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March 2024

TECHNICAL NOTE ON STRESS TESTING AND SYSTEMIC RISK ANALYSIS FOR INSURERS AND RETIREMENT FUNDS

This paper on Botswana was prepared by a staff team of the International Monetary Fund as background documentation for the periodic consultation with the member country. It is based on the information available at the time it was completed on January 18, 2024.

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TECHNICAL NOTE

STRESS TESTING AND SYSTEMIC RISK ANALYSIS FOR INSURERS AND RETIREMENT FUNDS

Prepared By

Monetary and Capital Markets Department

This Technical Note was prepared in the context of the Financial Sector Assessment Program in Botswana. It contains technical analysis and detailed information underpinning the FSAP's findings and recommendations. Further information on the FSAP can be found at http://www.imf.org/external/np/fsap/fssa.aspx

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Glossary

BoB	Bank of Botswana
BWP	Botswana Pula
FSAP	Financial Sector Assessment Program
FX	Foreign Exchange
IMF	International Monetary Fund
MCT	Minimum Capital Target
MoF	Ministry of Finance
NBFI	Non-Bank Financial Institution
NBFIRA	Non-Bank Financial Institutions Regulatory Authority
PCT	Prescribed Capital Target
RFA	Retirements Fund Act
ST	Stress Test
STeM	Stress Testing Matrix
TD	Top-Down (stress test)
TN	Technical Note
WEO	World Economic Outlook

EXECUTIVE SUMMARY

The FSAP mission conducted a risk analysis for large insurance companies and retirement funds. Building on the narrative of the adverse macrofinancial scenario also used in the banking ST, the focus of the analysis in the insurance sector was on solvency. Sensitivity analyses, e.g., interest rate and currency shocks and the default of the largest banking counterparty, complemented the analysis. For retirement funds, future pension values were modeled after a materialization of the adverse scenario in the first two years of the projection horizon. The sample comprised four life insurers, four short-term insurers and four retirement funds, with a market coverage between 80 and 95 percent in each sector. Incomplete reporting data complicated the top-down modelling, specifically with regard to the geographical breakdown of investments for insurers, and the valuation of insurance liabilities.

Insurers are resilient in the adverse scenario, but vulnerabilities exist with regard to concentrated exposures to domestic banks. In the adverse scenario, the impact on insurers' asset values is limited: For the median life insurer, assets decrease by 7 percent, while for some life insurers also liabilities—related to annuity business and unit-linked insurance—decline at a similar amount as assets. Shocks to domestic bond and equity prices contribute most to the decline in capital, while large cash holdings result in an overall low sensitivity to market risks in particular for short-term insurers, and the BWP depreciation increases the value of foreign assets. Overall, the adverse scenario, in isolation, does not cause any capital shortfalls. However, the concentration of deposits with individual domestic banks presents a significant transmission channel for systemic risk.

Retirement funds in Botswana are designed as defined contribution schemes, thereby effectively passing on investment risks to scheme members. Their asset allocation is rather growth-oriented with 68 percent invested in stocks, and 66 percent are invested abroad. The risk analysis therefore focused on future pension values, for representative members 10 and 30 years prior to retirement, instead of retirement funds' funding ratios.

The adverse scenario has a sizable impact on members with only few years to retirement, reducing future pension values by more than 15 percent compared to the baseline. The largest part of the decline stems from lower stock prices in the scenario. While for members with 30 years to retirement, the decline in pension values amounts to less than 5 percent, the result for members with 10 years—not being able to fully catch up after the shock—highlights the need for a switch of pre-retirement members to a more conservative asset allocation.

The new Retirement Fund Act, adopted in 2022, is very likely to impact the liquidity of retirement funds, calling for a robust liquidity management. The new Act provides more (lump-sum) withdrawal options for pension scheme members, thereby effectively transferring liquidity from pension funds to households, potentially compromising the ability to accumulate long-term retirement savings—already now, payments upon retirement account for only around 80 percent of all payouts, of these around 40 percent are paid as a lump-sum. These numbers differ considerably

between retirement funds, depending inter alia on the age and salary of members and the cyclicality of the employer's industry. Especially for smaller funds—and those where benefits already exceed contributions—a robust liquidity risk management will be critical. Furthermore, the Act also reduces sequentially the cap on foreign assets, raising questions about the capacity of domestic capital markets to absorb repatriated investments. Finally, effects of the new Act will be seen also in other financial sectors, e.g., in life insurers annuity business.

The risk analysis highlights the need for NBFIRA to substantially improve its data analytics and resources. The FSAP recommends a review of supervisory reporting templates, more robust processes to ensure complete and consistent reporting, and the implementation of a data management system which allows for horizontal and financial stability analysis. Further, authorities should conduct regular stress test of large insurers and retirement funds, and analyze risks stemming from concentrated bank exposures. In-house actuarial expertise is seen as a prerequisite for NBFIRA, as well as specific knowledge on reinsurance business and intensified cooperation with the home supervisors of local reinsurance subsidiaries. Regarding the new Retirement Funds Act, authorities should thoroughly analyze the impact on funds' liquidity and require liquidity risk management to be commensurate with expected withdrawals from its members.

Table 1. Botswana: Main Recommendations on Non-Bank Risk Analysis

Recommendation	Addressee	Timing*	Priority**
Data			
1. Ensure complete and consistent submission of reporting data (¶46)	NBFIRA	I-C	H
2. Introduce a data management system which allows for horizontal and time-series analysis (¶46)	NBFIRA	I-C	H
3. Review reporting templates and amend data items necessary for financial stability analysis (¶46)	NBFIRA	ST	H
4. Review reporting templates to align with IFRS 17 (¶46)	NBFIRA	MT	M
Risk Analysis			
5. Undertake a comprehensive impact assessment of the new Retirement Fund Act on the financial sector (¶45)	MoF, BoB, NBFIRA, FSC	I	H
6. Analyze impact of concentrated bank exposures and relevant transmission channels (¶47)	NBFIRA, BoB, FSC	ST	H
7. Conduct regular top-down stress tests for large insurers and retirement funds and feed results into the supervisory dialogue with firms (¶47)	NBFIRA	ST	M
Other			
8. Intensify cooperation with home authorities on the supervision of local reinsurance subsidiaries, and build up specialized knowledge about reinsurance business (¶38)	NBFIRA	ST	M
9. Establish a robust supervisory framework for liquidity risks of retirement funds and consider the use of liquidity buffers (¶44)	NBFIRA	I	H
10. Expand number of (experienced) actuarial staff at NBFIRA (¶48)	MoF, NBFIRA	I	H
11. Develop an understanding of the impact of IFRS 17 on life insurers business models and strategy (¶48)	NBFIRA	ST	M

* C = Continuous; I = Immediate (within one year); ST = Short Term (within 1-3 years); MT = Medium Term (within 3-5 years).

** H = High; M = Medium; L = Low.

INTRODUCTION[1]

1. This Technical Note analyzes systemic risks and vulnerabilities for insurance companies and retirement funds in Botswana. The analysis is part of the 2023 Financial Sector Assessment Program (FSAP) conducted jointly by the International Monetary Fund (IMF) and the World Bank. This note is based on a review of regulations, market analyses, and meetings with the Non-Bank Financial Institutions Regulatory Authority (NBFIRA) and the Bank of Botswana (BoB). The FSAP team also met with representatives from insurers, retirement funds, industry associations, and other private sector bodies. The work benefitted greatly from their readiness to discuss critical issues and share information.

2. The last FSAP in 2008 found data limitations which constrained a full analysis of financial risks for non-bank financial institutions (NBFI). The 2008 FSAP noted that "given the sizable cross-border investments of the pension funds, an underestimation of the risks in that area cannot be discounted". Accordingly, it recommended with regard to retirement funds to "expand the range of information collected […], such as foreign asset holdings, including 'non-traditional' assets" and for insurers to "collect and analyze statutory returns and analyze relevant information on solvency, detailed reinsurance, claims, and expenses".

3. NBFIRA was established as a supervisory authority in 2008 and supervises a wide range of different non-bank entities. Set up by the Non-Bank Financial Institutions Regulatory Authority Act 2006, NBFIRA regulates and supervises non-bank financial institutions, comprising insurance companies, retirement funds, collective investment undertakings, asset managers, investment advisors, microlenders, the securities exchange, custodians, finance and leasing companies, and others. As of March 2022, the authority had a staff of 89 and an annual budget of around BWP 80m—mostly funded through supervisory levies. In total, NBFIRA supervises the activities of around 800 entities.

NBFI MARKET STRUCTURE AND PERFORMANCE

A. Structure of the Non-Bank Financial Sector

4. The non-bank financial sector in Botswana is sizable, accounting for around 57 percent of the domestic financial system assets at end-2021. Assets of the sector amount to BWP 153bn (up from 115bn in 2016), or 78 percent of GDP. The largest sub-sector is formed by retirement funds, which hold accumulated balance sheet assets of BWP 110bn, thereby even exceeding the size of the banking sector by a small margin (Table 2). Given their size, retirement funds—and, to a lesser extent, also life insurers—are important players in the domestic financial system and highly

[1] The main author of this note is Timo Broszeit, IMF external expert on insurance and pension fund regulation and stress testing.

interconnected with other domestic entities. In addition, the large insurers are interconnected within the region, most of them being subsidiaries of South African insurance groups.

5. While the NBFI sector in Botswana encompasses a large number of very heterogenous entities, the risk analysis in the remaining part of this Technical Note will focus on insurance companies and retirement funds. As of end-2021, NBFIRA supervised a total of 812 entities, including 87 retirement funds, 9 life insurers, 12 short-term (life) insurers, and 5 reinsurers. Risks among these entities are very diverse, rendering it difficult to model or quantify the overall risk for the entirety of the NBFI sector. The following sections elaborate more in detail on the insurance sector (life and short-term) and the retirement funds—the focus of the risk analysis is thereby primarily on market and credit risks.

