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BMA
BERMUDA MONETARY AUTHORITY

Bermuda Long-term Insurance Market Analysis and Stress Testing Report

January 2024

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Acronyms

BEL	Best Estimate Liability
BMA	Bermuda Monetary Authority
C&S	Capital and Surplus
CSR	Capital and Solvency Return
EBS	Economic Balance Sheet
ECR	Enhanced Capital Requirement
GWP	Gross Written Premium
NWP	Net Written Premium
LT	Long-term
MBS	Mortgage-Backed Securities
TCL	Target Capital Level

Foreword

Despite the challenging global market conditions and series of significant stress events over the last few years, including high inflation, interest rates and the COVID-19 pandemic, Bermuda's long-term insurance[1] industry has experienced meaningful growth. This growth has been primarily driven by demand from direct insurers or institutions using reinsurance for exposure, risk, balance sheet volatility and capital management in light of the challenging economic environment and an ageing population with improved mortality.

The Bermuda market has also seen an increase within reinsurance of products that have a significant investment component (sometimes referred to as asset-intensive reinsurance); Bermuda firms often have better access to capital as well as significant expertise in investment and asset liability management to support this business. Asset-intensive products typically have longevity risk, which provides a natural hedge against the mortality risk many reinsurers already carry. In addition, Bermuda reinsurers have significant capacity that makes them better able to pool the risks from different insurers. Finally, many ceding companies in other jurisdictions take comfort in Bermuda's strong regulatory framework, which has full Solvency II equivalence as well as reciprocal and qualified jurisdiction status by the National Association of Insurance Commissioners (NAIC).

Long-term insurers have developed and established a sustained presence in the Bermuda insurance market. Given the material growth over the last decade and the sector's relevance to the overall Bermuda insurance market, the Authority is publishing this inaugural long-term insurance sector report in the spirit of transparency and information-sharing[2].

The report overviews Bermuda's long-term insurance sector and analyses stress testing results. Assessing the sector's key market developments and stress testing analysis at a macro-level is fundamental to the Authority's overall supervisory framework. Furthermore, the stress testing allows the Authority to evaluate insurers' capital adequacy under adverse financial markets and underwriting conditions.

Ricardo Garcia
Managing Director

[1] For this report, insurers also include reinsurers.
[2] While this is the first public report giving an overview of the Bermuda long-term insurance sector, as part of its supervisory mandate, the Authority has always assessed the resilience of the Bermuda's long-term insurance market at both the micro and macro levels.

Bermuda Long-term Insurance Market Analysis and Stress Testing Report

This is the Bermuda Monetary Authority's (Authority or BMA) first Bermuda Long-term Insurance Market Analysis and Stress Testing Report. The report is the result of the BMA's internal staff analysis.

About the Authority

The Authority was established by statute in 1969. Its role has evolved over the years to meet the changing needs in Bermuda's financial services sector. Today, it supervises, regulates and inspects financial institutions operating in the jurisdiction. It also issues Bermuda's national currency, manages exchange control transactions, assists other authorities with detecting and preventing of financial crime and advises the Government on banking and other financial and monetary matters.

The Authority develops risk-based financial regulations that it applies to the supervision of Bermuda's banks, trust companies, investment businesses, investment funds, fund administrators, money service businesses, corporate service providers, insurance companies, digital asset businesses and digital asset issuances. It also regulates the Bermuda Stock Exchange and the Bermuda Credit Union.

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1. Executive Summary

This report highlights, from a macroprudential viewpoint, the market characteristics of Bermuda's commercial long-term insurance segment. As mentioned in the foreword, the growth of Bermuda's sector has been driven by global macroeconomic trends such as low interest rates, tightening of credit spreads and shifting population demographics, amongst other drivers. The Authority, in applying a risk-based supervisory approach, regularly undertakes a review of and enhancements to its regulatory regime. The recent enhancements have focused primarily on the regulatory framework for long-term insurers.

The report highlights that the Bermuda Long-term sector experienced a modest growth in 2022 (2.2% increase in total assets) and a slight decline in gross written premium (-1.1%). As of year-end 2022, approximately two-thirds of the business is related to longevity and financial business and the remaining business is related to mortality and critical illness. The United States accounted for more than 60% of Bermuda's long-term insurers' reserves, followed by Asia; European business (including the UK) represented less than 5% of the insurance reserves.

The largest asset allocation for the sector was in corporate bonds, representing 55.7% of total investments as of year-end 2022. Fixed-income securities with an investment-grade rating made up 77.3% of total investments. Securities with sub-investment grade ratings made up 3.8% of total investments, 9.3% of total investments were unrated, and 9.6% of total investments were in the non-fixed-income class.

The sector had a robust solvency position with a median solvency ratio of 261% at year-end 2022. This allowed the sector to absorb the impacts of a number of adverse financial market stress tests, demonstrating the sector's overall financial resilience as shown in the report.

The BMA also conducted a pilot study to obtain a view of the different sources of liquidity in the Bermuda market and how companies were using them. The study showed that cash and cash equivalents were a common source of liquidity across most companies, together with investment-grade fixed-income assets, of which most were sovereigns and corporates. The study also revealed that insurers took a wide variety of approaches to managing liquidity risk. While the BMA's pilot liquidity stress test was still being developed and remained open for further refinements, all participating companies showed adequate liquidity under the stress testing scenario.

Future reports will expand on the data and exhibits presented in this inaugural report, including, but not limited to:

- The addition of future reporting years providing more years of comparison
- Incorporating additional or new data from CSR enhancements, where possible
- Providing additional insights into asset holdings
- Providing additional insights into the stress test results
- Including quantitative data on the new liquidity stress test scenarios
- Considering new or enhanced stress test scenarios

2. Introduction

Drawing from the long-term insurers' annual Capital and Solvency Return (CSR) and survey data, this report gives an overview of Bermuda's long-term insurance sector and stress testing analysis at a macro-level.

The first section of this report outlines the methodology used, including data collection, its basis and the periods covered. The methodology also includes the limitations of this report, in addition to describing the types of exhibits and metrics used to describe the reporting data.

The second section provides an overview of the current landscape of Bermuda's long-term insurance sector and outlines key market indicators in terms of assets, liabilities, solvency, profitability and liquidity.

The third section of the report provides an overview of the stress testing analysis. Stress testing is used to assess the capacity of individual insurers and the sector's ability to withstand the impact of various severe but plausible events. Stress testing is a valuable supervisory tool for the BMA as it provides supervisors with a forward-looking perspective of the resilience of individual insurance entities and the sector. Furthermore, the stress and scenario testing results help the Authority identify the concentration of risk and new and/or emerging risks, as well as help to assess how insurers are responding to such risks.

