047)	8,712	6,788
61750FAE0	472,290	-	472,290	426,190	(46,100)	426,190	370,275
617526AE8	213,790	-	213,790	183,317	(30,473)	183,317	205,107
86359DXD4	258,372	-	258,372	209,421	(48,950)	209,421	209,160
86363HAB8	42,386	-	42,386	39,363	(3,023)	39,363	33,395
93934XAB9	173,541	-	173,541	135,596	(37,945)	135,596	152,650
05535DAN4	846,722	-	846,722	844,091	(2,632)	844,091	719,154
12667GKG7	53,610	-	53,610	50,015	(3,595)	50,015	52,574
12668ACY9	196,165	-	196,165	158,127	(38,037)	158,127	199,829
18974BAA7	139,604	-	139,604	135,673	(3,931)	135,673	142,094
22540VG71	39,290	-	39,290	38,205	(1,085)	38,205	39,865
22943HAD8	3,726,422	-	3,726,422	3,648,804	(77,618)	3,648,804	1,947,539
45254TSM7	666,066	-	666,066	648,569	(17,497)	648,569	557,450
466247XE8	670,770	-	670,770	665,673	(5,097)	665,673	576,833
525221AJ6	554,561	-	554,561	553,790	(771)	553,790	552,476
59020UW43	99,571	-	99,571	98,502	(1,069)	98,502	80,640
65535VRK6	537,959	-	537,959	492,267	(45,692)	492,267	506,957
75116CET9	52,218	-	52,218	37,480	(14,738)	37,480	51,726
92926UAC5	57,744	-	57,744	45,834	(11,910)	45,834	55,826
92978EAA2	93,378	-	93,378	87,280	(6,098)	87,280	83,812
23332UCM4	26,121	-	26,121	24,163	(1,958)	24,163	25,263
41161PTP8	76,675	-	76,675	72,259	(4,416)	72,259	68,493
41161PWB5	796,629	-	796,629	761,585	(35,044)	761,585	655,513
45660N5H4	1,475,897	-	1,475,897	1,375,793	(100,104)	1,375,793	1,309,005
362341VU0	1,644,583	-	1,644,583	1,609,277	(35,306)	1,609,277	1,524,505
Totals	\$ 23,315,048	\$ -	\$ 23,315,048	\$ 22,016,070	\$ (1,298,978)	\$ 22,016,070	\$ 19,284,696

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
NOTES TO INTERIM STATUTORY FINANCIAL STATEMENTS, continued  
(UNAUDITED)

The following is the impairment listing for loan-backed and structured securities for the three months ended June 30, 2022:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
01853GAB6	\$ 66,515	\$ -	\$ 66,515	\$ 11,444	\$ (55,072)	\$ 11,444	\$ 88,216
040104RV5	1,784,407	-	1,784,407	1,603,660	(180,747)	1,603,660	1,520,334
040104TF8	38,441	-	38,441	35,870	(2,572)	35,870	27,369
04012XAC9	110,303	-	110,303	106,039	(4,264)	106,039	85,613
1248MGAJ3	33,572	-	33,572	31,812	(1,760)	31,812	27,009
14454AAB5	881,442	-	881,442	677,715	(203,728)	677,715	840,850
35729RAE6	4,202,719	-	4,202,719	4,089,490	(113,229)	4,089,490	3,504,758
45071KDD3	273,858	-	273,858	258,285	(15,573)	258,285	253,045
61749BAB9	51,130	-	51,130	41,427	(9,703)	41,427	50,025
86359DXD4	272,114	-	272,114	262,835	(9,280)	262,835	230,996
86363HAB8	33,458	-	33,458	28,887	(4,571)	28,887	26,054
05535DAN4	1,158,770	-	1,158,770	873,964	(284,806)	873,964	779,790
07387AFX8	65,702	-	65,702	54,499	(11,203)	54,499	65,889
12668ABP9	177,942	-	177,942	145,191	(32,751)	145,191	170,379
18974BAA7	163,686	-	163,686	159,493	(4,193)	159,493	158,996
18974BAN9	77,869	-	77,869	70,973	(6,896)	70,973	75,478
22943HAD8	4,013,588	-	4,013,588	3,751,800	(261,788)	3,751,800	2,037,389
45254TRX4	45,557	-	45,557	40,333	(5,224)	40,333	42,158
525221AJ6	718,882	-	718,882	583,189	(135,692)	583,189	606,787
59020UW43	106,578	-	106,578	102,698	(3,880)	102,698	124,978
761118FM5	1,217,616	-	1,217,616	1,142,589	(75,026)	1,142,589	1,144,285
85554NAG5	94,558	-	94,558	80,862	(13,696)	80,862	90,860
92978EAA2	67,304	-	67,304	65,210	(2,094)	65,210	61,610
45660N5H4	1,537,499	-	1,537,499	1,502,180	(35,320)	1,502,180	1,379,463
12669GXW6	44,815	-	44,815	41,990	(2,826)	41,990	77,371
589929N38	68,312	-	68,312	63,956	(4,356)	63,956	65,216
Totals	\$ 17,306,639	\$ -	\$ 17,306,639	\$ 15,826,391	\$ (1,480,248)	\$ 15,826,391	\$ 13,534,918