Table 2. Botswana: Size and Structure of the NBFI Sector

Botswana's financial sector is dominated by retirement funds and commercial banks: Assets of each sector correspond to around 56 percent of the GDP.

	Number of institutions (31 Dec 2021)	Assets (31 Dec 2021)			Assets (31 Dec 2016)
		in BWP billions	*in percent of financial sector assets*	*in percent of GDP*	*in BWP billions*
Banking sector	**13**	**117.0**	**43.3**	**59.9**	**88.3**
Commercial banks	10	108.6	40.2	55.6	80.7
Statutory banks	2	4.5	1.7	2.3	3.9
Building societies	1	3.8	1.4	1.9	3.8
NBFI sector	**799**	**153.0**	**56.7**	**78.3**	**114.8**
Microlenders 1/	97	7.6	2.8	3.9	3.9
Life insurance	9	18.4	6.8	9.4	19.3
Short-term insurance	12	2.6	1.0	1.3	1.9
Reinsurance	5	0.7	0.3	0.4	0.2
Retirement funds	87	110.0	40.7	56.3	75.1
Investment funds 2/	n.a.	11.1	4.1	5.7	7.5
Others 3/	589	2.6	1.0	1.3	6.9
Total	**812**	**269.9**	**100.0**	**138.2**	**203.2**

1/ Reporting micro lenders only.
2/ "Investment funds" comprise only assets managed on behalf of retail and private clients.
3/ "Other" comprise own company assets for non-reporting micro lenders, medical aid funds, insurance intermediaries, securities brokers, the stock exchange, the central securities depository, asset managers and management companies, finance and leasing companies.

Sources: BoB, NBFIRA, and IMF.

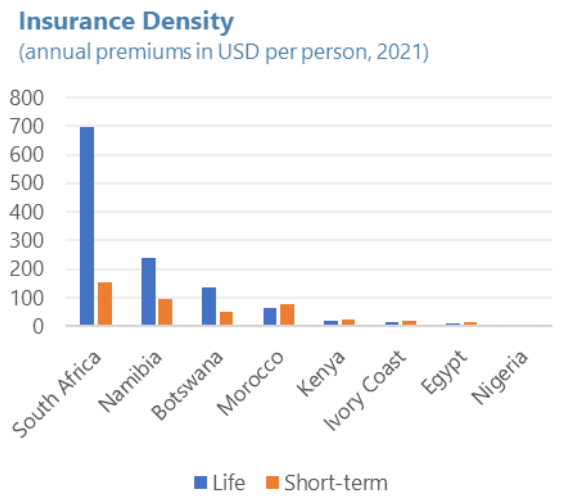
B. Insurance Sector

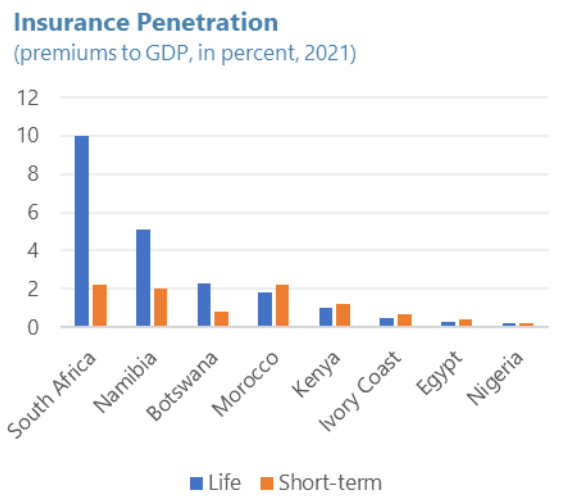
6. Compared to peers in the Southern African region, Botswana's insurance sector is smaller, but still considerably larger than in other countries on the continent. The insurance density, which measures average annual premiums per person, reached USD 186 in 2021, of which USD 136 were life insurance premiums and USD 50 were generated in short-term (non-life) insurance. In the life sector, South Africa and Namibia generate USD 698 and USD 241, respectively, and also short-term premiums are higher than in Botswana. The insurance penetration—premiums in percent of the GDP—amounts to 2.3 percent in the life and 0.8 percent in the non-life sector, also below the respective numbers in South Africa and Namibia.

Figure 1. Botswana: Insurance Density and Penetration

In Botswana annual life insurance premiums amount to USD 136 person on average, and short-term insurance premiums to USD 50.

The insurance density amounts to 2.3 and 0.8 percent in the life and the short-term sector, respectively—similar to the insurance density, these numbers are lower than in South Africa and Namibia.





Source: IMF staff calculations based on Swiss Re Sigma and NBFIRA.

7. Life insurance business in Botswana is relatively traditional, highly concentrated, and growth has slowed down in recent years (Figures 2a and 2c). Life insurance mostly comes in the form of funeral insurance or as credit life insurance, similar to other markets in the Southern African region. In addition, the largest life insurer also maintains a large annuity book, funded through pension savings, as only few retirement funds pay out pension annuities directly to retirees and most transfer the accumulated savings to an annuity provider. The concentration among the nine life insurers is very high, and the three largest entities hold a combined market share of more than 90 percent. In total, gross written life premiums amounted to BWP 4.4bn in 2021, and have increased on average by 6.9 percent per year since 2016. The retention rate is very high, and only around 3 percent are ceded to reinsurers.

8. Most short-term insurers have built up a rather diversified business mix and record modest growth rates (Figures 2b and 2d). In 2021, short-term insurers wrote BWP 1.6bn in gross premiums—growing on average by 4.6 percent per year since 2016. The largest lines of business are property and motor with 32 percent and 29 percent of gross written premiums, respectively. The sector is less concentrated than the life segment: Based on premiums, the three largest entities (out of twelve) hold a market share of 69 percent. Typical for the short-term sector is a retention rate which is considerably lower than in the life sector: In 2021, short-term insurers retained 55 percent of their business, well below the average value of the previous years (63 percent for 2016–20).

9. The reinsurance market has expanded recently, driven by foreign market participants, and fostered by regulatory requirements for primary insurers to reinsure domestically. In 2021, reinsurers wrote premiums of BWP 466m, up from BWP 175m five years earlier. Two new reinsurers have entered the market since 2020, raising the total number of firms to five. All reinsurers are subsidiaries of foreign groups, four of them being headquartered in Zimbabwe and one in Nigeria. Batswana insurance regulation determines that if primary insurers cede business, they have to contract with domestic reinsurers—only in case the domestic market does not provide sufficient capacity, business can be ceded to foreign reinsurers after having received approval from NBFIRA.

10. The large majority of insurers are subsidiaries of international groups and often have significant interlinkages with related entities within the same group. Many groups are cross-sectoral, offering banking, insurance and asset management services, although not necessarily in all countries where they are active. Distribution of insurance services in Botswana, both in the life and the short-term sector, relies to a large extent on insurance brokers and agents, which account for about 60 percent of total premiums—associated banks within the same financial group are an important channel. As of March 2022, 144 insurance agents and 58 insurance brokers were active and licensed by NBFIRA.

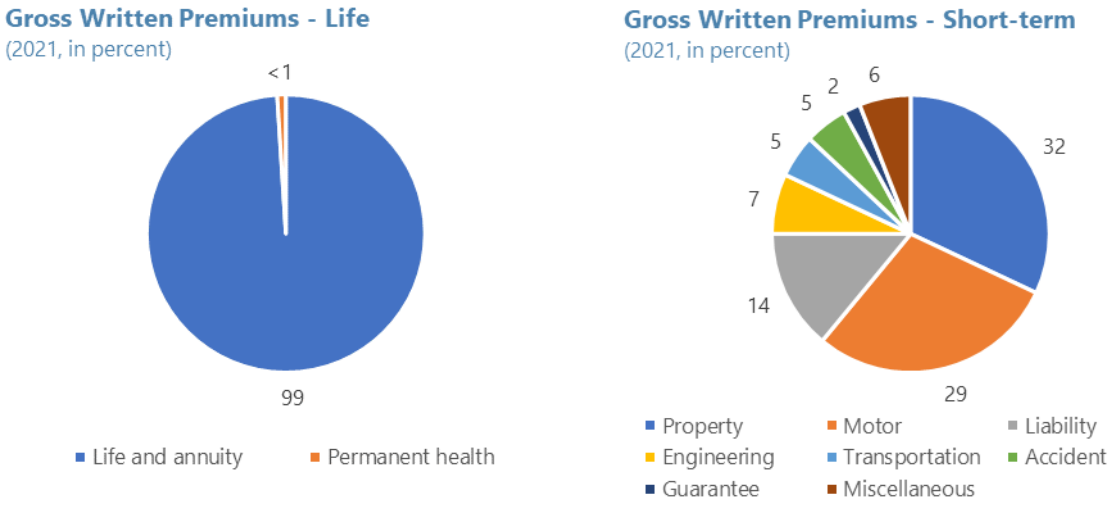
11. The investment asset allocation of insurers is characterized by large bond holdings in the life sector, and a very high share of cash and deposits in the short-term sector (Figure 3). Life insurers hold on aggregate 27 percent of their assets in government bonds, and another 22 percent in corporate bonds; 13 percent are held in shares and 26 percent in unit-linked assets. However, these numbers are somewhat distorted by two major firms which are active in the annuities business—such activities require a more long-term investment strategy, while other life firms maintain an asset allocation which is geared even more towards bonds and deposits. Short-term insurers hold almost two thirds of their assets in cash and deposits, effectively reducing their exposure to market risks.