Bermuda long-term insurers are required to carry out rigorous and comprehensive forward-looking stress tests to measure the sensitivity of their statutory capital and surplus in various adverse financial markets. This report provides aggregated market results for Bermuda long-term insurers' capital adequacy, under prescribed stress testing scenarios, to withstand severe but remote losses from various possible events that might adversely impact their economic balance sheets (i.e., assets, liabilities, capital and surplus).

The Authority does not use the stress testing exercise to determine required capital levels. Nonetheless, this exercise does help the Authority evaluate if the risk assumed by Bermuda insurers is commensurate to each insurer's risk appetite. This information ultimately informs the Authority's risk-based supervisory approach and any capital adequacy concerns identified during this exercise are addressed as part of the Authority's normal supervisory oversight.

3. Methodology

Figures used in Section 4 of the report utilise data from the unconsolidated statutory financial statement submitted in the Bermuda annual returns (i.e., the Capital and Solvency return[3]) of 165 firms with a Class C, Class D or Class E license for the periods ending 31 December 2022 and 31 December 2021[4]. Figures used in Section 5 of the report utilise data submitted by firms when applying the Authority's stress scenarios to their economic balance sheet.

The Authority continually monitors trends and market developments, including evolving risks and business models, and adjusts its regime accordingly to international standards. In general, enhancements and changes made to the Authority's reporting framework provide more data and a higher level of detail. However, these changes may limit aggregation and y/y comparability at a macro level. As a result, this first long-term insurance sector report is limited to two reporting periods. However, as noted in Section 6, the annual publication of this report will include future years.

The BMA has only aggregated data when it was possible to do so. To supplement aggregated data, boxplots (or box and whisker plots) are used in some analyses to describe the distribution of individual results, presenting various percentiles and the median.

The stress/scenario impact and effects reported here are instantaneous, i.e., those observed immediately upon the occurrence of the event (stress/scenario) as determined by the insurer's internal and/or vendor model(s), both with and without the effect of reinsurance and/or other loss mitigation instruments. The stress/scenarios were run against the insurers' balance sheet positions and aggregated in-force exposures as of year-end 2022.

The analysis in this report is based on the original CSR data input. No references were made to other supporting documents required separately for the CSR filing. These additional documents are reviewed by the Authority's supervisory team at the micro-level in the context of individual insurers. As such, this report does not reflect subtle nuances provided by an insurer's full return.

[3] The Capital and Solvency return is an annual return relating to an insurer's risk management practices and information used by an insurer to calculate its ECR and Target Capital Level (TCL). Bermuda's EBS framework forms the basis used to determine capital requirements for Bermuda commercial insurers. Specifically with respect to insurance liabilities, 'Technical Provisions' is established as the sum of a best estimate liability and a risk margin.

[4] All ECR ratios are presented using the consolidated financial statements and using the EBS basis.

Reported ratios are presented by taking the proportion of the respective metric to the population total. The resulting percentage will reflect large insurance groups that may influence the market results. In response to this issue, the median statistic was also included (as it is less distorted by outliers) and extreme outliers are occasionally removed from the sample.

Many factors influence the change in a long-term insurer's capital position from one year to the next, such as, but not limited to, new business strain, lapsation of existing business, operating gains/losses, mark-to-market valuations, capital withdrawals/injections, reinsurance strategy, investment performance, taxation and changes in best estimate liability assumptions. While we present a comparison of overall results below, it is difficult to draw conclusions with respect to individual factors causing observable differences.

The Bermuda Solvency Capital Requirement (BSCR) and its individual components are calibrated to Tail Value-at-Risk (TVaR) at a 99% confidence level over the one-year time horizon and emcompasses all quantifiable material risks (market, credit, insurance and operational). Assets and liabilities are measured consistently according to the EBS framework – an economic valuation framework which is the basis used for the solvency ratios. Insurance technical provisions are decomposed into a best-estimate liability component and a risk margin component.

4. Bermuda's Commercial Long-term Insurance Sector

4.1 Overview of the Sector

Bermuda has a multi-licence system of regulation, which categorises licensees into general insurance company classes, long-term insurance company classes, limited and special purpose insurer classes, innovative classes, collateralised insurer classes and intermediaries. For regulatory and supervisory purposes, the Bermuda commercial long-term sector is broadly classified by the following licence classes, i.e.:

- Class C: Long-term insurers and reinsurers with total assets of less than $250.0 million that are not registrable as a Class A or Class B insurer[5]. Class C insurers are required to maintain eligible capital and surplus equal to, or in excess of, the ECR, which corresponds to the greater of 1) Bermuda Solvency Capital Requirement (BSCR), 2) an asset-based formula, and 3) a $500,000 floor
- Class D: Long-term insurers and reinsurers with total assets of $250.0 million or more but less than $500.0 million and not registrable as a Class A or Class B insurer. Class D insurers are required to maintain eligible capital and surplus equal to, or in excess of, the ECR, which corresponds to the greater of 1) BSCR, 2) an asset-based formula, and 3) a $4.0 million floor
- Class E: Long-term insurers and reinsurers with total assets of more than $500.0 million that are not registrable as a Class A or Class B insurer. Class E insurers are required to maintain eligible capital and surplus equal to, or in excess of, the ECR, which corresponds to the greater of 1) BSCR, 2) an asset-based formula, and 3) an $8.0 million floor

[5] Please refer to https://www.bma.bm/insurance-licensing for a definition of Class A and Class B insurers.

The long-term insurance sector experienced material growth over the last decade because of increasing demand for and supply of (re)insurance products and solutions, driven by a variety of trends, including profitability, economic, environmental, social and demographic trends.

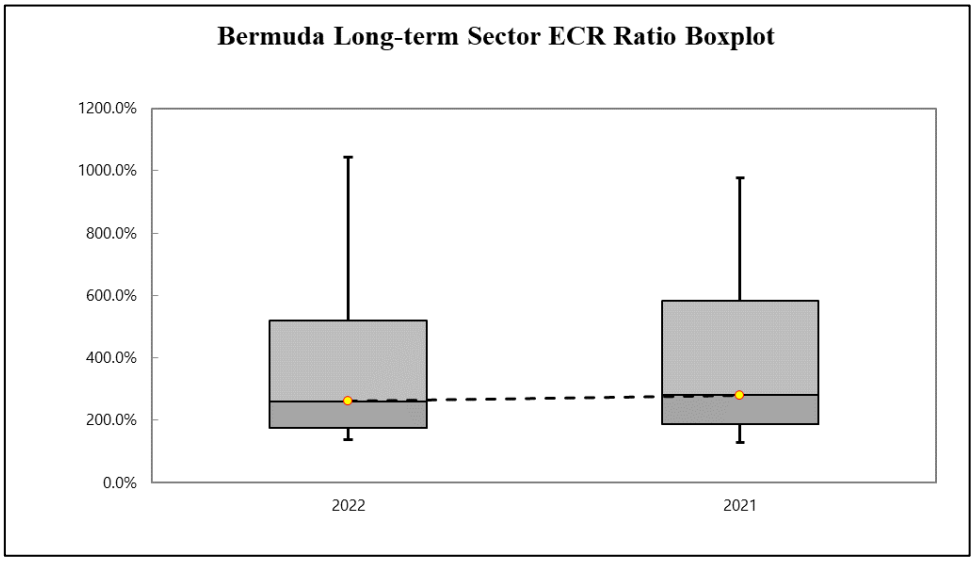
As at year-end 2022, firms had written gross written premiums of US$134.0 billion for the year and net written premiums of US$96.6 billion. Firms held total assets of US$1,089.5 billion at year-end 2022 against total liabilities of US$974.3 billion. Net income for the sector was down 26% year-over-year, largely due to decreases in investment income.

