Financial Stability Focus

SOUTH AFRICAN RESERVE BANK

2020 I December 2020

The Financial Stability Focus is a compilation of South African Reserve Bank Topical Briefings

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   (University of Cape Town) – SARB's student grant programme for financial stability research (2017)

Authorised for distribution by:

Dr Hendrik Nel
+27 12 313 4293

TOPICAL BRIEFING: No. 1

Financial Stability Department

SOUTH AFRICAN RESERVE BANK

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The Bank-Sovereign Nexus Amid COVID-19[1]

Abstract

The interconnectedness between banks and the sovereign has emerged as a major financial stability threat in South Africa. This paper explores the various channels through which the bank-sovereign nexus can give rise to financial stability risks. Among other things, rising public debt and the substantial absorption of this debt by domestic banks is highlighted. COVID-19 has exacerbated bank-sovereign nexus risks by driving up public debt issuance and spurring the foreign selling of government bonds, placing further reliance on domestic banks to fund government. The bank-sovereign nexus can pose major financial stability risks even if government debt remains sustainable. However, the probability that government becomes unable to fund itself sustainably without policy interventions has increased. This could place SARB in a challenging position and calls for increased consideration to be given to SARB's role in mitigating adverse feedback loops between banks and the sovereign.

[1] This paper has been authorised for distribution by Dr Hendrik Nel. The authors are grateful to Unathi Kamlana and Stewart Bobo from the SARB, as well as Marco van Hengel from the Dutch Central Bank (DNB) for comments. Any remaining errors are our own.

1. Introduction

The financial health of a country's banking sector and the sovereign are interwoven through the "bank-sovereign nexus". Financial institutions that are in financial difficulty might require large-scale government support, which can result in substantial fiscal pressure. Similarly, a deterioration of fiscal sustainability may cause stress in the financial system and ultimately financial instability. At the same time, both the performance of the banking sector and the sovereign are influenced by macroeconomic developments. Through the nexus, systemic risks can emerge.

This bank-sovereign nexus is a source of financial stability risk in South Africa. This reflects three key developments. First, the sovereign exposure of the banking sector has increased rapidly over the past decade as sovereign creditworthiness has deteriorated. Second, the bank resolution and deposit insurance frameworks - which aim to limit fiscal pressures in the event of a bank failure - are not yet legally or administratively operational. Third, it is conceivable (under an extreme scenario) that government could become unable to access financing at sustainable interest rates (Sachs, 2020).

The COVID-19 crisis has amplified risks further as both the sovereign and banking sector have to operate in a stressed macroeconomic environment with unprecedented economic uncertainty. The health crisis is expected to have a significant impact on the South African economy, with a GDP contraction of 7% anticipated for 2020 (SARB, 2020). The country was already in a precarious economic situation before the COVID-19 crisis and fiscal space has been limited with public debt sustainability under pressure. The Supplementary National Budget predicts a significantly wider budget deficit for 2020/21 than in the February National Budget and warns of a possible debt crisis should the country fail to contain ballooning sovereign debt and debt-service costs. The government's financing costs are likely to remain elevated due to recent credit rating downgrades which place the sovereign rating from all three major rating agencies at sub-investment grade. Weaker appetite for government bonds since March 2020 has resulted in reduced liquidity in the bond market, prompting SARB intervention in that market.

A rapid economic recovery in 2021 is, to a large extent, dependent on whether government actions are able to prevent large scale bankruptcies, job losses and financial instability. It is also dependent on whether the banking sector can continue to allocate resources effectively and match savings with sustainable investments. Policy makers should therefore be aware of, and consider mitigation strategies for, the financial stability risks related to the bank-sovereign nexus.

This note consists of two main sections. First, it explains the three key channels of the nexus. Second, it examines the financial stability risks posed by the nexus for South Africa in more detail.

