28 November 2019

2019 CAPITAL AND SOLVENCY RETURN

STRESS/SCENARIO ANALYSIS – CLASS E, CLASS D AND CLASS C

The Bermuda Monetary Authority (the Authority) requires Class E, Class D and Class C insurers[1] to conduct prescribed stress/scenario testing and analysis. The results are to be submitted to the Authority as part of the 2019 year-end Capital and Solvency Return.

The objective of stress testing within the 2019 year-end Capital and Solvency Return is to assess the capital adequacy of the insurers under adverse financial market and underwriting conditions and provides a comprehensive understanding of the sector's general vulnerability to shocks. More specifically, the purpose of the tests is to assess the impact of the losses, as determined using proprietary/vendor models, on the insurer's statutory balance sheet (i.e. statutory admitted assets, admitted liabilities, and capital and surplus). Thus, these tests help determine the financial capacity of insurer to absorb the manifestation of key financial risks, such as shocks to investment performance and projected losses arising from specific underwriting risks.

GENERAL INSTRUCTIONS

Measurement of impact: As noted above, the insurer is to provide the post stress/scenario positions of the expected impact and effects on both statutory assets and liabilities.

Accounting treatment: The insurer is to use the accounting standard ordinarily used for statutory reporting so that the pre-stress/scenario statutory capital and surplus can be reconciled to the insurer's 2019 year-end statutory balance sheet.

Timing of impact: The stress/scenario impact and effects reported are those that would be observed immediately upon the occurrence of the event (stress/scenario) as determined by the insurer's internal or vendor model(s) (both with and without the effect of reinsurance and/or other loss mitigation instruments).

Balance sheet date: The insurer is to run the stress/scenario tests based on its balance sheet position and aggregate in-force exposures as at 1 January 2020[2].

Reporting currency: All amounts reported with respect to the stress scenarios must be shown in the

[1] In this document, the terms "insurer" and "insurer's" include "reinsurer" and "reinsurer's", respectively.

[2] Where the fiscal year does not correspond to the calendar year, in-force exposures on the day following the fiscal year-end should be used rather than 1 January 2020.

Bermuda equivalent. In this regard, the Bermuda equivalent of an amount in foreign currency is an amount converted into Bermudian dollars at the rate of exchange used by any licenced bank in Bermuda in relation to purchases by that bank of that foreign currency on 1 January 2020 or the day after, provided that the rate of exchange of one US dollar will be deemed to be one Bermuda dollar.

Vendor and/or internal model descriptions: To assist the Authority with comparability, the insurer is to provide a description of the vendor model(s) used to perform the stress/scenario tests, identifying what model and version was used for each stress/scenario. The acquisition of a vendor package is not an obligation. Where an internal model is utilised, the description should also include information on the internal model's key assumptions and parameters.

Confirmation of no loss exposure: For instances where the insurer has no loss exposure to a particular financial market scenario(s), underwriting loss scenario(s) and/or has no Other Underwriting Loss Scenarios, the Authority has created a new section that allows for the confirmation that fields left blank/omitted are the result of no loss exposure.

A. FINANCIAL MARKET SCENARIOS

The financial market scenarios comprise capital market-related single factor shocks triggered by specific risk factors (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. Further, in light of continued sovereign risk concerns and its implications on the investment performance of insurers, the financial market scenarios include haircuts on sovereign bonds. The ongoing volatility due to political risk and also volatility of capital flows warrants shocks on foreign currency positions.

The insurer is to quantify the impact of the following stress events on its statutory balance sheet:

Stress Event	Interpretation
R1. Severe decline in equity prices	The stress test is a decrease of 40% 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.
R2. Alternative Investments and Real Estate	This stress is related to investment holdings in hedge funds, ILSs, real estate, private placements, venture capital and other types of securities that cannot be characterised as equity, bonds, cash, foreign exchange and mutual funds in typical asset categories or participations to other corporations excluding venture capital. Usual characteristics of these assets are the low correlation with financial markets and the low or lower liquidity compared with typical financial assets. Such assets should be decreased in value by 40%. For assets such as hedge funds with lockup periods, venture capital and real estate in illiquid markets, the (re)insurer should report whether sudden decreases in their value could entail inability for rapid sale and whether this effect has material consequences.

Level 3 Assets A shock of a 40.0% reduction in the value of level three assets should be performed. If level three assets can be found in alternative investments and real estate, equities or other categories, then those assets have to be reported and stressed separately.

R3. Extreme US Yield Curve Widening

This stress refers to an extreme movement upwards of the U.S. yield curve. The (re)insurer will use the following 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 of 5.0% from year 31.