The following is the impairment listing for loan-backed and structured securities for the three months ended March 31, 2022:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
00256DAA0	\$ 1,762,699	\$ -	\$ 1,762,699	\$ 1,364,210	\$ (398,489)	\$ 1,364,210	\$ 1,122,333
07388VAH1	2,364,730	-	2,364,730	244,594	(2,120,137)	244,594	244,594
22545XBB8	1,683,921	-	1,683,921	211,871	(1,472,050)	211,871	210,934
00442FAB8	70,075	-	70,075	52,264	(17,811)	52,264	10,685
040104TF8	59,249	-	59,249	53,852	(5,397)	53,852	41,892
040104TG6	623,388	-	623,388	531,410	(91,978)	531,410	545,952
04012XAC9	178,777	-	178,777	162,199	(16,578)	162,199	136,446
1248MGAJ3	52,182	-	52,182	51,033	(1,149)	51,033	45,331
17311YAC7	1,623,994	-	1,623,994	1,327,822	(296,172)	1,327,822	1,502,602
24763LFY1	134,155	-	134,155	67,703	(66,452)	67,703	106,050
35729RAE6	4,416,912	-	4,416,912	4,231,274	(185,638)	4,231,274	3,947,591
40431KAE0	2,521,316	-	2,521,316	2,214,702	(306,614)	2,214,702	2,513,960
45071KDD3	488,363	-	488,363	436,903	(51,460)	436,903	448,752
55291KAC1	633,248	-	633,248	169,402	(463,846)	169,402	598,172
57643LMP8	906,102	-	906,102	809,314	(96,788)	809,314	815,499
617463AA2	10,553	-	10,553	9,894	(659)	9,894	8,101
61750FAE0	509,354	-	509,354	473,873	(35,481)	473,873	435,242
617526AE8	262,688	-	262,688	214,229	(48,459)	214,229	243,939
86359DXD4	304,264	-	304,264	279,462	(24,802)	279,462	275,224
07384YPP5	314,885	-	314,885	207,555	(107,330)	207,555	66,352
32053LAA0	27,875	-	27,875	22,820	(5,055)	22,820	25,221

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
NOTES TO INTERIM STATUTORY FINANCIAL STATEMENTS, continued  
(UNAUDITED)

45660LAU3	78,731	-	78,731	75,334	(3,397)	75,334	76,824
59020UW43	176,900	-	176,900	108,489	(68,411)	108,489	132,229
65535VRK6	592,663	-	592,663	536,987	(55,676)	536,987	561,983
761118FM5	1,932,729	-	1,932,729	1,911,872	(20,857)	1,911,872	1,863,619
76112HAE7	13,536	-	13,536	10,283	(3,253)	10,283	13,495
92978EAA2	102,806	-	102,806	97,782	(5,024)	97,782	94,757
93935PAH2	137,585	-	137,585	115,483	(22,102)	115,483	131,766
41161PWBS	884,324	-	884,324	852,993	(31,331)	852,993	771,130
45660N5H4	1,600,750	-	1,600,750	1,533,921	(66,829)	1,533,921	1,444,261
36298XAB8	5,320,204	-	5,320,204	5,307,865	(12,338)	5,307,865	5,034,048
55274SAM3	177,495	-	177,495	25,133	(152,362)	25,133	29,827
59024WAB3	137,567	-	137,567	119,223	(18,344)	119,223	142,528
94984GAD9	31,976	-	31,976	26,026	(5,950)	26,026	33,031
Totals	\$ 30,135,997	\$ -	\$ 30,135,997	\$ 23,857,778	\$ (6,278,218)	\$ 23,857,778	\$ 23,674,371