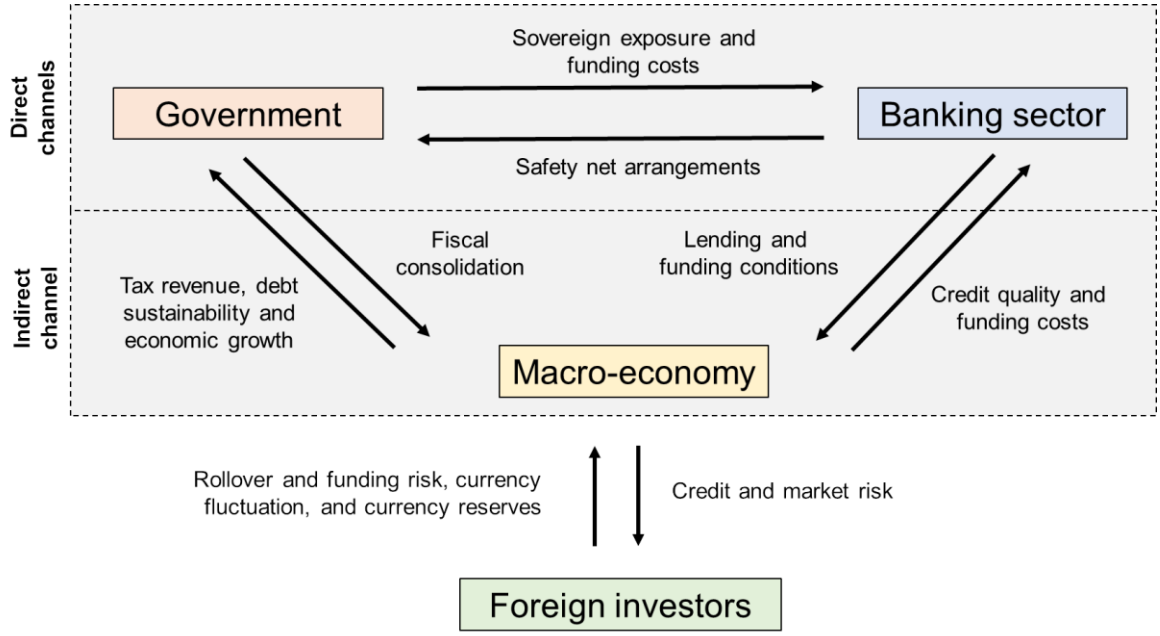
2. Overview of the Liquidity Coverage Ratio

2.1 The three channels of the nexus explained

The financial health of the banking sector and the sovereign are interconnected. The interconnectedness and interdependencies between banks and their governments is a normal feature of any economy and not necessarily a risk. Banks intermediate capital and the sovereign is often a major investor in the economy, utilising bank lending. However, financial difficulties of either banks or the sovereign can quickly spill-over from one to the other. In addition, some shocks impact both the financial position of the sovereign and the banking sector simultaneously, causing p adverse feedback loops between banks and the sovereign (IMF, 2018).

Nexus risks can propagate in many ways, but three key channels of transmission have been identified in the literature. These channels should not be considered in isolation as they operate simultaneously and interact and affect each other through various feedback loops (ECB, 2018). A proper understanding of the channels is important to assess the financial stability risks associated with the nexus and to effectively address these risks.

Diagram 1: The Bank-Sovereign Nexus explained.[2]



The first (direct) channel is the sovereign-exposure channel. Domestic banks are often a large holder of sovereign debt as they are an important financing source for the government. The sovereign exposure is generally classified as "safe and highly-liquid" and is therefore instrumental in the banks' liquidity management[3]. On the one hand, perceptions of increasing sovereign risk directly impacts the health of the banks' balance sheets. Deteriorating (investor) sentiment about public debt sustainability may increase sovereign risk premia and can depress the value of the banks' sovereign exposure. On the other hand, distress in the banking sector may result in increasing funding costs for the sovereign, especially if domestic banks are responsible for a substantial portion of the absorbance of bond issuances in the sovereign bond market.

The second (direct) channel is the safety net channel. The sovereign may prevent banks from defaulting given their key intermediary role in the economy. Some banks may be considered too big to fail. In addition, bank creditors may expect government

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2 Diagram based on Feyen & Zuccardi (2019) and DNB (2019).

3 The Basel III regulatory framework may have encouraged banks to accumulate sovereign bonds to meet their liquidity requirements. The framework treats sovereign bonds – denominated and funded in domestic currency – favourably. Banks that use a standardized approach to model credit risk can assign a zero-risk weight to these bonds, limiting their capital requirements. In addition, the bonds are exempted from Basel's large exposure framework, which limits the exposure of a bank to any other asset holding with an individual counterpart to 25% (Bonner, 2016; Weidmann, 2013).

to back their claims. The government provides the protection either through explicit (like deposit insurance protection schemes and sovereign loan guarantees) or implicit arrangements (like bail-outs or emergency liquidity support). The sovereign often acts as the ultimate backstop to financial sector distress. Without a credible fiscal backstop, bank runs are more likely which can sharply aggravate distress in the banking system, posing a threat to financial stability. Concerns about sovereign risk may raise questions about the credibility of the safety net, potentially increasing funding costs of the banking sector. Likewise, the use of the safety net may put government under severe financial pressure.