12. Further analysis is limited by the availability of supervisory reporting data. The supervisory reporting for insurers does not provide a detailed breakdown of investments into domestic and foreign assets—only certain large foreign exposures are reported, but typically unstructured and potentially incomplete. The reporting does furthermore not allow for a comprehensive analysis of credit risks (e.g., through a reporting of credit ratings) or asset-liability risks (e.g. through a reporting of remaining maturities or durations of fixed-income instruments).

Figure 2. Botswana: Premium Income of Insurers

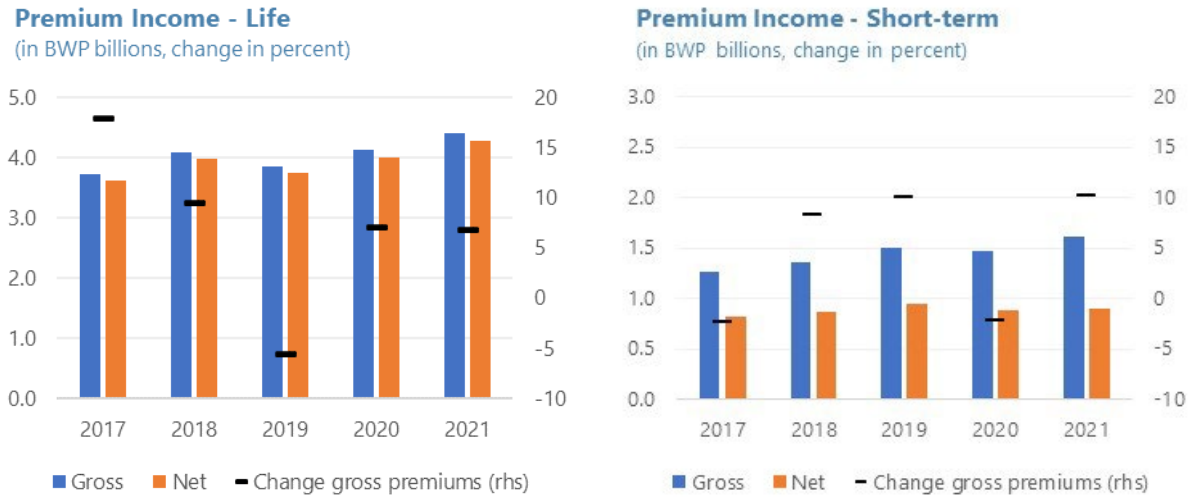
Life insurance business is very traditional and almost exclusively covering life and annuities, while permanent health insurance contributes less than 1 percent of total gross written premiums.

In the short-term sector, almost one third of gross premiums stems from property insurance, and another 29 percent is related to motor insurance.



Gross written life premiums have reached BWP 4.4bn in 2021, growing by almost 7 percent p.a. since 2016.

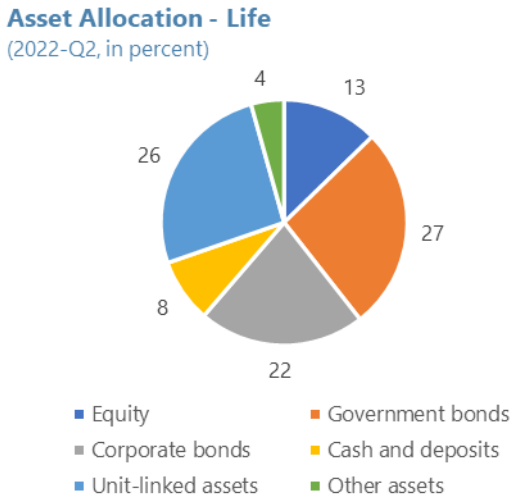
In the short-term sector, gross written premiums amounted to BWP 1.6bn in 2021.



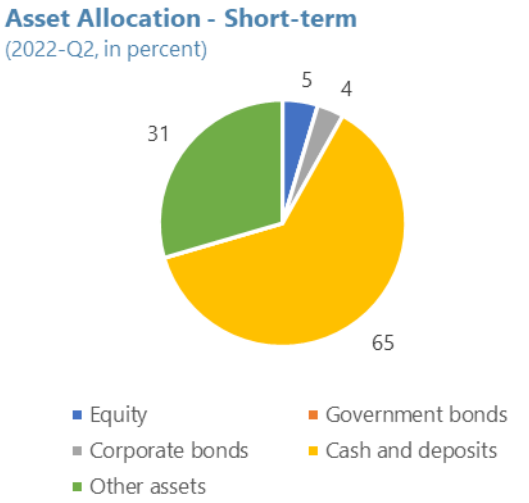
Source: NBFIRA.

Figure 3. Botswana: Asset Allocation of Insurers

Life insurers invest almost half of their assets in bonds and another 13 percent in equity. 26 percent of assets back unit-linked insurance policies.



Assets of short-term insurers are largely composed of cash and deposits (65 percent). Longer-term investments like equity and bonds represent less than 5 percent each.



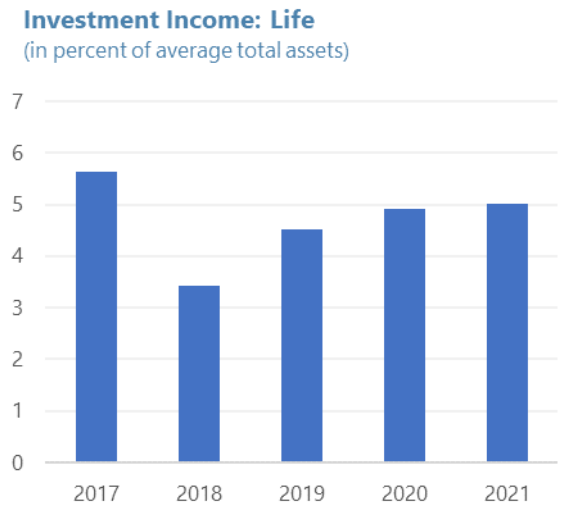
Notes: Stress test participants only.
Source: IMF staff calculations based on NBFIRA data.

13. Profitability of the insurance sector is only moderate, but overall rather stable (Figures 4a–c). Life insurers' profits are highly dependent on investment income, which has been at 5 percent as share of total assets in both 2020 and 2021. However, with falling equity and bond markets, the investment return is expected to be lower in 2022. Increased mortality during the COVID-19 pandemic has resulted in a substantially higher net claims for life insurers which increased in 2021 by 43 percent compared to the previous year. In the short-term sector, underwriting results are the major component of overall net income. The combined ratio—claims payments and expenses, divided by premiums—remained below 100 percent for the last four years, amounting to 96 percent in 2021. The pandemic caused a more favorable claims developments in the short-term sector, particularly during the lockdowns in 2020 when lower mobility caused fewer claims in motor insurance. Finally, in the reinsurance sector, the combined ratio is significantly more volatile, reaching 82 percent in 2021, but fluctuating between 74 percent and 115 percent in the five years prior to that.

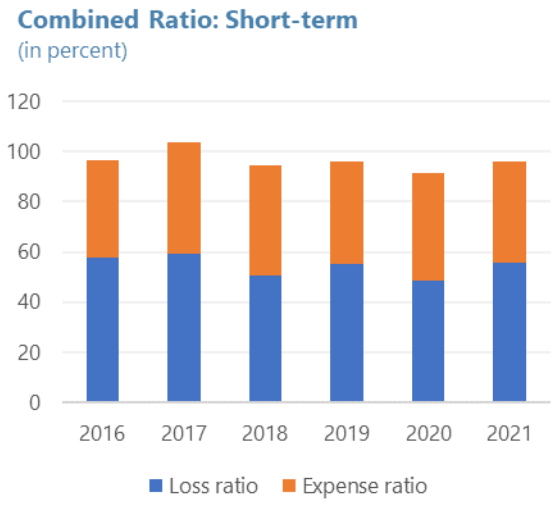
14. Capital ratios have been very stable in the life insurance sector, but declining and more volatile over the last five years among short-term insurers and reinsurers (Figure 4d). The average capital ratio, defined as shareholder equity to assets, in the life insurance sector has been very stable at around 16 percent for the last four years. Short-term insurers' capital ratios have been declining since 2016, but with 30 percent in 2021, they are still significantly higher than in the life sector—a result of a more volatile risk profile. The more risk-based solvency ratios based on the prescribed capital target are not published.

Figure 4. Botswana: Insurers' Profitability and Solvency

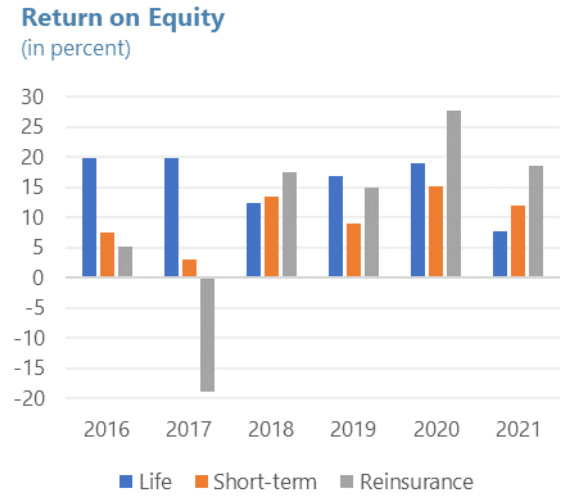
Investment returns of life insurers have been stable since 2017, between 3 and 6 percent, and amounting to 5 percent in 2021.