The following is the impairment listing for loan-backed and structured securities for the three months ended December 31, 2021:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
040104TF8	\$ 59,686	\$ -	\$ 59,686	\$ 59,300	\$ (386)	\$ 59,300	\$ 49,870
04012XAC9	130,314	-	130,314	122,160	(8,154)	122,160	107,581
1248MGAJ3	35,096	-	35,096	34,855	(241)	34,855	31,996
35729RAE6	4,028,108	-	4,028,108	3,999,290	(28,818)	3,999,290	3,995,059
617463AA2	6,685	-	6,685	5,767	(918)	5,767	5,247
61749BAB9	61,698	-	61,698	51,363	(10,335)	51,363	60,638
61750FAE0	342,930	-	342,930	319,304	(23,626)	319,304	307,808
61750MAB1	3,456	-	3,456	3,113	(343)	3,113	3,182
86359DXD4	335,476	-	335,476	308,315	(27,161)	308,315	309,361
92926SAB2	558	-	558	494	(64)	494	521
45660LYW3	677,413	-	677,413	675,162	(2,251)	675,162	630,760
79548KXQ6	51,835	-	51,835	37,121	(14,714)	37,121	65,254
92978EAA2	75,569	-	75,569	72,635	(2,934)	72,635	72,325
41161PWBS	822,378	-	822,378	776,768	(45,610)	776,768	706,114
55274SAM3	27,413	-	27,413	24,861	(2,552)	24,861	23,482
Totals	\$ 6,658,614	\$ -	\$ 6,658,615	\$ 6,490,508	\$ (168,107)	\$ 6,490,508	\$ 6,369,198

The following is the impairment listing for loan-backed and structured securities for the three months ended December 31, 2021:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
040104TF8	\$ 59,686	\$ -	\$ 59,686	\$ 59,300	\$ (386)	\$ 59,300	\$ 49,870
04012XAC9	130,314	-	130,314	122,160	(8,154)	122,160	107,581
1248MGAJ3	35,096	-	35,096	34,855	(241)	34,855	31,996
35729RAE6	4,028,108	-	4,028,108	3,999,290	(28,818)	3,999,290	3,995,059
617463AA2	6,685	-	6,685	5,767	(918)	5,767	5,247
61749BAB9	61,698	-	61,698	51,363	(10,335)	51,363	60,638
61750FAE0	342,930	-	342,930	319,304	(23,626)	319,304	307,808
61750MAB1	3,456	-	3,456	3,113	(343)	3,113	3,182
86359DXD4	335,476	-	335,476	308,315	(27,161)	308,315	309,361
92926SAB2	558	-	558	494	(64)	494	521
45660LYW3	677,413	-	677,413	675,162	(2,251)	675,162	630,760
79548KXQ6	51,835	-	51,835	37,121	(14,714)	37,121	65,254
92978EAA2	75,569	-	75,569	72,635	(2,934)	72,635	72,325
41161PWBS	822,378	-	822,378	776,768	(45,610)	776,768	706,114
55274SAM3	27,413	-	27,413	24,861	(2,552)	24,861	23,482
Totals	\$ 6,658,614	\$ -	\$ 6,658,615	\$ 6,490,508	\$ (168,107)	\$ 6,490,508	\$ 6,369,198



MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
NOTES TO INTERIM STATUTORY FINANCIAL STATEMENTS, continued  
(UNAUDITED)

The following is the impairment listing for loan-backed and structured securities for the three months ended September 30, 2021:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
00442FAB8	\$ 95,903	\$ -	\$ 95,903	\$ 70,276	\$ (25,627)	\$ 70,276	\$ 60,821
86359DXD4	359,657	-	359,657	339,761	(19,896)	339,761	337,895
05535DAN4	1,260,315	-	1,260,315	1,255,426	(4,889)	1,255,426	1,020,099
073879QF8	247,750	-	247,750	226,078	(21,672)	226,078	256,430
45660LYW3	907,047	-	907,047	906,647	(400)	906,647	879,977
92978EAA2	110,354	-	110,354	108,384	(1,970)	108,384	106,564
41161PWB5	1,049,397	-	1,049,397	1,023,087	(26,310)	1,023,087	908,082
55274SAM3	30,959	-	30,959	26,064	(4,895)	26,064	25,345
Totals	\$ 4,061,382	\$ -	\$ 4,061,382	\$ 3,955,723	\$ (105,659)	\$ 3,955,723	\$ 3,595,213