The third (indirect) channel is the macroeconomic channel. Both the financial health of the banks and the government are affected by domestic macroeconomic developments. Moreover, the actions of both the banking sector and the government have a significant impact on these developments. Governments can use contractionary fiscal policy to limit sovereign risk, but such a policy may hinder economic activity, constraining household income and business profitability. Were this to be the case, it could have indirect negative effects on the balance sheets of banks, as credit demand declines and the rates of non-performing loans increase. Simultaneously, financial distress among banks may impede economic activity, by limiting the supply of credit and the efficiency with which it is intermediated. Slower economic growth negatively impacts tax revenue collection and therefore government's fiscal balance, which, all things equal, can be expected to increase sovereign risk.

Foreign investors can amplify these channels of transmission[4]. Foreign investors are generally more reactive to changes in (sovereign) credit and market risk than local investors. Increased perceptions of risk can weigh on capital inflows, increasing refinancing costs and making the rollover of debt more difficult. In addition, a currency depreciation increases the debt servicing costs of external debt denominated in foreign currency and would therefore weaken any balance sheet containing unhedged foreign currency liabilities. Sovereign credit ratings also play an important role in a country's ability to access international capital markets and in determining financing

[4] This is particularly the case in countries with shallow domestic financial markets and where foreign investors are responsible for a large part of the credit extension.

terms (Reinhart, 2002). Downgrades generally have a direct impact on the country's funding costs and may significantly impact the financial portfolios of the sovereign, the banking sector as well as actors in the real economy.

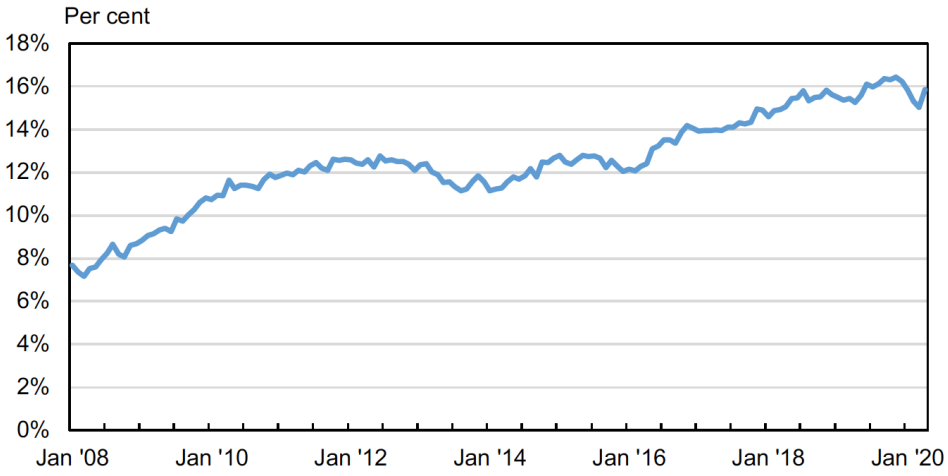
Example of a nexus risk materialising: the Eurozone crisis

In the euro area, the financial support provided by various governments to their banking sectors after 2008 resulted in sharp increases in public debt. Governments provided large- scale emergency financial support and nationalised (parts of) commercial banks to prevent the banks from defaulting, while at the same time banks were an important source of finance for fiscal deficits. Furthermore, governments across the euro area adopted austerity measures to limit the deficits. These austerity measures depressed economic activity and put further pressure on the banking system through additional non-performing loans and lower credit demand. The economic downturn resulted in declining (tax) revenues and widening deficits which required governments to issue additional debt. The fiscal deterioration negatively