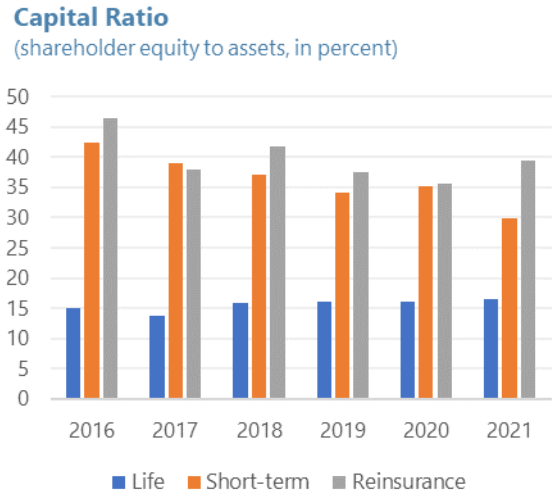
Short-term insurers are profitable in their underwriting with combined ratios typically below 100 percent. Loss ratios are even below 60 percent, while expense ratios are relatively high.



Between 2016 and 2021, life insurers achieved an average return on equity of 16 percent, while the averages for short-term insurers and reinsurers were 10 and 11 percent, respectively.



Capital ratios have been very stable in the life insurance sector, at around 16 percent. For short-term insurers and reinsurers, the ratios declined since 2016, but are still significantly above those of life firms, mainly due to their more volatile risk profile.



Source: IMF staff calculations based on NBFIRA data.

C. Retirement Funds

15. Retirement funds in Botswana are almost entirely defined-contribution schemes, hence the investment risk is borne by fund members. Contributions have increased from BWP 3.8bn in 2016 to BWP 5.6bn in 2021 (plus 50 percent), and 69 percent were paid by employers (Figure 5a). As of December 2021, retirement funds recorded 293,015 active members (i.e., 59 percent of the working population), 51,806 deferred members, and 13,187 pensioners. The number of deferred members has increased substantially in 2021, from just around 18,000 at the end of the previous year.

16. The retirement funds sector is very heterogenous, dominated by very few large players and a large number of small funds. The four largest funds account for 81 percent of the market, based on balance sheet assets. Among these four large funds, three are single-employer funds, including the largest one, the Botswana Public Officers Pension Fund, and one retirement fund serves multiple employers across different economic sectors. Thirty-one funds recorded less than 200 members as of end-2021, and 37 funds managed less than BWP 100m.[2] While there has not been any notable consolidation in the market recently—on the contrary, the number of retirement funds has increased from 89 in 2017 to 92 in 2021—some reduction in the number of funds appears likely going forward.

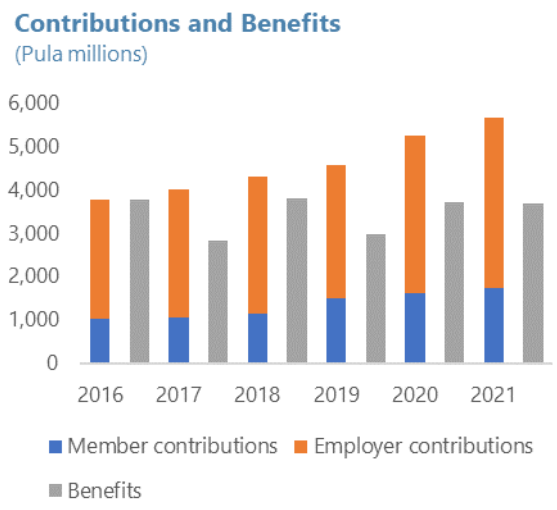
17. Investments are very growth-oriented with large holdings in stocks, and assets are mostly foreign (Figure 5c). Given the limited capacity of the domestic capital market, the retirement funds have built up a sizable portfolio of foreign assets, also as an attempt to curb concentration risks and domestic interlinkages. Still, domestic shareholdings correspond to about 52 percent of the Batswana stock market capitalization (domestic firms only), and retirement funds also hold about 44 percent of outstanding domestic bonds. Currency risks resulting from foreign-denominated assets are almost entirely unhedged. Investment income is very volatile given the market valuation of large parts of the asset portfolio and the use of a definition for investment income which includes unrealized gains and losses. In 2021, funds recorded a record investment income of BWP 17bn (translating into an investment return of 15.1 percent), mainly a base effect as financial markets were bottoming around the fiscal year-end 2020 and strongly recovered afterwards (Figure 5b).

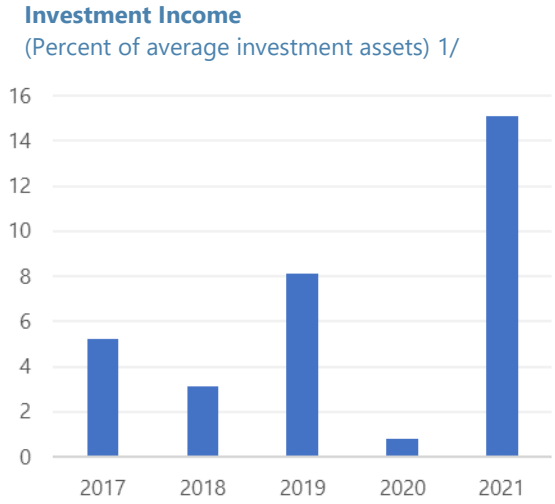
[2] For an additional 12 funds, no data was available for at least one of the used indicators—some of them might also fall below the above-mentioned thresholds.

Figure 5. Botswana: Retirement Funds—Key Indicators

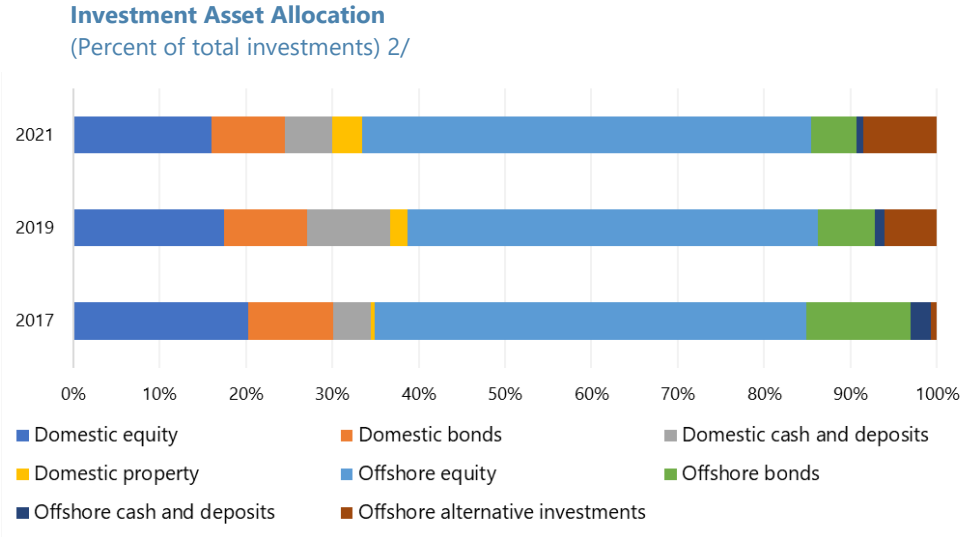
Contributions have increased by around 8 percent per year since 2016, and the split between members and employers is about. Benefits have fluctuated considerably, but overall have not changed significantly since 2016.

Investment income of retirement funds is extremely volatile given the valuation regime for assets: Unrealized gains and losses are included, leading to massive decline in 2020 and a rebound in 2021 when investment income reached BWP 17bn.





Investments are very growth-oriented. Allocations to domestic equity have slightly decreased since 2017, similar to offshore bonds, while offshore alternative investments have expanded, accounting now for almost 9 percent. With 52 percent of total assets, offshore equity is the dominant asset class.



1/ Investment income also includes unrealized gains and losses.
2/ Domestic equity includes exchange-traded funds and unlisted equity. Offshore equity includes dual-listed equity.

Source: IMF staff calculations based on NBFIRA data.

STRESS TEST METHODOLOGY

18. The FSAP conducted a risk analysis of large insurance companies and retirement funds. The top-down ST relied on the narrative of the adverse macrofinancial scenario also used in the banking ST, with some granularity added for the market shocks. Sensitivity analyses, e.g., interest rate and currency shocks and the default of the largest banking counterparty, were utilized to complement the analysis. While the focus of the analysis in the insurance sector was on solvency, for retirement funds future pension values were projected over a longer horizon.

A. Scope and Sample of the Stress Test

19. A top-down (TD) solvency stress test was performed for four large life insurers and four short-term insurers, on a solo-entity basis.[3] This resulted in a market coverage of 93 percent in the life sector, based on assets, and 77 percent in the short-term sector, based on gross written premiums. The participants' aggregated balance sheet assets amount to BWP 18.2bn, of which 17bn stem from the four life insurers (Table 3).

20. The four retirement funds which were included in the sample are all defined contribution and cover 81 percent of the market, based on assets. One of the funds is a multi-employer umbrella fund, while the other three are only covering one employer, a group of connected companies, and the public sector. In total, balance sheet assets of the four participating entities amount to BWP 100bn.

Table 3. Botswana: Stress Test Sample

The stress test sample is characterized by very heterogeneously sized entities, specifically in the life insurance sector and among retirement funds.

	Life insurance	Short-term insurance	Retirement funds
Average balance sheet assets (BWPm, 2022-Q2)	4.238	315	24.953
min-max	298 - 13.545	129 - 452	1.022 - 86.323
Average gross written premiums (BWPm, 2021)	1.060	318	--
min-max	153 - 3.145	162 - 543	--
Average contributions (BWPm, 2021)	--	--	1.141
min-max	--	--	57 - 3.834
Average number of members (2022-Q2)	--	--	55.831
min-max	--	--	698 - 164.633

Source: IMF staff calculations based on NBFIRA data.

[3] For a summary of the stress testing approach, refer to the Insurance Stress Testing Matrix (STeM) in Appendix II.