The following is the impairment listing for loan-backed and structured securities for the three months ended June 30, 2021:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
040104TG6	\$ 751,483	\$ -	\$ 751,483	\$ 596,747	\$ (154,736)	\$ 596,747	\$ 700,223
05535DCF9	2,412,525	-	2,412,525	2,168,139	(244,386)	2,168,139	2,608,461
40431KAE0	2,389,667	-	2,389,667	2,348,253	(41,414)	2,348,253	2,745,165
61750FAE0	555,370	-	555,370	534,914	(20,456)	534,914	493,887
86359DXD4	394,726	-	394,726	364,962	(29,764)	364,962	369,964
05535DAN4	1,386,766	-	1,386,766	1,038,889	(347,877)	1,038,889	1,141,961
45660LYW3	959,375	-	959,375	942,757	(16,618)	942,757	927,049
79548KXQ6	121,590	-	121,590	96,976	(24,616)	96,976	97,070
92978EAA2	115,502	-	115,502	112,103	(3,399)	112,103	110,484
41161PWB5	1,112,829	-	1,112,829	1,079,359	(33,470)	1,079,359	969,681
576433H33	1,119,491	-	1,119,491	1,071,784	(47,707)	1,071,784	1,074,403
55274SAM3	33,318	-	33,318	31,698	(1,620)	31,698	85,553
Totals	\$ 11,352,643	\$ -	\$ 11,352,642	\$ 10,386,581	\$ (966,063)	\$ 10,386,581	\$ 11,323,900

The following is the impairment listing for loan-backed and structured securities for the three months ended March 31, 2021:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
36828QQJ8	\$ 5,796,000	\$ -	\$ 5,796,000	\$ -	\$ (5,796,000)	\$ -	\$ -
05535DCF9	2,560,946	-	2,560,946	2,505,561	(55,385)	2,505,561	2,647,762
61750FAE0	582,728	-	582,728	558,079	(24,649)	558,079	500,569
18974BAA7	203,962	-	203,962	193,231	(10,731)	193,231	197,038
22540V3F7	124,724	-	124,724	11,082	(113,642)	11,082	3,496
92978EAA2	123,118	-	123,118	119,363	(3,755)	119,363	115,107
41161PWB5	1,183,481	-	1,183,481	1,153,338	(30,143)	1,153,338	1,017,022
12669GXW6	153,925	-	153,925	20,286	(133,639)	20,286	173,435
55274SAM3	38,192	-	38,192	33,418	(4,774)	33,418	84,650
86359DME4	480,180	-	480,180	480,135	(45)	480,135	498,095
Totals	\$ 11,247,256	\$ -	\$ 11,247,257	\$ 5,074,493	\$ (6,172,764)	\$ 5,074,493	\$ 5,237,174

The following is the impairment listing for loan-backed and structured securities for the three months ended December 31, 2020:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
01853GAB6	\$ 166,318	\$ -	\$ 166,318	\$ 58,609	\$ (107,709)	\$ 58,609	\$ 136,619
05535DCF9	2,639,139	-	2,639,139	2,595,116	(44,023)	2,595,116	2,812,127

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
NOTES TO INTERIM STATUTORY FINANCIAL STATEMENTS, continued  
(UNAUDITED)

61750FAE0	594,740	-	594,740	584,887	(9,853)	584,887	530,736
61750MAB1	4,675	-	4,675	4,502	(173)	4,502	4,545
92926SAB2	585	-	585	567	(18)	567	562
124860CB1	21,523	-	21,523	14,872	(6,651)	14,872	17,887
18974BAA7	205,451	-	205,451	204,843	(608)	204,843	186,946
18974BAN9	101,669	-	101,669	101,513	(156)	101,513	98,300
2254W0NK7	89,902	-	89,902	23,726	(66,176)	23,726	94,611
45660LYW3	1,074,456	-	1,074,456	1,035,449	(39,007)	1,035,449	1,020,046
65535VRK6	681,735	-	681,735	601,631	(80,104)	601,631	653,481
79548KXQ6	99,323	-	99,323	98,725	(598)	98,725	92,899
92978EAA2	130,042	-	130,042	125,448	(4,594)	125,448	119,223
23332UBW3	26,310	-	26,310	21,116	(5,193)	21,116	30,347
576433H33	1,207,614	-	1,207,614	1,145,808	(61,806)	1,145,808	1,116,853
125435AA5	1,635,577	-	1,635,577	1,543,519	(92,058)	1,543,519	1,596,490
36298XAA0	6,639,520	-	6,639,520	5,802,921	(836,599)	5,802,921	6,153,831
55274SAM3	61,225	-	61,225	42,760	(18,465)	42,760	93,792
86359DME4	673,784	-	673,784	662,791	(10,993)	662,791	698,159
929227ZF6	18,319	-	18,319	5,496	(12,823)	5,496	16,063
Totals	\$ 16,071,907	\$ -	\$ 16,071,907	\$ 14,674,300	\$ (1,397,607)	\$ 14,674,300	\$ 15,473,517