2.2 The nexus in South Africa: a rising systemic risk

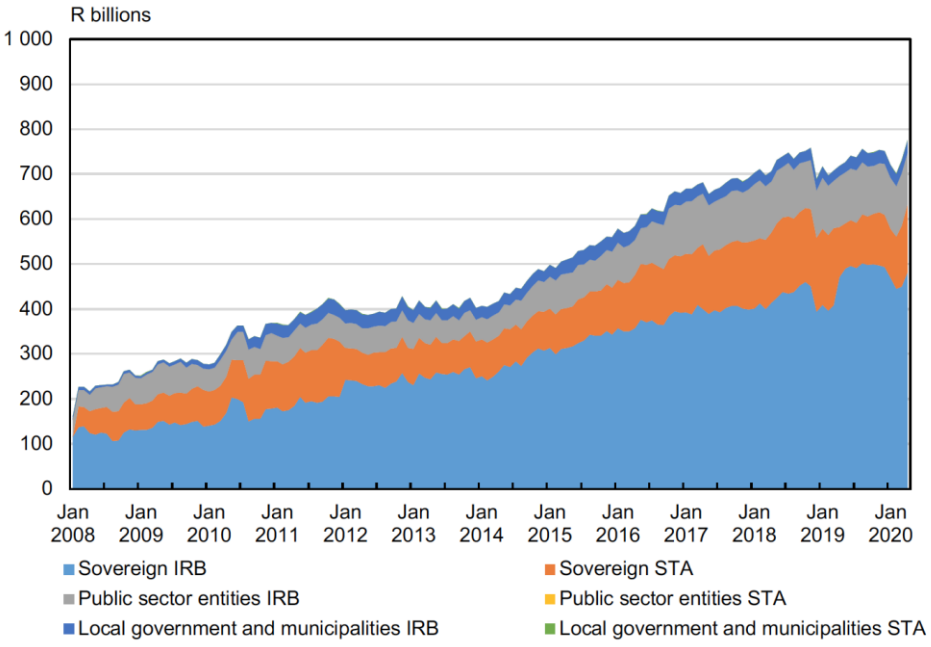
The continuous increase in the sovereign exposure of the South African banking sector raises financial stability concerns. At the end of 2019, the sovereign exposure of the South African banking sector peaked at more than 16% of total assets, compared to less than 8% at the beginning of 2008 (see Figure 1). This increase is largely a result of the continuous rise in South African government debt over the past decade. The central government accounted for 78.4% of the total banking sector's sovereign exposure at the end of April 2020. Public sector entities and local governments accounted for 18.1% and 3.5%, respectively (see Figure 2).

Figure 1: South African banks' sovereign exposure relative to total assets (in percentages). The sovereign exposure includes loans and securities with the central government, municipalities, central bank and public sector entities as counterpart.



Source: SARB, Prudential Authority data.

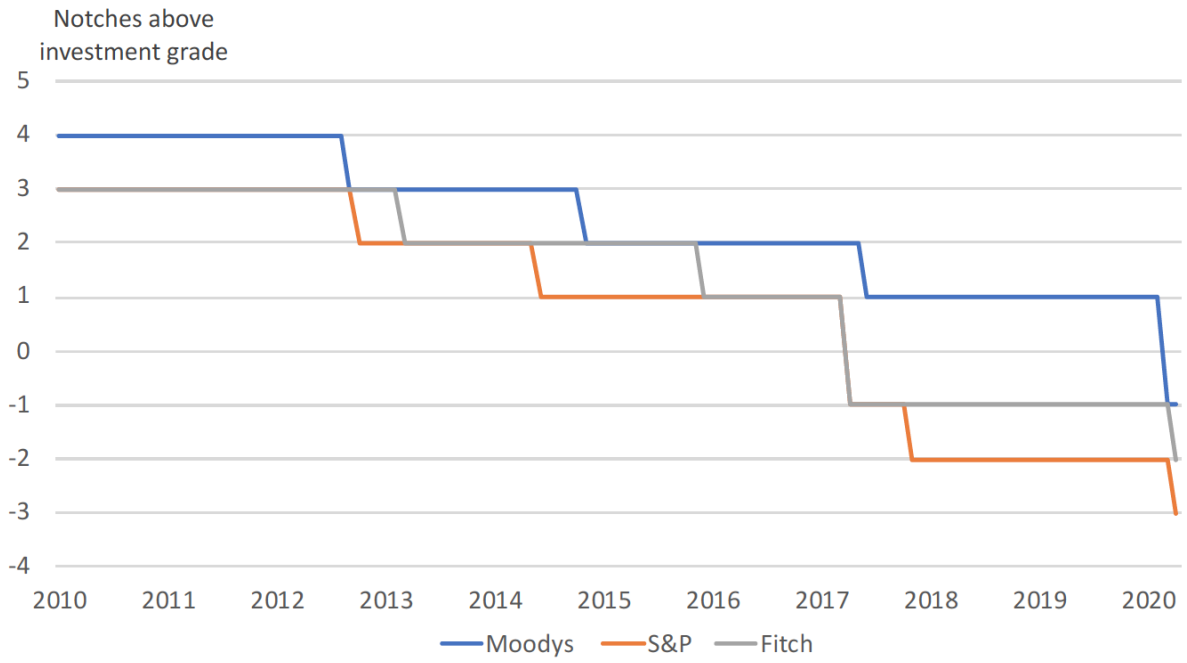
Figure 2: Total exposure of the South African banking sector to the sovereign. Exposure of banks (split between banks following the standardized and internal model approach for risk weight determination) to the sovereign (central government), local governments and municipalities, and public sector entities (in R billion).