B. Scenarios for the Solvency Stress Test

21. The adverse macrofinancial scenario which was used for the stress test reflects a stagflationary environment. It is characterized by high inflation, mainly through higher and more volatile food and energy prices, and an increase in commodity price as a spillover from the war in Ukraine. According to the narrative of the scenario, central banks globally adopt a tighter monetary policy to maintain price stability. Employment declines due to economic slacks, and the diamond price—crucial for Botswana's trade account—decreases due to lower demand in a global slow-down. The Pula depreciates due to higher inflation domestically relative to trading partners.

22. The adverse scenario as described above was adjusted for the purpose of the NBFI stress test. While the scenario is highly relevant also for non-banks, some adjustments were made to make the scenario directly applicable to the balance sheets of insurers and retirement funds. Contrary to the scenario which projects macro and market variables for the next three years, for the insurance stress test all shocks were assumed to occur at the beginning of the first year (instantaneous shock). Market shocks, such as declines in equity and property prices, have therefore been front-loaded so that the maximum drawdown during the projection horizon of the macrofinancial scenario is realized immediately after the reference date (30 June 2022). For retirement funds, the timing of the stress is more aligned with the banking sector ST given the longer-term projection horizon and spreads out the market shocks over the first two years.

23. To cover the most relevant risk factors for an insurer's balance sheet, specifically the market risk stresses have been defined more granularly. The scenario includes shocks to bond prices, equity and property prices, as well as the external value of the Pula (Table 4).

Table 4. Botswana: NBFI Stress Test Specification

			Stress (in percent)
Equity	Domestic		-25.1
	Offshore, advanced economies		-28.7
	Offshore, emerging markets		-25.1
Bonds	Domestic	Short-term (~1-3 years)	-9.2
		Long-term (~5-10 years)	-7.3
	Offshore		-15.0
Property			-15.0
Currency	External value of BWP against USD, EUR, GBP [1/]		-20.6

1/ Negative value means a depreciation of the BWP.
Sources: IMF staff.

24. Additional sensitivity tests, which assumed single-factor shocks, were utilized to complement the stress test:

- Currencies: Increase of the BWP external value by 10 percent;
- Equity: Decline of domestic and foreign equity prices by 40 percent;
- Counterparty risk: Default of the largest banking counterparty.

The results of these sensitivity analyses were not added to the result of the adverse scenario.

C. Capital Standard and Modeling Assumptions

25. The current valuation regime and the prescribed capital target (PCT) were introduced in Botswana in 2012 and form the basis of the insurance stress test. As a general principle, most assets are valued mark-to-market, exceptions exist for the valuation of group undertakings.[4] For liabilities, no detailed valuation method is prescribed, further specifying the use of "best-estimate valuation assumptions, adjusted by compulsory margins and possibly also by discretionary margins".[5]

26. IFRS 17 is being implemented mainly by the larger insurers which are subsidiaries of international groups, while authorities have not yet adopted a strategy on how to embed IFRS 17 in a future prudential regime. For the time being, this implies a parallel regime of prudential valuation and accounting valuation according to IFRS. Going forward, life insurers could potentially adjust their business models, using IFRS figures as parameters for their management, and adopt changes, e.g., to product design, pricing, management of asset-liability risks, or asset allocation.

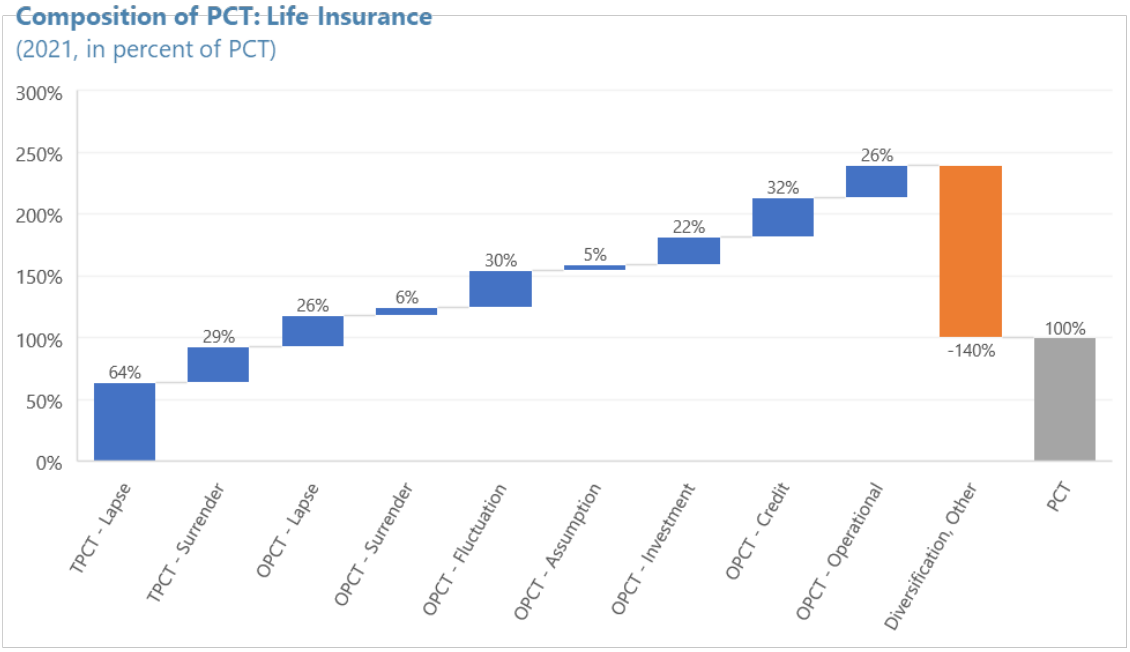
27. The solvency regime is to some extent risk-based, but could potentially benefit from a review. The methods for calculating the capital requirements are very different for life insurers and short-term insurers, which is partly due to different (underwriting) risks being covered in each methodology, but even for common risks like market risks the methodologies differ. The capital requirement for short-term insurers does not include a module for operational risks, and for both sectors an explicit requirement for asset concentration risk—including counterparty concentration—is missing. Reporting data on the composition of the PCT is only available on an annual basis. For the stress test which uses 30 June 2022 as the reference, the composition of the mid-year PCT was assumed to be the same as at end-2021.

[4] Insurance Prudential Rules IPR2L: Prescribed Valuation Method for Long-Term Insurance Assets

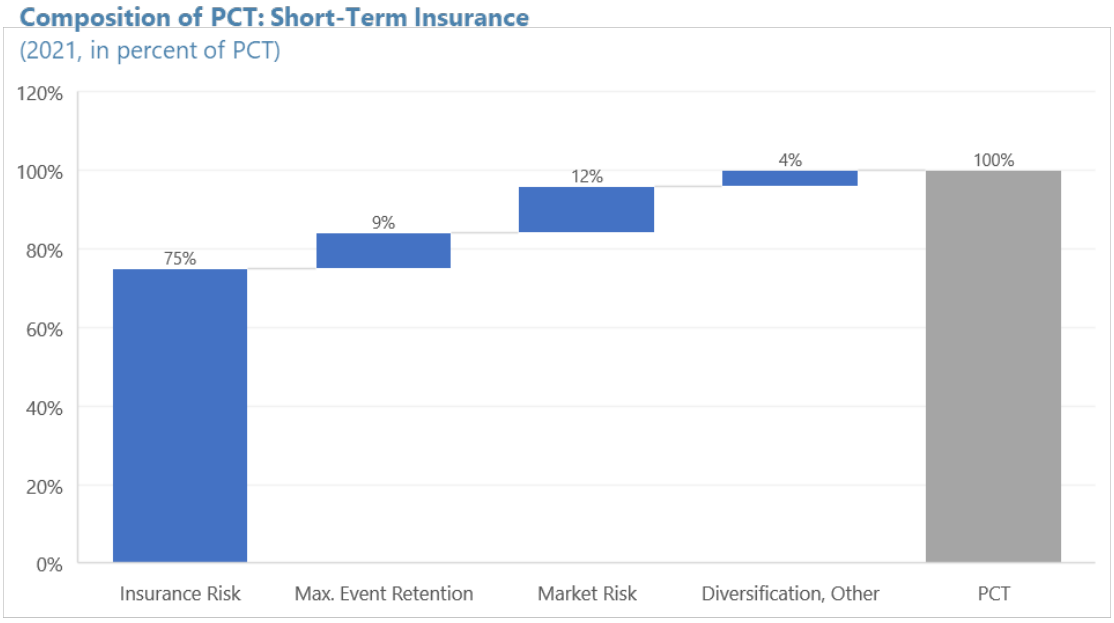
[5] Insurance Prudential Rules IPR1L: Prescribed Valuation Method Long-Term Insurance Liabilities

Figure 6. Botswana: Insurers' Composition of the Prescribed Capital Target

The largest component in the PCT of life insurers is the Lapse Capital Target as a component of the Termination Capital Target (64 percent of the final PCT after diversification). The Investment Capital Target accounts for only 22 percent, reflecting to some extent a rather conservative asset allocation of some insurers in the sample.



For short-term insurers, the largest component is the insurance risk (75 percent). Diversification between modules is not relevant for most firms in the sample.



Notes: Stress test participants only.

Source: IMF staff calculations based on NBFIRA data.

28. The main output of the insurance stress test calculations is the effect on the excess of assets over liabilities, eligible for the coverage of the PCT. Haircuts in line with the adverse scenario were applied to the respective asset classes, within the limitations of the less granular asset reporting currently in place. On the liability side, the interest rate shock is only applied for the life insurers (separate for annuity and non-annuity business), as short-term insurers do not discount their future cash flows—hence their liability valuation is impacted by interest rate changes. For unit-linked business, the decline in liabilities mirrored the market value loss of underlying assets. The difference between post-stress assets and post-stress liabilities is used as a proxy for available capital.