The following is the impairment listing for loan-backed and structured securities for the three months ended September 30, 2020:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
US05618HAE53	\$ 555,162	\$ -	\$ 555,162	\$ 387,040	\$ (168,122)	\$ 387,040	\$ 162,575
00442FAB8	144,957	-	144,957	79,275	(65,682)	79,275	112,060
05535DCF9	2,755,413	-	2,755,413	2,649,186	(106,228)	2,649,186	2,553,142
46630KAA4	191,718	-	191,718	184,342	(7,376)	184,342	179,699
61749BAB9	105,432	-	105,432	91,620	(13,812)	91,620	88,204
61750MAB1	4,837	-	4,837	4,672	(165)	4,672	3,421
92926SAB2	604	-	604	588	(16)	588	438
07384YPP5	12,990	-	12,990	9,466	(3,524)	9,466	35,174
073879QF8	45,111	-	45,111	43,889	(1,222)	43,889	39,772
17307GRU4	104,250	-	104,250	55,590	(48,659)	55,590	91,680
18974BAA7	215,833	-	215,833	212,231	(3,602)	212,231	183,053
18974BAN9	106,359	-	106,359	104,851	(1,507)	104,851	97,631
9393365V1	399,194	-	399,194	394,263	(4,932)	394,263	364,935
23332UBW3	31,650	-	31,650	29,218	(2,432)	29,218	22,244
12669GWN7	849,557	-	849,557	799,224	(50,333)	799,224	782,638
12669GXW6	244,251	-	244,251	233,647	(10,604)	233,647	223,233
32051DCK6	79,208	-	79,208	61,819	(17,389)	61,819	82,998
36298XAA0	7,738,893	-	7,738,893	7,511,130	(227,763)	7,511,130	7,120,125
36298XAB8	7,666,120	-	7,666,120	6,250,751	(1,415,369)	6,250,751	6,539,292
45660LY94	13,115	-	13,115	6,394	(6,721)	6,394	26,528
74951PBT4	110,729	-	110,729	51,052	(59,676)	51,052	153,185
Totals	\$ 21,375,383	\$ -	\$ 21,375,383	\$ 19,160,250	\$ (2,215,134)	\$ 19,160,250	\$ 18,862,027

The following is the impairment listing for loan-backed and structured securities for the three months ended June 30, 2020:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
17307GRU4	\$ 107,326	\$ -	\$ 107,326	\$ 77,392	\$ (29,934)	\$ 77,392	\$ 160,449
18974BAA7	245,427	-	245,427	235,230	(10,197)	235,230	201,416
18974BAN9	119,509	-	119,509	114,571	(4,938)	114,571	107,924
362290AC2	220,776	-	220,776	219,541	(1,235)	219,541	307,360
79548KXQ6	172,175	-	172,175	170,007	(2,168)	170,007	130,248
855541AC2	508,940	-	508,940	384,558	(124,383)	384,558	460,800

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
NOTES TO INTERIM STATUTORY FINANCIAL STATEMENTS, continued  
(UNAUDITED)

9393365V1	433,313	-	433,313	415,261	(18,053)	415,261	356,247
45660LY94	28,987	-	28,987	13,258	(15,729)	13,258	21,174
57643QAE5	2,203,118	-	2,203,118	1,819,560	(383,558)	1,819,560	2,367,000
74951PBT4	260,811	-	260,811	143,231	(117,579)	143,231	157,616
86359DMC8	5,799,490	-	5,799,490	5,333,524	(465,966)	5,333,524	4,907,737
92990GAE3	80,251	-	80,251	66,477	(13,773)	66,477	71,880
Totals	\$ 10,180,123	\$ -	\$ 10,180,123	\$ 8,992,610	\$ (1,187,513)	\$ 8,992,610	\$ 9,249,851