Table 4.1.1 Bermuda Long-term Insurance Sectoral Highlights

(In US$ billions unless indicated otherwise)	**2022**	2021	*Y/Y Change (%)*
Gross Written Premiums	**134.0**	135.4	-1.1
Net Written Premiums	**96.6**	100.8	-4.2
Net Income	**11.0**	14.9	-26.1
Total Claims	**61.3**	49.2	24.5
Total Assets	**1,089.5**	1,066.0	2.2
Total Liabilities	**974.3**	938.4	3.8
"AAA-BBB" Assets/Claims (%)	**740.6**	875.1	-15.4

Summary of year-over-year movements:

Figure 4.1.2 Boxplot of ECR Ratios at Year-end 2022 and 2021



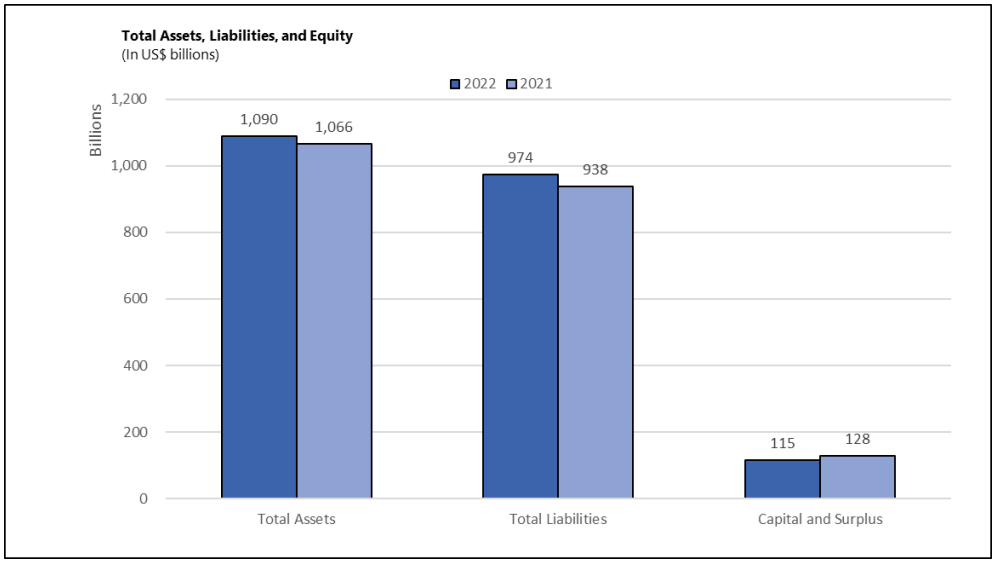
- The median ECR Ratio was 261% at year-end 2022, down from 279% in 2021, indicating a healthy capital position for the commercial long-term insurance sector. The boxplots above provide the 25th, median, and 75th percentile of the distribution of ECR ratios, with the whiskers representing the distance to the 10th (lower whisker) and 90th percentiles (upper whisker)

Table 4.1.3 Key Balance Sheet Indicators

(In US$ billions unless indicated otherwise)	**2022**	2021	*Y/Y Change (%)*
Capital and Surplus	**115.2**	127.6	-9.7
Total Assets	**1,089.5**	1,066.0	2.2
Total Liabilities	**974.3**	938.4	3.8
NWP / Equity (%)	**83.8**	79.0	6.1
Reserves / Capital and Surplus (%)	**787.4**	675.1	16.6

- Total assets increased by US$23.5 billion (up 2.2%) in 2022, rising from US$1,066.0 billion to US$1,089.5 billion
- Total liabilities stood at US$974.3 billion at year-end 2022, up from $938.4 billion compared to the prior year. This represents a 3.8% increase y/y
- In aggregate, the excess assets over liabilities were 11.8% in 2022, a decrease compared to the 13.6% reported in 2021
- Capital and surplus decreased 9.7%, from US$127.6 billion to $115.2 billion
- Reported insurance reserves were 787% of corresponding capital and surplus at year-end 2022, up 16.6%% from 2021

Figure 4.1.4 Total Assets, Liabilities, and Capital and Surplus YE21 – YE22



Key financial, capital and profitability indicators are shown in the tables below for Bermuda's long-term insurers as of 31 December 2022 and 31 December 2021.

Table 4.1.5 Key Income Statement Indicators

(In US$ billions)	**2022**	2021	*Y/Y Change (%)*
Gross Written Premiums	**134.0**	**135.4**	-1.1
Net Written Premiums	**96.6**	100.8	-4.2
Total Expenses	**15.8**	18.9	-16.6
Total Claims	**61.3**	49.2	24.5
Investment Income	**0.5**	23.6	-98.0
Underwriting Income	**101.1**	102.8	-1.6
Net Income	**11.0**	14.9	-26.1

Operationally, firms reported a net income of US$11.0 billion in 2022 compared to a net income of US$14.9 billion reported in 2021. The decrease was driven by a significant drop in investment income in 2022, with firms reporting only US$0.5 billion of investment income versus the US$23.6 billion reported in 2021. Underwriting income of US$101.1 billion in 2022 remained relatively stable, with a moderate decrease of 1.6% y/y. Claims increased by 24.5% to US$61.3 billion in 2022, up from US$49.2 billion in 2021, resulting in payments of US$110.5 billion to policyholders over the two years.

Table 4.1.6 Aggregate Capital Structure

(In US$ billions unless indicated otherwise)	**2022**	2021	*Y/Y Change (%)*
Total Assets	**1,089.5**	**1,066.0**	2.2
Capital and Surplus	**115.2**	127.6	-9.7
Insurance Reserves	**907.0**	861.4	5.3
Total Assets / Capital and Surplus (%)	**945.8**	835.4	13.2
Capital and Surplus / Total Assets (%)	**10.6**	12.0	-11.7
Insurance Reserves / Total Assets (%)	**83.3**	80.8	3.0

The sector's total capital and surplus decreased by 9.7% to US$115.2 billion from US$127.6 billion in 2021. Aggregate sector assets were 9.46 times (or 946% of) capital and surplus – this proportion increased 13.2% y/y. Conversely, total capital and surplus represented 10.6% of total assets, decreasing 11.7% y/y, driven by the decrease in capital and surplus. Insurance reserves increased 5.3% y/y to US$907.0 billion and amounted to 83.3% of assets held by firms, an increase from 80.8% reported in 2021.