29. As the stress also affects the capital requirement, the PCT was partly recalculated after stress. For this purpose, only the component reflecting market and investment risks was proportionally adjusted to account for any reductions in exposures caused by the materialization of the adverse scenario.

30. Data for the TD solvency stress test was gathered from annual and quarterly prudential reporting. Mainly the following templates were used:

- Balance sheet: Annual statements 3.1 and 7.2 (life insurers), 3.3 and 6 (short-term insurers) and 4.6 (retirement funds); quarterly statements A (life and short-term insurers), and "Balance sheet" (retirement funds);
- Composition of the prescribed capital target: Annual statements 3.2 (life insurers) and 8 (short-term insurers); quarterly statements A (life and short-term insurers);
- Sensitivity analysis for bank counterparty default: The largest counterparty was determined based on investment asset data as reported in the annual supervisory reporting (Tables 5.1–5.5 for life insurers, and 6.1–6.5 for short-term insurers). These reporting templates lack a cumulative exposure towards a counterparty across different classes. Hence, the counterparty exposures could only be included if the counterparty is listed among the largest individual exposures.

31. Insurers have a broad range of risk-mitigating mechanisms in place which cannot be fully captured in a TD stress test, and potential reactive management actions were not modeled in the stress test. Data granularity of the supervisory reporting does not allow for a very granular modelling of the impact of an adverse scenario on the assets and liabilities of a retirement fund. In particular, hedging through derivatives—though only rarely used among insurers—cannot be modeled due to missing reporting data on such instruments. In addition, de-risking the investment allocation, changes to the reinsurance program, or dividend cuts are measures which could relatively easily be adopted by an insurers' management in order to restore solvency after the materialization of stress.

STRESS TEST RESULTS – INSURANCE

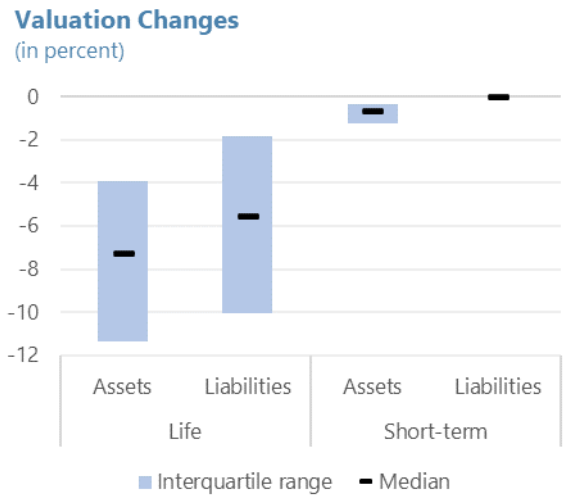
A. Results of the Solvency Stress Test

32. The results of the stress test need to be interpreted against the heightened market volatility observed during February/March 2022 following the war in Ukraine. As stock markets and bond markets have deteriorated in 2022, asset values and available capital of some insurers as of end-2022 are expected to be lower than in the prior year.

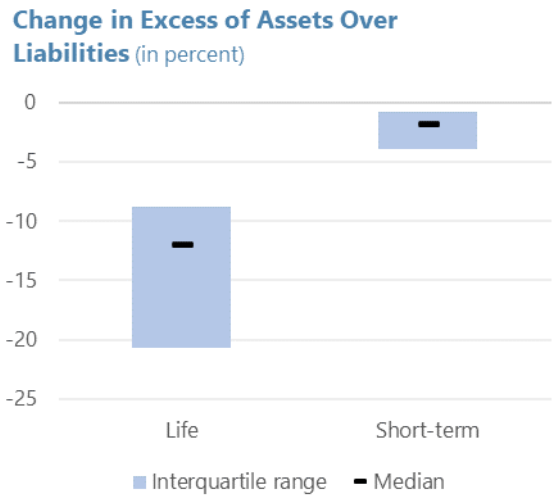
33. The valuation impact on assets and liabilities is considerably more pronounced in the life insurance sector, while short-term insurers are rather immune to the market shocks of the adverse scenario (Figure 7). In the adverse scenario, the impact on insurers' asset values is limited: For the median life insurer, assets decrease by 7 percent, while for some life insurers also liabilities—related to annuity business and unit-linked insurance—decline at a similar amount as assets. In the short-term sector, the median decline in asset values amounts to only 1 percent. The excess of assets over liabilities shrinks by 12 percent for the median life insurer, and by 2 percent for the median short-term firm. Especially in the life sector, variations across firms are quite large, reflecting the heterogeneity in business models and the resulting differences in the asset allocation as well as in asset and liability durations.

Figure 7. Botswana: Insurance ST—Valuation Impact

The value of life insurers' assets decline by between 4 and 12 percent for half of the sample, but also liabilities decrease by an almost equal amount. Asset values of short-term insurers decrease by only 1 percent.



The excess of assets over liabilities shrinks by 12 percent for the median life insurer, but with large variations across the sample. In the short-term sector, the decline amounts to only 2 for the median firm.



Source: IMF staff calculations based on NBFIRA data.

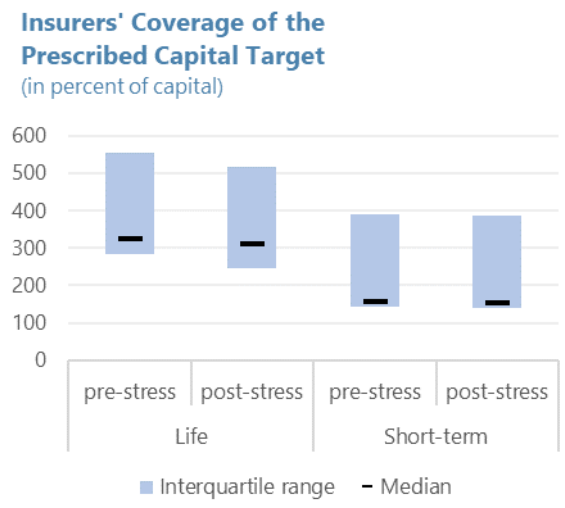
34. In terms of solvency levels, insurers are broadly resilient under the adverse scenario (Figure 8a). Overall the adverse scenario, in isolation, does not cause any capital shortfalls. Compared to the pre-stress levels, the median life insurer in the sample, the ratio declines by 12 percentage points, from 325 percent to 313 percent—while the 25th and the 75th percentile decline each by around 40 percentage points. In the short-term sector, the effect of the adverse scenario is almost negligible, and the solvency ratio of the median firm decreases by only 2 percentage points to 155 percent.

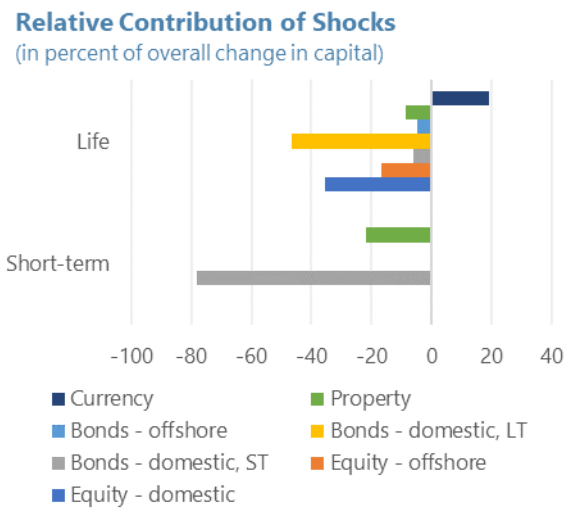
35. Shocks to domestic bond and equity prices contribute most to the decline in capital, in total 89 percent of the net overall change in life insurers' capital (Figure 8b). A major compensating factor in the life sector is the assumed BWP depreciation which increases the value of foreign assets. Large cash holdings result in an overall low sensitivity of short-term insurers to market risks. For them, 78 percent of the capital reduction stems from the shock on short-term domestic bonds, and the remainder from property exposures.

Figure 8. Botswana: Insurance ST—Solvency Impact

Solvency ratios decline only marginally for the life sector as a whole, but results vary across firms. The impact on short-term insurers is minimal due to their extensive cash holdings.

For life insurers, most of the decline in capital stems from lower values of long-term domestic bonds and domestic equity, while the BWP depreciation increases asset values, and hence capital.





Source: IMF staff calculations based on NBFIRA data.

B. Sensitivity Analyses

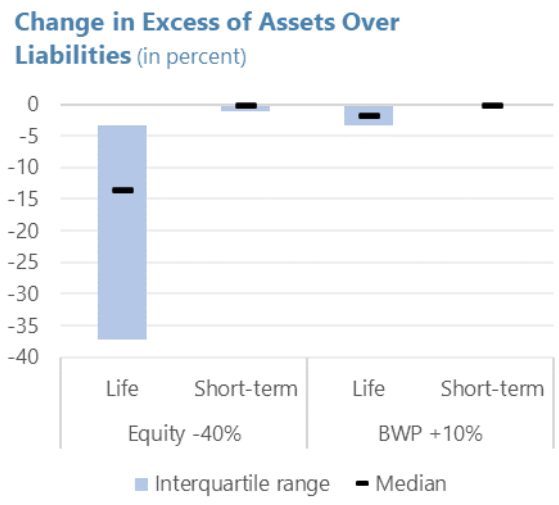
36. Sensitivities to equity price shocks are very pronounced in the life insurance sector, but also very heterogenous across firms (Figure 9a). A general shock of -40 percent in equity prices, both domestic and foreign, would reduce the excess of assets over liabilities for the median life insurer by 13 percent, but for one firm by well more than 50 percent. Among short-term insurers, the impact of the equity shock is limited to a small number of firms. An appreciation of the Pula by

10 percent would have a limited impact on both life and short-term insurers: For the median life insurer, the excess of assets over liabilities would decline by only 3 percent.