The following is the impairment listing for loan-backed and structured securities for the three months ended March 31, 2020:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
05535DCF9	\$ 3,012,907	\$ -	\$ 3,012,907	\$ 2,862,429	\$ (150,478)	\$ 2,862,429	\$ 2,528,432
24763LFY1	147,758	-	147,758	146,827	(931)	146,827	180,454
45071KDD3	575,329	-	575,329	510,787	(64,542)	510,787	491,576
07384YPP5	33,493	-	33,493	28,061	(5,431)	28,061	46,723
12667GKG7	93,290	-	93,290	83,622	(9,668)	83,622	98,905
17307GRU4	114,325	-	114,325	112,699	(1,625)	112,699	157,144
362290AC2	316,883	-	316,883	225,907	(90,976)	225,907	322,987
59020UW43	214,183	-	214,183	182,719	(31,463)	182,719	200,181
65535VRK6	716,497	-	716,497	699,498	(16,998)	699,498	646,333
75115DAH8	6,842	-	6,842	6,564	(279)	6,564	6,397
76112BUE8	181,578	-	181,578	148,845	(32,733)	148,845	129,998
79548KXQ6	187,063	-	187,063	182,973	(4,090)	182,973	137,728
92926UAC5	136,220	-	136,220	130,734	(5,486)	130,734	130,957
23332UBW3	46,195	-	46,195	32,143	(14,052)	32,143	24,852
12669GWN7	889,281	-	889,281	871,126	(18,155)	871,126	863,235
32051DCR6	88,205	-	88,205	86,848	(1,358)	86,848	89,678
362334CN2	14,634	-	14,634	11,177	(3,457)	11,177	13,996
466247K93	7,584	-	7,584	6,335	(1,249)	6,335	7,318
57645LAA2	18,017,521	-	18,017,521	13,868,050	(4,149,471)	13,868,050	18,607,055
Totals	\$ 24,799,788	\$ -	\$ 24,799,788	\$ 20,197,344	\$ (4,602,443)	\$ 20,197,344	\$ 24,683,947

The following is the impairment listing for loan-backed and structured securities for the three months ended December 31, 2019:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
24763LFY1	\$ 182,113	\$ -	\$ 182,113	\$ 160,832	\$ (21,281)	\$ 160,832	\$ 200,613
05535DAN4	1,930,918	-	1,930,918	1,855,207	(75,711)	1,855,207	1,598,238
07384YPP5	187,700	-	187,700	39,691	(148,009)	39,691	71,760
17307GRU4	164,558	-	164,558	133,524	(31,034)	133,524	229,670
18974BAN9	134,619	-	134,619	125,398	(9,221)	125,398	126,170
65535VRK6	797,949	-	797,949	712,007	(85,942)	712,007	774,700
79548KXQ6	207,254	-	207,254	192,282	(14,972)	192,282	113,588
85554NAG5	194,730	-	194,730	158,214	(36,515)	158,214	187,575
12669FXR9	117,999	-	117,999	114,307	(3,692)	114,307	101,165
23332UBW3	74,561	-	74,561	47,819	(26,742)	47,819	35,659
Totals	\$ 3,992,400	\$ -	\$ 3,992,400	\$ 3,539,281	\$ (453,119)	\$ 3,539,281	\$ 3,439,138

The following is the impairment listing for loan-backed and structured securities for the three months ended September 30, 2019:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
12667F2A2	\$ 642,800	\$ -	\$ 642,800	\$ 484,346	\$ (158,455)	\$ 484,346	\$ 68,241
32053LAA0	47,447	-	47,447	40,280	(7,167)	40,280	47,846

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
NOTES TO INTERIM STATUTORY FINANCIAL STATEMENTS, continued  
(UNAUDITED)

761118FM5	2,843,393	-	2,843,393	2,789,133	(54,260)	2,789,133	2,918,992
79548KXQ6	297,379	-	297,379	277,239	(20,140)	277,239	60,979
23332UBW3	78,084	-	78,084	76,934	(1,151)	76,934	43,636
576433H33	1,579,401	-	1,579,401	1,448,247	(131,155)	1,448,247	1,448,863
12669GWN7	1,037,688	-	1,037,688	957,205	(80,484)	957,205	936,853
17309FAE8	161,243	-	161,243	129,536	(31,707)	129,536	159,357
36298XAA0	10,097,887	-	10,097,887	8,887,246	(1,210,641)	8,887,246	8,841,272
92990GAE3	86,314	-	86,314	85,680	(634)	85,680	87,117
US74951PBV94	37,392	-	37,392	16,087	(21,305)	16,087	26,602
Totals	\$ 16,909,029	\$ -	\$ 16,909,029	\$ 15,191,932	\$ (1,717,097)	\$ 15,191,932	\$ 14,639,756