4.2 Additional Performance Indicators

Financial indicators deteriorated in 2022 on all return indicators, with returns on assets reducing by nearly 30%, return on equity down about 20% and return on investments reduced to nearly 0% for 2022[6].

Table 4.2.1 Return on Assets, Equity and Investment

(In percent)	**2022**	2021	*Y/Y Change (%)*
Return on Assets (RoA)	**1.0**	1.4	-27.7
Return on Equity (RoE)	**9.6**	11.7	-18.2
Return on Investment (RoI)	**0.1**	2.6	-98.0

The figures below provide a comparison of key performance indicators y/y. Figure 4.2.2 indicates the movement of gross written premium, net written premium, claims and expenses. Figure 4.2.3 is a boxplot showing the 25th percentile, median and 75th percentile of total assets to capital and surplus. The median value in 2022 shows total assets are 7.4 times capital and surplus, as compared to 8.1 times capital and surplus in 2021.

Figure 4.2.2 Gross and Net Premiums, Claims, and Expenses

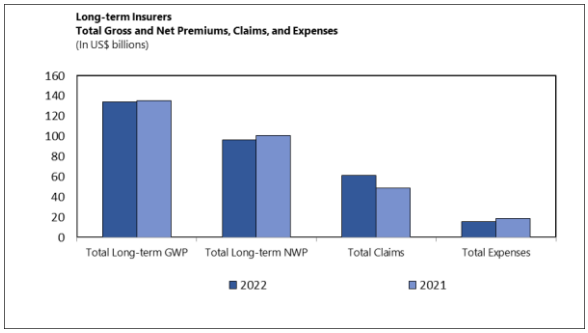
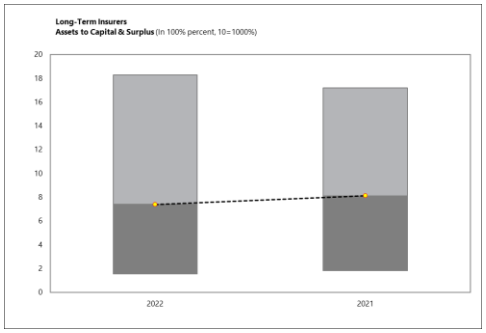


Figure 4.2.3 Assets as a Percentage of Capital and Surplus



4.3 Lines of Business and Geographical Breakdown of Claims and Reserves

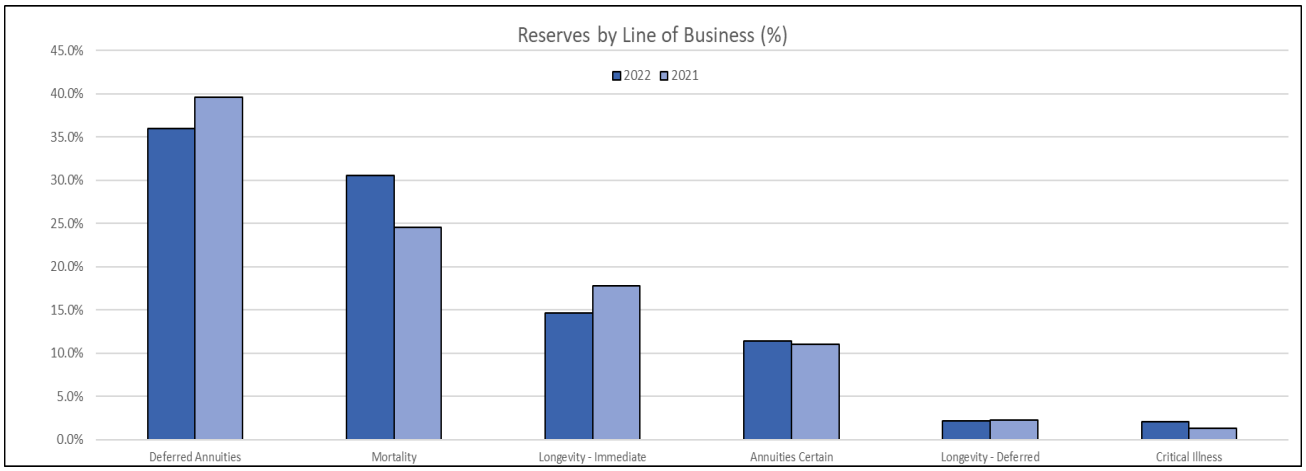
Bermuda's life sector is comprised of direct and indirect insurers underwriting risks ranging from mortality, longevity, critical illness, disability and group life, among other products. The reserves attributed to key lines of business are shown in Figure 4.3.1. The exposures, as determined by reserves, are located predominantly in the United States and, to a much lesser extent, in Asia.

[6] 'Return on Assets' is net income as a proportion of Assets, 'Return on Equity' is net income as a proportion of Capital and Surplus and Return on Investment' is investment income as a proportion of total investments.

Table 4.3.1 Reserves by Key Lines of Business

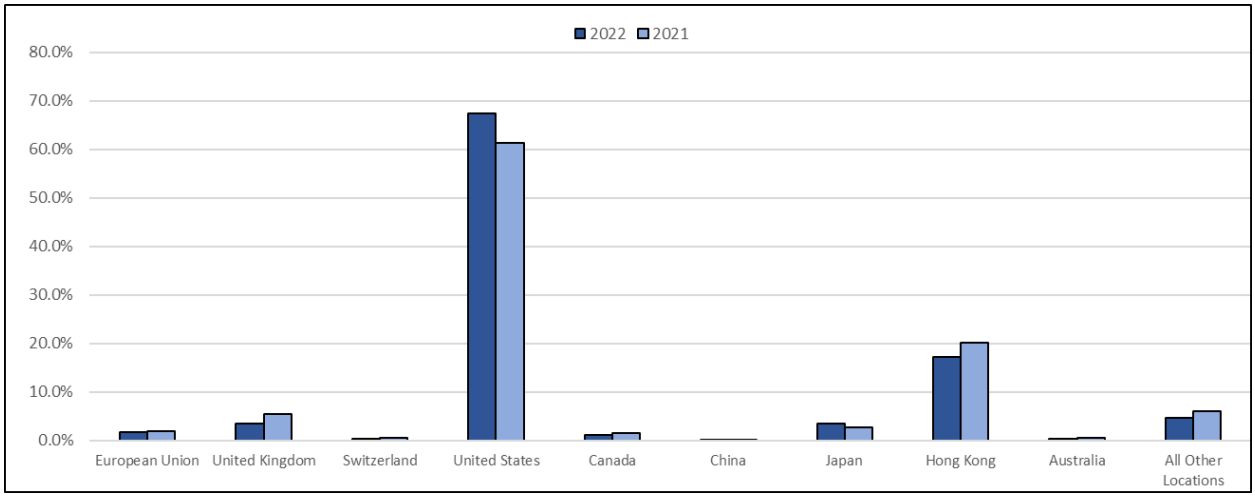
(In US$ billions unless indicated otherwise)	**2022**	2021	*Y/Y Change (%)*
Deferred Annuities	**263.3**	278.3	-5.4
Mortality	**223.8**	172.5	29.7
Longevity - Immediate	**107.3**	124.7	-13.9
Annuities Certain	**83.3**	77.7	7.2
Longevity - Deferred	**15.4**	16.0	-3.6
Critical Illness	**15.3**	9.3	64.3