Table 1 – Yield Curve (In Percent)

Year	1	2	3	4	5	6	7	8	9	10
	3.99	3.77	3.81	3.83	3.92	4.00	4.04	4.07	4.07	4.08
Year	11	12	13	14	15	16	17	18	19	20
	4.12	4.12	4.15	4.17	4.17	4.19	4.19	4.18	4.19	4.21
Year	21	22	23	24	25	26	27	28	29	30
	4.22	4.23	4.23	4.23	4.23	4.32	4.34	4.36	4.40	4.42

Source: BMA staff calculations and Bloomberg. Notes: This yield curve is a product of a bespoke BMA scenario generator. This yield curve represents the 99th percentile yield curve of all simulated paths of interest rates for each maturity.

R4. General widening of credit spreads

Credit spreads widen across different rating classes (see Table 2). The widening reflects the increase of the perceived credit risk in the market. The table summarises the shocks.

Table 2. Credit Spread Widening
In basis points

Rating Category					
AAA	**AA**	**A**	**BBB**	**BB**	**Below BB**
152.0	206.0	195.0	204.0	533.0	4,231.0

Source: BMA staff calculations and Bloomberg. Notes: The 99.9th percentile was used for all but two scenarios. For AAA we used the 99th percentile, for junk bonds (ratings Below BB) we used the 99.99th percentile. The spreads in these rating classes show high (for AAA) or low (for Below BB) variability compared to the intermediate rating classes. The 99th percentile would overestimate the reasonable stress scenario for AAA assets and it would underestimate a reasonable stress scenario for Below BB. We used the Moody's bond indices for ratings from AAA to BBB and the J. P. Morgan bond indices for BB and Below BB rating classes. The reference risk free rate was the 10-year U.S. treasury rate.

All positions including available for sale and held to maturity should be stressed. Structured finance products, asset-backed securities, agency and non-agency MBSs must be included as well. If there is no rating for an asset, the (re)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.

R5. Combine R1, R2, R3 and R4

Combine the extreme yield curve of table 1 and the credit spread widening of table 2. This means that corporate bonds have to be revalued using the risk-free curve of table 1, the prevailing credit spread over today's curve plus the widening of credit spreads in table 2. Together with corporate bonds, sovereigns are to be shocked as well using the yield curve in table 1.

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 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.

Table 3. Exchange Rate Shocks (*In percent)*

	EUR/USD	JPY/USD	GBP/USD	CHF/USD	AUD/USD	*Avg.*
Shock	16.1	22.7	33.7	21.6	25.3	23.8

Source: BMA staff calculations and Bloomberg. Notes: For currencies other than those indicated the average appreciation/depreciation (rightmost column) should be used. The scenario estimation horizon covers daily exchange rate movements from 2000 up to 2017. A GARCH(1,1) model was used to generate the scenarios. Due to Brexit the GBP/USD shock increased by considering the 99.9th percentile of projected depreciation.

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.

Table 4. Reductions in Current Value of Sovereign Bonds

	Time to Maturity				
	<1 year	**<3 years**	**<5 years**	**<7 years**	**>7 years**
Greece	100.0	100.0	100.0	100.0	100.0
Italy	50.0	50.0	50.0	50.0	50.0
Portugal	50.0	50.0	50.0	50.0	50.0
Ukraine	100.0	100.0	100.0	100.0	100.0
Argentina	50.0	50.0	50.0	50.0	50.0
Turkey	50.0	50.0	50.0	50.0	50.0

Source: BMA staff calculations and Bloomberg. The haircuts are based on the realization of a prolonged pan-European banking crisis in Europe which will cause sovereign defaults.

R8. Inflation and Monetary Policy Risk

Inflation risk stems from the general increase of prices. Inflation decreases the value of loans and debts while it may increase the value of indemnities and claims.

Simulate a scenario similar to the 1973 inflationary scenario. The (re)insurer should apply each inflation scenario (low, medium, high, severe) for three years assuming no initial action to curb inflation from the Federal Reserve. In year four the Federal Reserve changes stance and increases 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 scenario. From year five and onwards inflation and interest rates return to current levels. All assets and liabilities are to be shocked. In case that the (re)insurer holds TIPS or other inflation sensitive securities, these securities should be indexed to the inflation scenarios.

Table 5: Inflation Scenarios (In percent)	
Scenario	Inflation Rate
Low Inflation	2.7
Medium Inflation	5.1
High Inflation	7.3
Severe Inflation	11.3

Source: BMA staff calculations and Federal Reserve of Saint Louis. Each inflation scenario corresponds to the 50th, 80th, 90th and 99th percentile of the historical annual U.S. core inflation rates from 1957 until 2016.