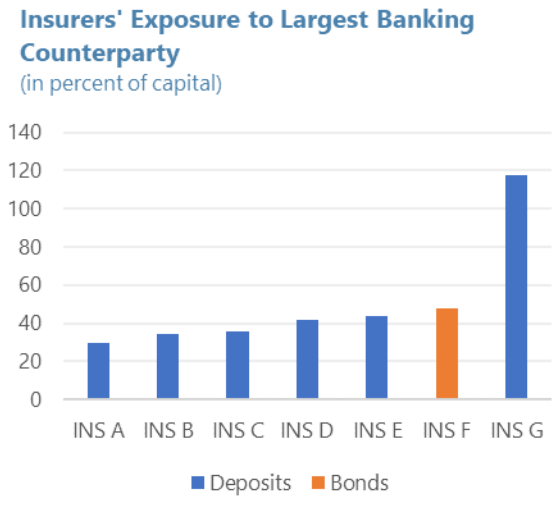
37. Concentrated exposures towards domestic banks—mainly through deposits—are a relevant channel for the transmission of systemic risks (Figure 9b). Exposures to domestic banks are however not reported in their entirety to NBFIRA. The reporting templates contain the largest exposures in each of five asset classes (deposits, bonds, property, shares, and other loans and securities), hence smaller exposures across different asset classes, which in combination could be sizable, might remain undetected. Notwithstanding these shortcomings, the analysis shows that the largest deposits with a single banking counterparty amount to more than one third and up to half of the shareholder capital for most insurers in the sample—for one firm, the largest (deposit) exposure even exceeds their capital. While exposures as such do not inform about a potential loss given default, further analysis by the authorities would also need to take into account second-round effects--on the interbank market, but also on sovereign bond spreads—in case one of the largest domestic banks would default.

Figure 9. Botswana: Insurance ST—Sensitivity Analyses

Life insurers are very sensitive to declines in equity prices: A decline by 40 percent would reduce the excess of assets over liabilities by 13 percent for the median firm, but considerably more for some entities.



The exposure toward the largest banking counterparty—largely through deposits—amounts to more than one third of shareholder capital for most insurers in the sample.



Source: IMF staff calculations based on NBFIRA data.

C. Other Risks

38. Channeling reinsurance business primarily through domestic reinsurers requires a robust supervisory approach and strong cooperation with foreign supervisory authorities. The fact that all domestic reinsurers are subsidiaries of foreign groups highlights the need for a strong role of NBFIRA as a host supervisor. Data sharing with the home authorities on the financial

conditions of the group, joint on-site inspections of the group parent and the local subsidiary, as well as regular exchange on supervisory findings are critical. Internally, NBFIRA should ensure that staff acquires and maintains specialized knowledge about reinsurance business.

39. Climate risks are only to a small degree borne by the Batswana insurance sector. Botswana is hit by climate change like other countries in Sub-Saharan Africa mainly through higher temperatures and droughts. Nevertheless, the direct impact on insurance claims is very limited as many perils are currently not insured. Going forward, it will be critical to evaluate the insurability of such risks and how protection gaps could be reduced.

STRESS TEST RESULTS – RETIREMENT FUNDS

40. The risk analysis for retirement funds aimed at determining the nominal future pension value after the materialization of the adverse scenario. Retirement funds in Botswana are designed as defined contribution schemes, thereby effectively passing on investment risks to scheme members. Future pension values were simulated for two representative fund members, with different characteristics as regards their age, current accumulated pension savings, and current contributions:

- 10 years prior to retirement; BWP 1,000,000 accumulated pension savings; BWP 20,000 annual contributions;
- 30 years prior to retirement; BWP 200,000 accumulated pension savings; BWP 12,000 annual contributions.

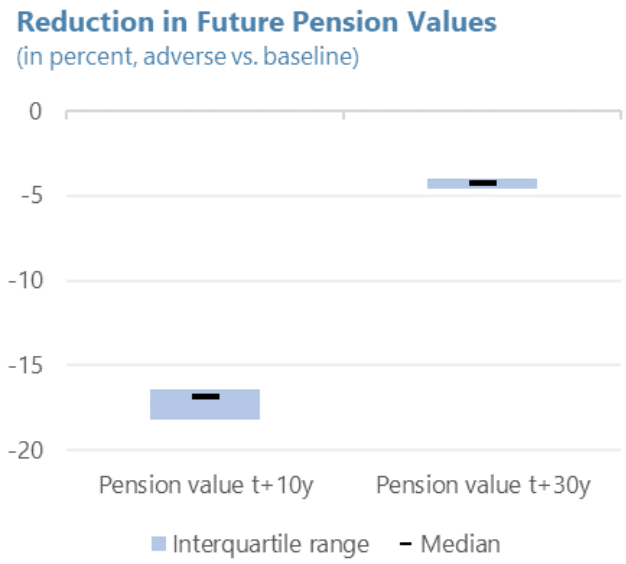
The analysis does not aim at modelling exactly the future pension value, but only the difference between the baseline and the adverse scenario.

41. The adverse scenario was slightly modified as compared to the insurance scenario. Market risks unfold over the first two years of the projection horizon; afterwards, the investment performance is the same as under the baseline. For this baseline projection after t+2y, future investment returns are projected based on a bootstrapping of historic returns for individual asset classes, based on each retirement fund's asset allocation as of the reference date. It is assumed that retirement funds maintain their asset allocation over the full projection horizon and re-balance it annually. Contributions are assumed to increase at a constant rate of 4.5 percent per year.

42. The adverse scenario has a sizable impact on members with only few years to retirement. For the representative member with ten years prior to retirement, future pension values decline by around 17 percent compared to the baseline—these model results are rather similar across different entities (Figure 10). Younger members with 30 years to retirement, for which the future pension value depends relatively more on future accruals, are less impacted by the adverse scenario. Their pension values decline by only 4 percent. The differences highlight the need for a timely switch of pre-retirement members to a more conservative asset allocation in order to lock-in accrued pension values.

Figure 10. Botswana: Retirement Funds—Impact on Future Pension Values

Future pension fund values would be lower in the adverse scenario—by more than 15 percent for a representative pension member with 10 years prior to retirement.



Source: IMF staff calculations based on NBFIRA data.

43. The new Retirement Fund Act, adopted in 2022, is very likely to impact the liquidity of retirement funds, calling for a robust liquidity management. The new Act provides more (lump-sum) withdrawal options for pension scheme members, both upon retirement and prior to that, e.g., in order to repay mortgages or to pay for medical bills. This effectively transfers liquidity from pension funds to households, potentially compromising the ability to accumulate long-term retirement savings. Already now, payments upon retirement account for only around 80 percent of all payouts, of these around 40 percent are paid as a lump-sum. The other 20 percent are paid out for other reasons, with payments upon dismissals or resignations being the most important type in this category.

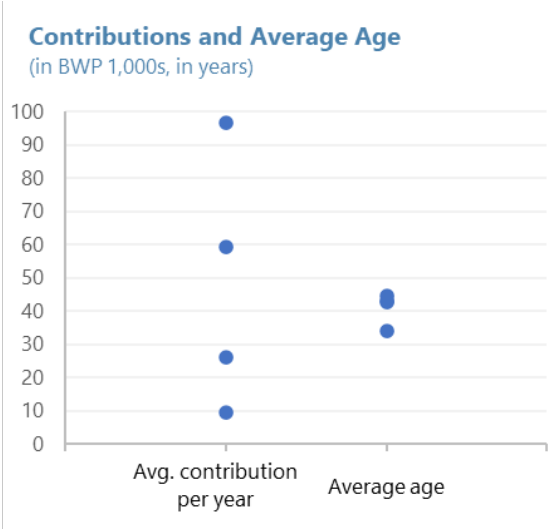
44. Differences in the membership in terms of age and salary of members, and also the cyclicality of the employer's industry will determine how individual retirement funds are affected by the new Act. Particularly vulnerable are likely to be:

- Smaller funds;
- Funds serving only one employer or being active in only one economic sector, in particular if cyclicality in this sector is very pronounced;
- Funds serving the lower-income sector;
- Funds with a high ratio of deferred to active members;
- Funds where benefits are at a similar size as contributions or even already exceeding contributions.

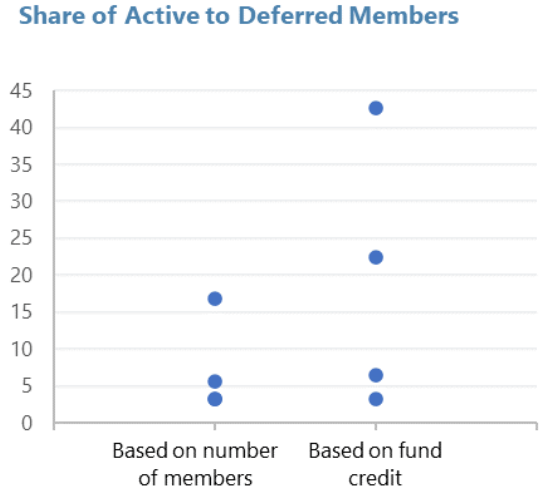
For all those entities, a robust liquidity risk management will be critical, and NBFIRA should increase the intensity of supervision for those and require liquidity buffers to be held where deemed necessary.