Figure 4.3.2 – Bermuda Long-term Insurance Sector Reserves by Key Lines of Business



The Bermuda long-term insurance sector reserves are broken down by geographical distribution in the tables 4.3.3 below. The United States accounts for more than 60% of Bermuda's long-term insurers' reserves for 2022 and 2021.

Figure 4.3.3 Geographical Distribution of Reserves for YE22, YE21



4.4 Asset, Reserve and Liquidity Indicators

Firms reported US$141.5 billion of reinsurance assets at year-end 2022, remaining flat compared to year-end 2021. The expense-to-assets ratio of 1.5% in 2022 was down from a 1.8% ratio in 2021. Total claims represented 6.8% of total reserves at year-end 2022, up 18.3% from 5.7% in 2021.

Table 4.4.1 Expense Ratio, Claims as a Percentage of Reserves and Reinsurance Assets

(In per cent unless indicated otherwise)	**2022**	2021	*Y/Y Change (%)*
Total Expenses / Total Assets	**1.5**	1.8	-18.4
Claims / Reserves	**6.8**	5.7	18.3
Reins. Assets (In US$ billions)	**141.5**	142.2	-0.5

At the end of 2022, cash holdings, sovereign bonds, and corporate bonds constituted 65.1% of the asset allocation for Bermuda's long-term sector, followed by mortgage and asset-backed securities (17.8%). This compares to holdings of 70.7% for cash and sovereign and corporate bonds in 2021 and to holdings of 14.3% for mortgage and asset-backed securities in 2021. Figure 4.4.2 shows the composition of assets year-over-year.

Figure 4.4.2 Composition of Investments in Percentage

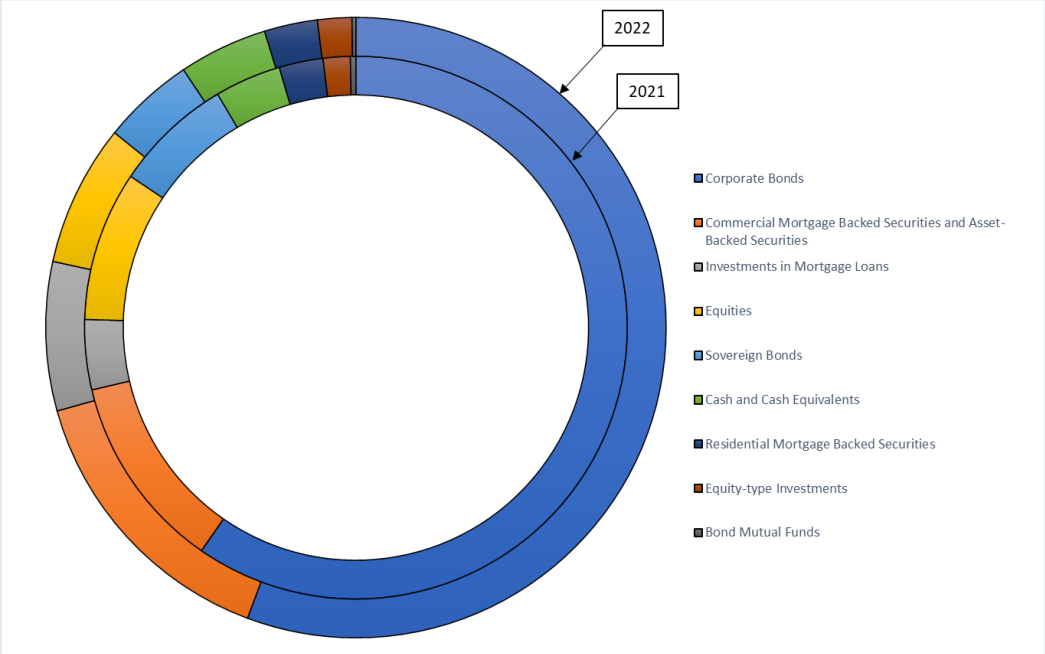


Table 4.4.3 below gives a breakdown of assets held by Bermuda's long-term insurers by type of assets. Table 4.4.4 provides a categorisation of investments held by quality type at year-end 2022 and 2021.

The largest allocation for the sector is in corporate bonds, representing 55.7% of total investments at year-end 2022. This is down from 59.6% in 2021, an overall allocation reduction of 6.6%.

Table 4.4.3 Asset Classes as a Percentage of Total Investments

(In per cent)	**2022**	2021	*Y/Y Change (%)*
Corporate Bonds	**55.7**	59.6	-6.6
Commercial Mortgage-Backed Securities/Asset-Backed Securities	**15.0**	11.7	28.4
Investments in Mortgage Loans	**7.8**	4.2	85.9
Equities	**7.4**	8.9	-17.3
Sovereign Bonds	**4.8**	7.1	-32.1
Cash and Cash Equivalents	**4.6**	4.0	16.9
Residential Mortgage-Backed Securities	**2.8**	2.6	5.8
Equity-type Investments	**1.8**	1.6	11.0
Bond Mutual Funds	**0.2**	0.3	-38.7