The following is the impairment listing for loan-backed and structured securities for the three months ended June 30, 2019:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
61750MAB1	\$ 4,942	\$ -	\$ 4,942	\$ 4,899	\$ (42)	\$ 4,899	\$ 4,344
18974BAN9	143,913	-	143,913	143,911	(2)	143,911	141,999
761118FM5	3,338,972	-	3,338,972	3,276,460	(62,512)	3,276,460	3,468,889
79548KXQ6	335,309	-	335,309	321,864	(13,445)	321,864	218,663
55274SAM3	114,173	-	114,173	79,608	(34,565)	79,608	119,029
57643QAE5	3,042,722	-	3,042,722	2,360,287	(682,436)	2,360,287	3,180,695
Totals	\$ 6,980,030	\$ -	\$ 6,980,030	\$ 6,187,029	\$ (793,001)	\$ 6,187,029	\$ 7,133,620

The following is the impairment listing for loan-backed and structured securities for the three months ended March 31, 2019:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
61750MAB1	\$ 5,275	\$ -	\$ 5,275	\$ 4,933	\$ (341)	\$ 4,933	\$ 4,989
65106FAG7	232,843	-	232,843	215,726	(17,118)	215,726	6,316
18974BAA7	285,889	-	285,889	270,801	(15,088)	270,801	278,616
18974BAN9	149,774	-	149,774	139,333	(10,441)	139,333	148,234
22541QQR6	1,569	-	1,569	-	(1,569)	-	1
32051GCF0	22,786	-	22,786	(6,720)	(29,507)	(6,720)	17,553
761118FM5	3,259,303	-	3,259,303	3,218,368	(40,935)	3,218,368	3,244,154
17309FAE8	200,512	-	200,512	200,501	(11)	200,501	208,828
466247UG6	467,713	-	467,713	452,359	(15,354)	452,359	459,812
57643QAE5	3,114,325	-	3,114,325	3,109,376	(4,949)	3,109,376	3,256,107
US74951PBV94	51,011	-	51,011	29,960	(21,051)	29,960	58,411
Totals	\$ 7,791,000	\$ -	\$ 7,791,000	\$ 7,634,637	\$ (156,362)	\$ 7,634,637	\$ 7,683,021

The following is the impairment listing for loan-backed and structured securities for the three months ended December 31, 2018:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
65106FAG7	\$ 205,885	\$ -	\$ 205,885	\$ 17,668	\$ (188,218)	\$ 17,668	\$ 21,031
18974BAA7	306,428	-	306,428	295,291	(11,137)	295,291	294,986
22541QQR6	28,742	-	28,742	(9,704)	(38,446)	(9,704)	1
32051GCF0	32,493	-	32,493	20,481	(12,012)	20,481	20,063
17309FAE8	203,743	-	203,743	202,326	(1,417)	202,326	201,875
57643QAE5	3,657,695	-	3,657,695	3,177,611	(480,084)	3,177,611	3,365,017
92990GAE3	115,186	-	115,186	111,886	(3,300)	111,886	111,541
Totals	\$ 4,550,173	\$ -	\$ 4,550,173	\$ 3,815,559	\$ (734,614)	\$ 3,815,559	\$ 4,014,514

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
NOTES TO INTERIM STATUTORY FINANCIAL STATEMENTS, continued  
(UNAUDITED)

The following is the impairment listing for loan-backed and structured securities for the three months ended September 30, 2018:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
05535DCF9	\$ 3,454,425	\$ -	\$ 3,454,425	\$ 3,141,048	\$ (313,377)	\$ 3,141,048	\$ 3,134,409
07384YPP5	321,829	-	321,829	148,884	(172,945)	148,884	132,968
07386HCP4	2,164	-	2,164	(6,255)	(8,418)	(6,255)	320
76110H4M8	1,715	-	1,715	(3,719)	(5,434)	(3,719)	641
79548KXQ6	423,086	-	423,086	383,222	(39,864)	383,222	292,015
939336Z48	117,607	-	117,607	-	(117,607)	-	126,945
Totals	\$ 4,320,826	\$ -	\$ 4,320,826	\$ 3,663,181	\$ (657,645)	\$ 3,663,181	\$ 3,687,297

The following is the impairment listing for loan-backed and structured securities for the three months ended June 30, 2018:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
59020UW43	\$ 337,732	\$ -	\$ 337,732	\$ 271,686	\$ (66,046)	\$ 271,686	\$ 354,508
76110H4M8	6,848	-	6,848	1,969	(4,879)	1,969	1,713
863579DV7	289,655	-	289,655	5,567	(284,089)	5,567	30,531
Totals	\$ 634,235	\$ -	\$ 634,235	\$ 279,221	\$ (355,014)	\$ 279,221	\$ 386,752