Figure 11. Botswana: Retirement Funds—Membership Characteristics and Payouts

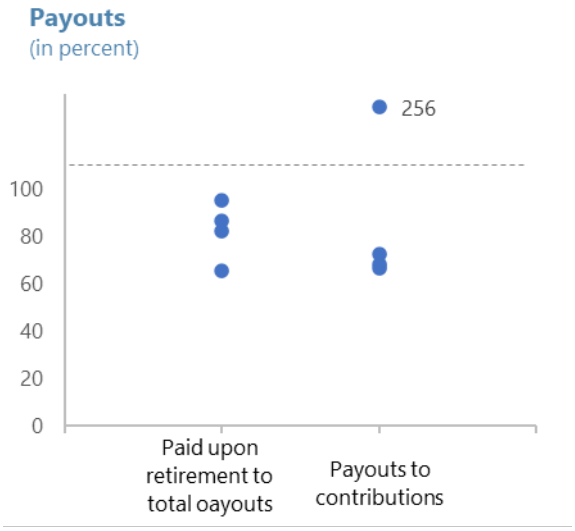
Average annual contributions vary substantially across the retirement funds in the sample, ranging from BWP 9,000 to 97,000. The average member age for three funds ranges between 42 and 45 years, with one outlier at 34 years.



Some funds in the sample are characterized by a very share of active members relative to deferred members, while for some the number of active members exceeds the number of deferred members only by a factor of 3.



Payments upon retirement range between 65 and 95 percent of all payouts. With one exception, payouts are still considerably lower than contributions, implying some further medium-term growth potential.



Notes: All data as of 2021.
Source: IMF staff calculations based on NBFIRA data and company submissions.

45. The Act brings further changes which might have a significant impact on Botswana's financial system, and therefore require a comprehensive impact assessment. On the investment side, the Act reduces sequentially the cap on foreign assets, raising questions about the capacity of domestic capital markets to absorb repatriated investments. Finally, effects of the new Act will be seen also in other financial sectors, e.g., in life insurers annuity business, if pension funds will transfer less accrued pension interest to annuity providers upon retirement.

SUMMARY AND POLICY RECOMMENDATIONS

46. The risk analysis highlighted the need for NBFIRA to substantially improve its data analytics and resources. Concretely, the FSAP recommends a review of supervisory reporting templates (also to accommodate for IFRS 17), more robust processes to ensure complete and consistent reporting, and the implementation of data systems which allow for horizontal and financial stability analysis.

47. Further, authorities are recommended to conduct regular stress test of large insurers and retirement funds, and to analyze the risks stemming from concentrated bank exposures. Stress tests should initially be conducted top-down by NBFIRA, based on—enhanced—supervisory reporting data. In a second step, bottom-up stress tests could be used from time to time, both to calibrate the top-down methodology and to proliferate advance stress testing methods among insurers and retirement funds. The analysis of bank exposures should be conducted jointly with the Bank of Botswana and coordinated by the Financial Stability Council.

48. Lastly, NBFIRA's should build up in-house actuarial expertise. Such expertise would be needed for regular and deep-dive analyses of underwriting risks and asset-liability risks—both from a microprudential and macroprudential angle—policy advice with regard to the implementation of IFRS 17 or possible future reviews of the valuation and solvency framework. In the context of IFRS 17, it will be crucial for NBFIRA to develop an understanding of how this valuation of insurance liabilities will change the way how life insurers will adjust the product design, their pricing, their management of asset-liability risks, their asset allocation, and other parts of their business model. While NBFIRA could to some extent leverage on external experts, own senior staff being capable of overseeing such outsourcing will be important.

Appendix I. Financial Soundness Indicators for Insurance Companies and Retirement Funds

Table 1. FSIs for Insurers
(In percent)

	2016	2017	2018	2019	2020	2021
Capital adequacy						
Assets / liabilities – life	15.1	13.7	15.9	16.0	16.0	16.5
Assets / liabilities – short-term	42.3	39.0	37.1	34.1	35.1	30.0
Assets / liabilities – reinsurance	46.4	38.0	41.7	37.5	35.5	39.4
Solvency ratio – life 1/	...	646.4	525.7	496.3	483.4	669.4
Solvency ratio – short-term 1/	...	229.5	198.0	195.8	241.7	170.6
Profitability						
Growth in gross written premiums – life	...	17.9	9.5	-5.6	7.2	6.8
Growth in gross written premiums – short-term	...	-2.3	8.3	10.0	-2.2	10.2
Growth in gross written premiums – reinsurance	...	8.3	38.2	54.3	11.7	3.0
Investment income / total assets (average) – life	...	5.6	3.4	4.5	4.9	5.0
Loss ratio (net paid claims / net premiums) – short-term	57.5	59.2	50.6	55.1	48.6	55.8
Loss ratio (net paid claims / net premiums) – reinsurance	41.6	54.0	42.1	37.0	33.2	35.4
Combined ratio (loss ratio plus expense ratio) – short-term	96.6	103.8	94.7	96.3	91.2	96.0
Combined ratio (loss ratio plus expense ratio) – reinsurance	96.9	114.7	111.4	87.2	74.5	81.9
Return on equity – life	19.7	19.9	12.4	16.9	18.9	7.8
Return on equity – short-term	7.4	3.0	13.5	8.9	15.1	11.8
Return on equity – reinsurance	5.2	-18.8	17.5	14.8	27.7	18.6
Asset composition and quality						
Stocks / total assets – life 1/ 2/	...	21.9	18.1	18.1	19.7	23.1
Stocks / total assets – short-term 1/ 2/	...	7.4	4.3	3.6	3.8	2.1
Bonds / total assets – life 1/ 2/	...	55.0	55.8	54.7	53.1	48.1
Bonds / total assets – short-term 1/ 2/	...	0.0	0.0	1.9	2.2	2.5
Liquidity						
Cash and deposits / total assets – life 1/	...	9.8	11.0	13.7	14.4	13.8
Cash and deposits / total assets – short-term 1/	...	42.1	48.6	48.8	53.1	49.8
Cash and current assets / current liabilities – life	...	...	...	...	452.1	487.7
Cash and current assets / current liabilities – short-term	...	632.3	1,009	644.6	629.7	725.2
Lapse rate, based on contracts – life 1/	...	12.2	17.5	10.6	9.3	8.4
Reinsurance						
Risk retention ratio (net premium / gross premium) – life	97.4	97.1	97.4	97.1	96.7	96.9
Risk retention ratio (net premium / gross premium) – short-term	62.0	64.7	63.0	63.3	60.4	55.1

1/ Stress test participants only.
2/ Directly held.
Source: IMF staff calculations based on NBFIRA data.

Table 2. FSIs for Retirement Funds
(In percent)

	2016	2017	2018	2019	2020	2021
Profitability						
Change in contributions	...	5.6	7.3	6.8	14.5	7.9
Change in benefits	...	-25.2	34.7	-21.9	25.1	-0.6
Investment income / total investments (average)	...	5.2	3.1	8.1	0.8	15.1
Asset composition and quality						
Stocks / total investments	73.8	70.3	68.0	65.0	66.1	67.9
Bonds / total investments	21.8	21.9	18.1	16.2	15.3	13.7
Foreign assets / total investments	63.1	65.1	59.1	61.3	64.8	66.5
Liquidity						
Cash and deposits / total investments	3.9	6.7	9.8	10.8	8.6	6.3
Liquid assets / total assets 1/	66.8	68.7	65.3	64.9	65.5	63.4
Contributions / benefits	100.4	141.7	112.9	154.4	141.3	153.5

1/ Liquid assets include cash and deposits, offshore equity, and offshore bonds.
Source: IMF staff calculations based on NBFIRA data.

Appendix II. Stress Testing Matrix (STeM) for Insurance and Retirement Funds

INSURANCE: SOLVENCY RISK – RETIREMENT FUNDS: FUTURE PENSION VALUES		
1. Institutional perimeter	Sample size	4 life insurers: ABSA Life, Botswana Life, Hollard Life, Metropolitan Life; 4 short-term insurers: Botswana Insurance, Hollard, Old Mutual, Sesiro; 4 retirement funds: Alexander Forbes Retirement Fund, Bank of Botswana Pension Fund, Botswana Public Officers Pension Fund, Debswana Pension Fund.
	Market share	Life insurance: 93 percent (based on balance sheet assets) Short-term insurance: 79 percent (based on gross written premiums) Retirement funds: 81 percent (based on balance sheet assets)
	Data	Statutory returns
	Reference date	30 June 2022
2. Channels of risk propagation	Channels of risk propagation	• Investment assets: market value changes of assets and liabilities after price shocks, affecting the solvency position (future pension values for retirement funds); • Sensitivity analysis: effect on available capital and solvency position.
	Time horizon	• Instantaneous shock (for insurers); • Mid-2022 to Mid-2024 (for retirement funds).
3. Scenario analysis	Scenario analysis	Global market and emerging markets stress scenario: interest rates continuing to rise, sovereign bond spreads increasing, and equity prices decline. • Share prices: -25.1 percent (domestic, and offshore emerging markets), -28.7 percent (offshore advanced economies) • Bond prices: -9.2 percent (domestic short-term), -7.3 percent (domestic long-term), -15.0 percent (offshore)

		• Property prices: -15 percent • Currency: +20.6 percent (BWP appreciation)
	Sensitivity analysis	• Market shocks: increase in domestic interest rates, and BWP depreciation • Default of largest bank counterparty
4. Risk factors assessed		• Market risks: bond prices, share prices, property prices, FX rates • Credit risks: default of largest bank counterparty • Summation of risks
5. Regulatory/accounting standards		National GAAP
6. Reporting format for results		• Impact on valuation of assets • Impact on available capital and solvency position (insurance); Impact on future pension values (retirement funds) • Dispersion across companies • Contribution of individual shocks