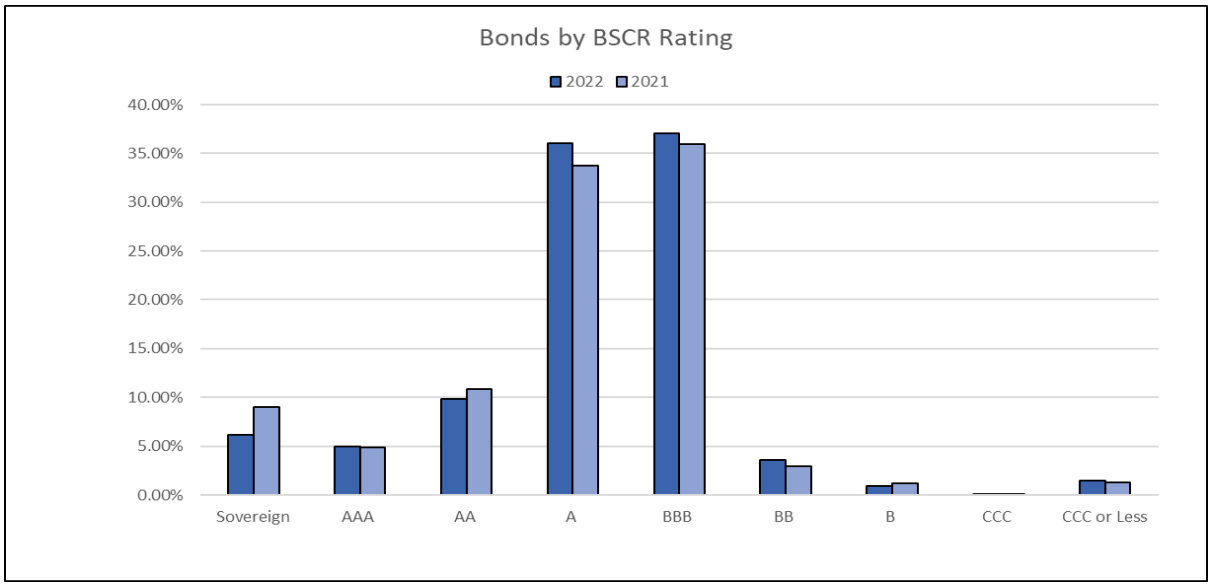
Fixed-income securities with an investment-grade rating make up 77.3% of total investments. Securities with sub-investment grade ratings make up 3.8% of total investments, 9.3% of total investments are unrated, and 9.6% of total investments are in the non-fixed-income class. The allocation to unrated investments increased to 9.3% from 5.4%, but the allocation remains less than 10% overall.

Table 4.4.4 Investment Rating Classes

(In per cent)	**2022**	**2021**	*Y/Y Change (%)*
Investment Grade Investments/Total Investments	**77.3**	**80.0**	-3.4
Non-Investment Grade Investments/Total Investments	**3.8**	**3.6**	3.9
Unrated Investments/Total Investments	**9.3**	**5.4**	71.8
Non-Fixed Income Investments/Total Investments	**9.6**	**11.0**	-12.4

Total bonds held by long-term insurers, categorised by BSCR Rating, are shown in Figure 4.4.5 below. Bond holdings with a rating of BBB or better represent 93.97% of total bonds at year-end 2022, which is relatively flat y/y.

Figure 4.4.5 Bonds Grouped by BSCR Rating



The boxplots shown in Figure 4.4.6 provide a look into the distribution of asset quality against total investments held by firms in Bermuda's long-term insurance sector. The median holding of corporate and sovereign bonds was 77.2% for 2022, down from 79.6% in 2021. The median of investment-grade assets to total investments remained relatively stable for 2022 (91.5%) versus 2021 (93.0%).

Figure 4.4.6 Box and Whisker Plots of Asset Quality

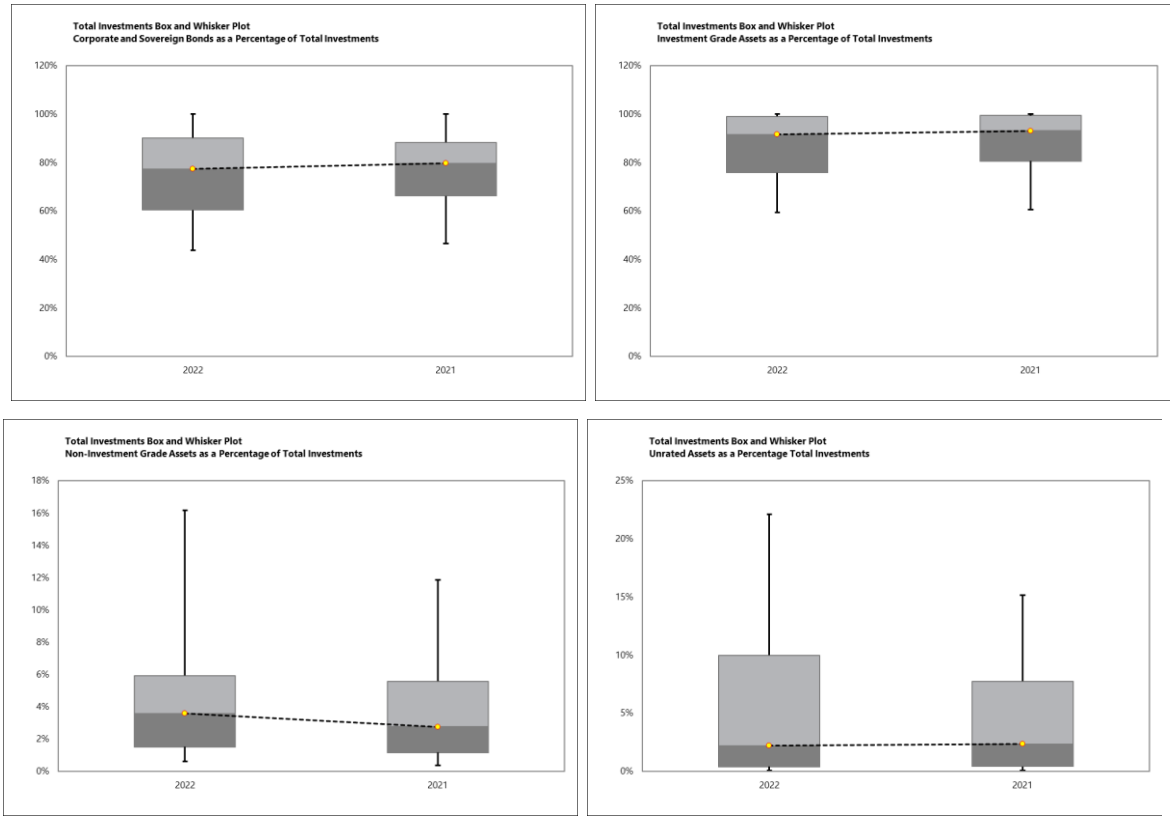


Table 4.4.7 lists liquidity indicators by comparing cash and assets with higher rating levels to assets, liabilities, reserves and claims. Cash investments are defined as cash, cash equivalents and sovereign bonds. These comprise 5.5% of total assets, 6.2% of total liabilities and 98.5% of claims. The sum of ‘AAA’, ‘AA’, ‘A’ and ‘BBB’ securities accounts for 55.1% of assets and covers 61.6% of liabilities and 979.1% of claims in 2022.