B. MORTGAGE INSURANCE

The insurer is to quantify the impact of the following stress events on its statutory balance sheet:

Mortgage Loan Shock 1	Part 1 - (Re)insurers that write mortgage business are to shock their exposure for this business by increasing the default rate to 9.47% (equivalent to approximately 99.5% TVaR) for their mortgage book and applied instantaneously. Assets and liabilities subject to mortgage-related default risk should be shocked. If the 40% CPR produces capital gains, the insurer is to stress the CPR at 0%, 5% and 10%. The expectation is that if using a CPR of 40% produces a gain, then applying a substantially lower MBS prepayment shock rate of 10% or less will likely produce capital losses. If a registrant still reports capital gains even after applying the lower MBS prepayment rates, then the registrant should provide sufficient comments. Part 2 - (Re)insurers holding agency MBS and real-estate securities as investment assets subject to prepayment risk are to shock these investments by assuming that the MBS will prepay at an annual constant prepayment rate (CPR) of 40% instantaneously.
Mortgage Loan Shock 2	Part 1 - (Re)insurers that write mortgage business are to shock their exposure for this business by assuming the default rate to be 5.5% (equivalent to approximately 90.0% TVaR) for their mortgage book and applied instantaneously. Assets and liabilities subject to mortgage-related default risk should be shocked. Part 2 - (Re)insurers holding agency MBS and real-estate securities as investment assets subject to prepayment risk are to shock these investments by assuming that the MBS will prepay at an annual constant prepayment rate (CPR) of 40% instantaneously. If the 40% CPR produces capital gains, the insurer is to stress the CPR at 0%, 5% and 10%. The expectation is that if using a CPR of 40% produces a gain, then applying a substantially lower MBS prepayment shock rate of 10% or less will likely produce capital losses. If a registrant still reports capital gains even after applying the lower MBS prepayment rates, then the registrant should provide sufficient comments.

C. UNDERWRITING SCENARIOS

The insurer is to submit to the Authority three of its own underwriting loss scenarios and also use these in the calculation under Section V below. The insurer is to submit the following for each of the three scenarios:

a. Description of the scenarios and related key assumptions; and
b. The post stress/scenario positions on aggregate statutory assets and statutory liabilities that would be observed immediately upon the occurrence of the event (stress/scenario) (both with and without the effect of reinsurance and/or other loss mitigation instruments).

D. RATING DOWNGRADE

The insurer is to submit detailed qualitative disclosure of the impact upon both its statutory statement of income and liquidity positions of a ratings downgrade of its Bermuda legal entity by two notches or below A-, whichever is lower. The disclosure should cover and provide an indication of the relative impact/severity of collateral requirements, loss payment triggers on in-force policy contracts, claw-backs, and/or other adverse financial and liquidity implications of the downgrade.

Upon reviewing the disclosure, the Authority may request additional information relating to the liquidity impact and potential losses.

E. WORST-CASE ANNUAL AGGREGATE CATASTROPHE LOSS SCENARIO

The insurer is to submit the following:

1. A combination of a financial market scenario and three largest underwriting scenarios

The aggregate impact of:

a. A financial market scenario under Section A above which would result simultaneously in the occurrence of R5 ; and
b. An aggregation of the three net underwriting losses under Section III above.

It is assumed that the underwriting loss events follow in quick succession and there is the inability to engage in capital or other fundraising activities. Further, it is assumed that there is no geographic correlation between these non-economic events. The insurer is to disclose its assumptions, including any magnified demand surge, if applicable, from the multiple events.

2. Insurer specific worst-case scenario

The insurer is to submit a description of its own worst-case annual aggregate loss scenario and the underlying assumptions. The scenario should be at a level considered extreme but plausible by the insurer.

F. REVERSE STRESS TEST SCENARIO

If an insurer performs reverse stress testing (as outlined in the CISSA IX(b) question 2), then the insurer is to provide the key assumptions, which includes specific market risk scenarios, loss figures and return period that would cause such business failure. Such scenarios should be reported and should be contrasted

with the scenarios in the current guidelines, i.e. whether worse or better scenarios than those provided by the BMA cause the (reinsurance company to fail.

If the insurer does not perform Reserve Stress Tests, then insurers are to calculate the clearance between their available economic statutory capital and surplus and enhanced capital requirement (ECR) to determine the size of loss that would cause them to breach their ECR and provide the occurrence and relative return period of such event.

G. TECHNOLOGY RISK

All (re)insurers, including those that do not underwrite cyber risk, shall complete the questions in section VII Technology Risk– 'Insurer own cyber security and resilience capabilities'. Responses will be selected from the drop down list or typed in as required and relevant documents will be included indicating the document name and identifying the applicable page numbers.