Source: SARB, Prudential Authority data.

Independent credit rating agencies are pessimistic about the risk assessment of the South African sovereign. At the end of March 2020, Moody's and Fitch downgraded South Africa's sovereign credit rating. Meanwhile, Standard & Poor's (S&P) announced a credit rating downgrade in April to three notches below investment grade. Moody's was the last rating agency to downgrade South Africa's sovereign credit rating to sub-investment grade (see Figure 3), which resulted in government securities being excluded from several (high-quality) sovereign bond indexes (including the FTSE World Government Index (WGBI)). These downgrades are expected to increase the government's financing costs and decrease the extent to which non-resident investors can hold South African government securities. According to the National Treasury (NT), these downgrades could "not have come at a worse time" with financial markets facing significant sell-offs since the COVID-19 outbreak (NT, 2020). The decreased appetite of non-resident investors for South African (sovereign) securities appears to have resulted in a shift to greater reliance of the government on the domestic banking sector for funding (see Figure 4). In fact, the share of government bonds held by domestic banks reached a 10-year high of 20.6% in June 2020.

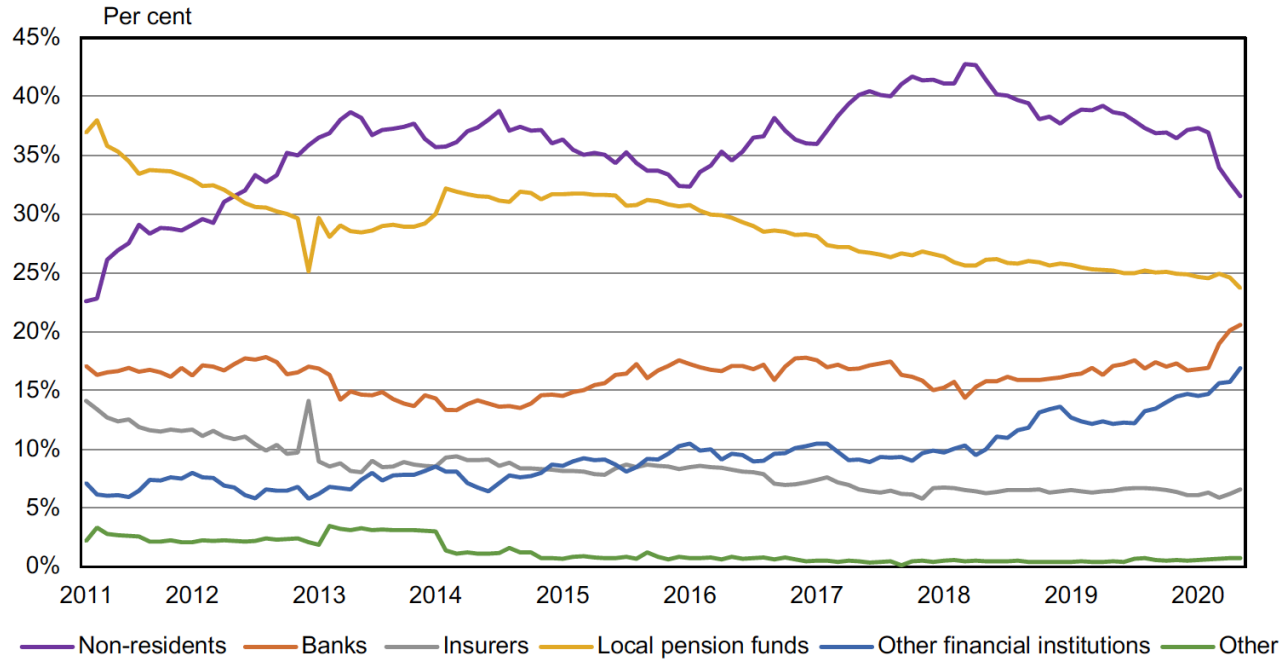
Figure 3: South Africa's sovereign credit ratings