The following is the impairment listing for loan-backed and structured securities for the three months ended March 31, 2018:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
07386HEN7	\$ 43,711	\$ -	\$ 43,711	\$ 2,334	\$ (41,377)	\$ 2,334	\$ 1,609
79548KXQ6	520,764	-	520,764	476,293	(44,471)	476,293	365,994
45660NZY4	81,215	-	81,215	9,554	(71,661)	9,554	80,891
Totals	\$ 645,690	\$ -	\$ 645,690	\$ 488,181	\$ (157,509)	\$ 488,181	\$ 448,494

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

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
03927RAA2	\$ 2,886,563	\$ -	\$ 2,886,563	\$ 1,464,907	\$ (1,421,656)	\$ 1,464,907	\$ 1,481,241
03927RAB0	910,639	-	910,639	363,543	(547,096)	363,543	362,176
07386HCP4	7,995	-	7,995	1,386	(6,609)	1,386	2,673
12669GMS7	25,101	-	25,101	21,923	(3,177)	21,923	21,921
22541QQR6	21,202	-	21,202	12,504	(8,698)	12,504	16,106
2254W0NK7	97,695	-	97,695	94,495	(3,200)	94,495	139,833
86359ACG6	318	-	318	-	(318)	-	2
Totals	\$ 3,949,513	\$ -	\$ 3,949,513	\$ 1,958,759	\$ (1,990,754)	\$ 1,958,759	\$ 2,023,952

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

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
22541NMA4	\$ 42,273	\$ -	\$ 42,273	\$ 41,434	\$ (839)	\$ 41,434	\$ 41,095
22541NMB2	11,869	-	11,869	11,634	(234)	11,634	11,535
22541SSD1	12,232	-	12,232	20	(12,213)	20	5,978
52108MDP5	3,497,947	-	3,497,947	-	(3,497,947)	-	1,925,413
55274SAM3	167,196	-	167,196	153,991	(13,206)	153,991	179,429

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY  
NOTES TO INTERIM STATUTORY FINANCIAL STATEMENTS, continued  
(UNAUDITED)

76110W4J2	1,131	-	1,131	229	(902)	229	556
88157QAL2	686,945	-	686,945	660,921	(26,024)	660,921	2,125,943
89789KAC9	16,949	-	16,949	8,714	(8,235)	8,714	357,735
Totals	\$ 4,436,542	\$ -	\$ 4,436,542	\$ 876,942	\$ (3,559,600)	\$ 876,942	\$ 4,647,683

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

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
76110H4M8	\$ 4,413	\$ -	\$ 4,413	\$ 2,326	\$ (2,087)	\$ 2,326	\$ 4,073
86358RLG0	3,485	-	3,485	2,670	(815)	2,670	30,171
86359ACG6	16,324	-	16,324	2	(16,322)	2	2
88157QAL2	774,182	-	774,182	675,599	(98,583)	675,599	1,947,675
89789KAC9	17,294	-	17,294	8,920	(8,374)	8,920	356,047
77277LAF4	22,514,590	-	22,514,590	22,167,493	(347,097)	22,167,493	34,318,674
77277LAH0	1,135,088	-	1,135,088	1,118,159	(16,929)	1,118,159	2,738,435
77277LAJ6	16,073,175	-	16,073,175	15,833,787	(239,388)	15,833,787	21,595,653
Totals	\$ 40,538,551	\$ -	\$ 40,538,551	\$ 39,808,956	\$ (729,595)	\$ 39,808,956	\$ 60,990,732

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

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
17307GH76	\$ 274,894	\$ -	\$ 274,894	\$ 44,730	\$ (230,163)	\$ 44,730	\$ 152,777
22541QJR4	11,175	-	11,175	54	(11,122)	54	6,866
32051DCK6	182,177	-	182,177	160,728	(21,449)	160,728	179,180
55274SAM3	225,790	-	225,790	209,839	(15,951)	209,839	218,832
86358RA23	1,326,199	-	1,326,199	1,253,636	(72,563)	1,253,636	1,289,099
86359ACG6	6,287	-	6,287	49	(6,239)	49	2
US77277LAF40	22,537,014	-	22,537,014	22,514,590	(22,424)	22,514,590	31,699,907
US77277LAH06	1,136,182	-	1,136,182	1,135,088	(1,094)	1,135,088	2,662,526
US77277LAJ61	16,088,661	-	16,088,661	16,073,175	(15,486)	16,073,175	19,947,746
Totals	\$ 41,788,380	\$ -	\$ 41,788,380	\$ 41,391,889	\$ (396,491)	\$ 41,391,889	\$ 56,156,936