Table 4.4.7 Indicators of Asset Liquidity*

(In per cent)	**2022**	2021	*Y/Y Change (%)*
Cash Investments/Total Assets	**5.5**	**6.8**	-18.9
Cash Investments/Total Liabilities	**6.2**	**7.8**	-20.2
Cash Investments/Reserves	**6.7**	**8.4**	-21.3
Cash Investments/Claims	**98.5**	**148.0**	-33.4
"AAA-BBB" Assets/Total Assets	**55.1**	**50.2**	9.7
"AAA-BBB" Assets/Total Liabilities	**61.6**	**57.0**	8.0
"AAA-BBB" Assets/Insurance Reserves	**66.1**	**62.1**	6.5
"AAA-BBB" Assets/Claims	**979.1**	**1087.5**	-10.0

**Note:* AAA refers to the rating category of investment assets held by firms. Cash investments include i) sovereign debt issued by a country in its own currency that is rated AA- or better, and ii) debt issued by government-owned and related entities that were explicitly guaranteed by that government, except for MBSs.

5. Stress Testing Analysis

The objective of stress testing for the Authority is to assess the capital adequacy of the insurers under adverse financial markets and stressed liquidity conditions; the scenarios provide an analysis of the long-term insurance sector's vulnerability to certain shocks. More specifically, the purpose of the tests is to assess the impact of the severe but plausible losses on the insurer's statutory balance sheet. Thus, these tests help assess the financial capacity of an insurer to absorb the manifestation of key financial risks.

This section provides a quantitative summary of the stress/scenarios submitted in Schedule V(e) of the 2022 year-end Capital and Solvency Return[7]. Furthermore, in April 2023, the Authority targeted enhancements to the regulatory regime for the long-term sector, which included reporting on an Economic Balance Sheet basis for Schedule V(e) and the introduction of a liquidity stress test scenario. The Authority is undertaking a deep-dive review into the results of the new liquidity stress test and intends to publish quantitative results in future reports.

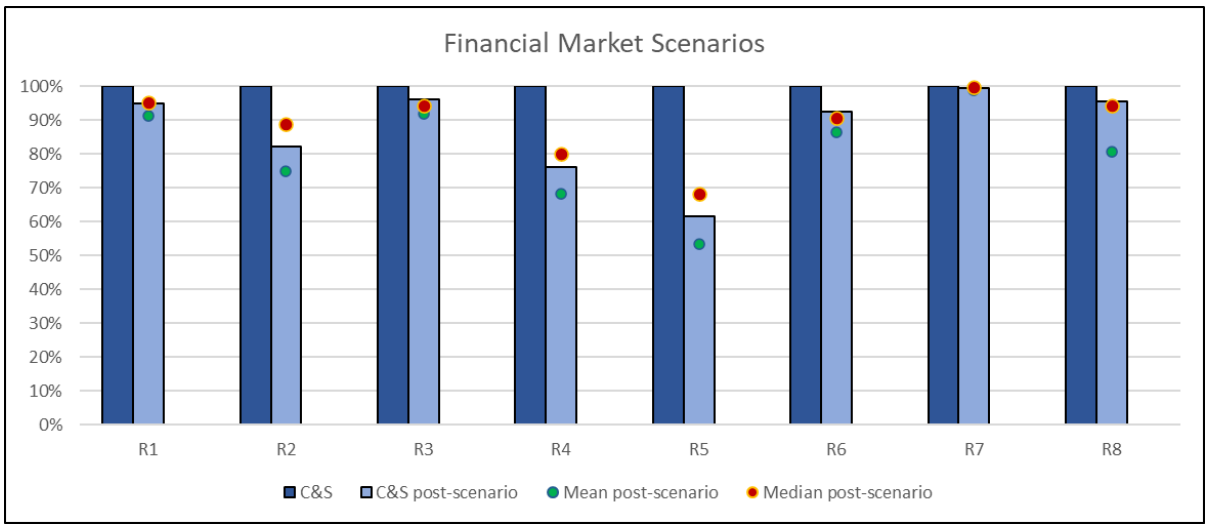
Financial Market Scenarios

The financial market scenarios, with R1 to R8 scenarios being the same as those applied to the Bermuda P&C market, comprise capital market-related single-factor shocks triggered by specific risk factors (i.e., equity returns, credit spreads and defaults). The calibration of these shocks is based on historical data about the evolution of interest rates, exchange rates and equity markets. Additionally, the financial market scenarios included the impact of haircuts on sovereign bonds to capital and surplus. These scenarios acknowledge continued stresses to global financial stability and sovereign risk concerns. The ongoing political risk and volatility of capital flows also warrant shocks on foreign currency positions.

Specifically, the insurer (depending on the insurer's exposure to capital market-related factors) was required to quantify the impact on its economic balance sheet from eight different financial market scenarios. Figure 5.1 shows the capital and surplus after the impact of various scenarios.

[7] An overview of the stress/scenarios carried out by long-term insurers can be found in the '2022 Capital and Solvency Return: stress/scenario analysis – Class E, Class D and Class C' published on the Authority's website.

Figure 5.1 Impact of Financial Market Scenarios R1 – R8 on Capital and Surplus



The figure above shows the percentage of starting capital (represented as 100% above for each scenario) and surplus remaining after the impact of the specific scenarios R1 to R8. The "C&S post-scenario" is the weighted average of each scenario. The figure also includes the simple mean and median (green and red dots) of capital remaining across the distribution of firm-level results in each scenario, providing additional insight into the distribution of results by scenario.

R1 – Severe Decline in Equity Prices: The stress test shows a decrease of 40.0% of the value of equities in a portfolio. This stress scenario is consistent with the Black Monday crash of 1987. If there are hedging instruments for equity exposures, their hedging result should be recorded separately. If hedging is done through replication strategies or continuous rollover of assets, this should be mentioned in the stress test result. Short positions are considered hedging positions. Material equity derivative positions should also be included in the test. The result of this scenario shows that the simple mean and median post-stress capital and surplus were 91.2% and 95.4%, respectively.

R2 – Alternative Investment and Real Estate: This stress is related to investment holdings in hedge funds, Insurance-linked Securities real estate, private placements, venture capital and other types of securities that cannot be characterised as equity, bonds, cash, foreign exchange or mutual funds in typical asset categories or participations to other corporations excluding venture capital. The usual characteristics of these assets are the low correlation with financial markets and the low or lower liquidity compared with other financial assets. Such assets should be decreased in value by 40.0%. For assets such as hedge funds with lockup periods, venture capital and real estate in illiquid markets, the insurer should report whether sudden decreases

in their value could entail an inability for rapid sale and whether this effect has material consequences. For **Level 3 Assets,** a shock of a 40.0% reduction in the value of Level 3 assets should be performed. If Level 3 assets can be found in alternative investments, real estate, equities or other categories, then those assets have to be reported and stressed separately. The result of this scenario shows that the simple mean and median post-stress capital and surplus were 74.8% and 89.0%, respectively.

R3 – Extreme US Yield Curve Widening: This stress refers to an extreme upward movement of the US yield curve. The insurer uses the risk-free yield curve for valuations of assets and liabilities. Corporates should be revalued as well assuming constant credit spreads. For assets and liabilities with durations longer than 30 years, assume a constant rate from year 31. The result of this scenario shows that the simple mean and median post-stress capital and surplus were 92.0% and 94.4%, respectively.

R4 – General Widening of Credit Spreads: Credit spreads widen across different rating classes. The widening reflects the increase of the perceived credit risk in the market. All positions, including those available for sale and held to maturity, should be stressed. Structured finance products, asset-backed securities, agency and non-agency MBSs must also be included. If there is no rating for an asset, the insurer must assume that the rating is 'Below BB'. CAT Bonds are treated as alternative investments and not as assets susceptible to credit spread changes. The result of this scenario shows that the simple mean and median post-stress capital and surplus were 68.2% and 80.0%, respectively.

R5 – Combine R1 to R4: Combine the extreme yield curve and the credit spread widening. This means that corporate bonds must be revalued using the risk-free curve, the prevailing credit spread over today's curve, plus the widening of credit spreads. Together with corporate bonds, sovereigns are to be shocked as well using the yield curve. The result of this scenario shows that the simple mean and median post-stress capital and surplus were 53.4% and 68.3%, respectively.

R6 – Foreign Currency Shocks: An equal percentage of depreciation and/or appreciation of foreign exchange positions in both assets and liabilities when these shocks reduce the value of assets and increase the value of liabilities. When an FX liability is passed on to the party claiming the liability, the shock can be excluded for such positions. The following table provides the percentage depreciations/appreciations. Hedging of FX positions should be reported separately, especially if hedging is done with roll-over strategies. The result of this

scenario shows that the simple mean and median post-stress capital and surplus were 86.5% and 90.8%, respectively.

R7 – Escalation of Sovereign Risk: In this test, we assume that the weakest sovereigns will have to undergo a haircut in the face value of their debt. Both available for sale and held to maturity bonds should be stressed. The result of this scenario shows that the simple mean and median post-stress capital and surplus were 98.9% and 99.7%, respectively.

R8 – Inflation and Monetary Policy Risk: Inflation risk stems from the general price increase. Inflation decreases the value of loans and debts, while it may increase the value of indemnities and claims. This stress test simulates a scenario like the 1973 inflationary scenario. The insurer should apply each inflation scenario (i.e., low, medium, high and severe) for three years, assuming no initial action to curb inflation from the Federal Reserve. In year four, the Federal Reserve changes its stance and increased rates to maintain the current real interest rate. Therefore, the reinsurer should raise the yield curve across maturities for one year by 510, 730 and 1,130 basis points, respectively, for the medium, high and severe inflation scenarios. From year five and onwards, inflation and interest rates return to current levels. All assets and liabilities are to be shocked. In case the insurer holds TIPS or other inflation-sensitive securities, these securities should be indexed to the inflation scenarios. The result of this scenario shows that the simple mean and median post-stress capital and surplus were 80.6% and 94.4%, respectively.

Liquidity Stress Test Scenario

The Authority recently added liquidity stress testing to its stress testing framework and the first full reporting is due in April/May 2024. The information box below provides background information on this stress.

Textbox 5.3 Background to the BMA's New Liquidity Stress Test Scenario

Commercial Long-term Insurers Liquidity Stress Test

Most long-term and annuity insurance liabilities are long-term in nature and as such it is often enough to rely on premiums, investment income and other sources for liquidity. However, demands for liquidity can become elevated under certain stress situations. Policyholder behaviour is one such source which can lead to mass surrenders. Although research shows long-term insurance mass surrenders are rare and therefore are usually treated as tail events in insurance regulatory capital frameworks, they have potential to erode the stability and predictability of future cashflows and hence negatively impact an insurer's liquidity position.

In the July 2023 Consultation Paper (CP2), i.e., the second consultation paper on regulatory enhancements, the BMA outlined a number of minimum expectations that companies exposed to liquidity risk should meet as part of a robust liquidity risk management programme. These included governance requirements, having cash sources and needs register as well as a liquidity buffer and applying scenario and stress testing, as well as requirements around reporting and monitoring. The BMA will therefore have close and ongoing supervision of liquidity as a risk area with a view to ensure long-term companies are embedding liquidity risk management in their day-to-day and strategic decisions (e.g., investment) as part of enhancing balance sheet resilience.

There is no single and complete way to assess liquidity risk as it can be company and scenario specific. However, it is often useful to have a common measure and it is in this spirit that the BMA has developed the market stress-mass lapse liquidity stress test. This is not meant to be a substitute for companies' own liquidity stress tests but rather to provide additional lenses of assessing the risk and build upon the companies' own stress and scenario analyses, which should be tailored to company specifics in line with the insurer's nature, scale and complexity.

Commercial Long-term Insurers Liquidity Stress Test (cont.)

Pilot

In June 2023, the BMA conducted a pilot study to obtain a view on the different sources of liquidity in the Bermuda market and how these were being used by companies. More than 50% of the long-term companies participated. The study showed that cash and cash equivalents were a common source across most companies, together with investment-grade fixed-income assets, mainly sovereigns and corporates. Some insurers expressed the view that liquid money market funds should be considered among the primary sources of liquidity. The study also revealed that insurers took a wide variety of approaches in managing liquidity risk. This is reflective of the diversity of the Bermuda market, the different types of products written and the risk management techniques in use.

While the BMA's pilot liquidity stress test was still being developed and remained open for further refinements, all participating companies showed adequate liquidity under the tested stress scenario, albeit to varying degrees. There were also several clarification questions raised by companies pointing to the need for enhanced instructions in completing the stress tests.

Next Steps

The BMA is working to refine the liquidity stress test, part of which is as outlined in CP2, by including additional sources of liquidity, e.g., covered bonds and tightening the constraints under which different sources can be used. The stress test will be implemented for year-end 2023 reporting. Insurers will be required to run both 1-in-20 and 1-in-200 stresses that combine both the asset and liability sides of the balance sheet. At a minimum, insurers are expected to have a liquidity coverage ratio greater than 105%. A supervisory assessment of the results of the stress tests will follow through supervisor-insurer engagements throughout the year. The results of the stress tests will also be published in the next iteration of this publication.

6. Future Enhancements

The Authority's risk-based supervisory approach involves the application of appropriate supervisory intensity to key areas of risk. It continually monitors trends and market developments, including evolving risks and business models, and adjusts its regime accordingly to international standards. Future reports will build on the data[8] and exhibits presented in this inaugural report, including, but not limited to:

- The addition of future reporting years providing more years of comparison
- Incorporating additional or new data from CSR enhancements, where possible
- Providing additional insights to asset holdings
- Providing additional insights to the stress test results
- Including quantitative data on the new liquidity stress test scenarios
- Considering new or enhanced stress test scenarios

[8] Subject to the availability and appropriateness of its use in macro-level analysis.