Source: Moody's, S&P and Fitch.

As the COVID-19 pandemic spread during the first few months of 2020 the government bond market experienced heightened volatility displayed signs of dysfunction. Emerging market economies (EME) with elevated levels of foreign ownership in their local currency bond markets, such as South Africa, have experienced noticeably bigger increases in their local currency bond spreads during this period (Hofmann *et al*., 2020). Foreigners held approximately one third of South African government bonds in March 2020. As these bonds have recently fallen out of the WGBI, foreign ownership in the bond market may be structurally lower in the future. This raises serious questions about where funding for government deficits will come from, particularly as the balance sheets of domestic pension funds, insurers and banks are at risk of shrinking in the near term.

Figure 4: Holdings of South African government bonds.



Note: Data updated to end of May 2020

Source: National Treasury

Sovereign exposures are treated preferentially in international banking regulations. The Basel III Capital Framework includes a national discretion for jurisdictions to assign zero-risk weights to sovereign debt – denominated and funded - in domestic currency. Furthermore, no concentration limits to the sovereign

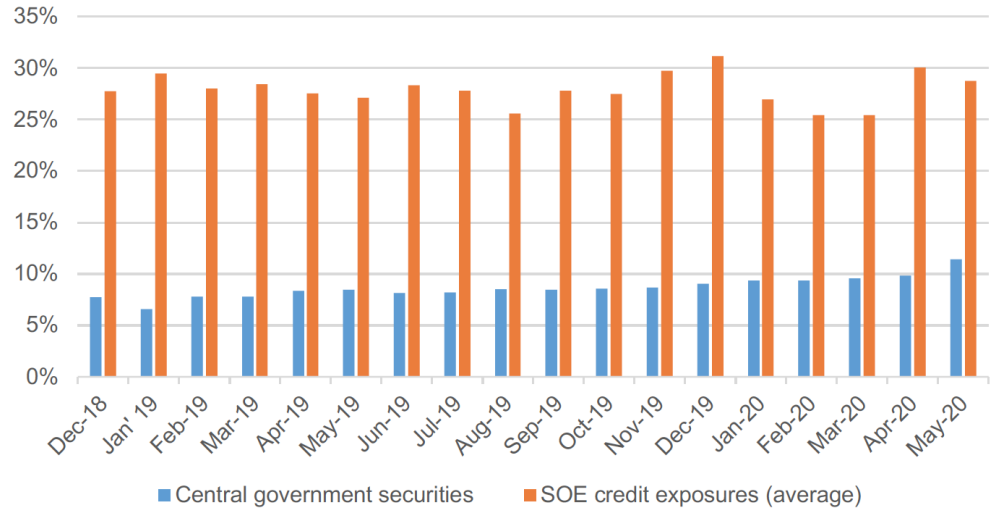
exposure are included in international regulation. However, in practice, this preferential treatment does not apply to the entire banking sector. Only banks that follow a standardized (STA) approach (in line with international regulation) to calculate their capital requirements use zero-risk weights for the sovereign exposures. However, banks have the option to develop internal ratings-based models to model credit risks and determine their capital requirements[5].

This preferential treatment may incentivise banks that follow the standardized approach to prioritize lending to the sovereign rather than to the private sector. We do not have evidence that this is happening, however the large real yields available on government debt and the zero-risk weight treatment could present a perverse incentive.

The risk weights for sovereign exposures of banks using an internal model are non-zero and have increased over the past year, reflecting rising sovereign risk. Most of the largest domestic banks use an internal model to determine risk weights and, as a result, the majority of the sovereign debt in the South African banking sector is held by banks using an internal risk based model (IRB) approach. The average risk weight assigned by IRB banks to government bonds and treasury bills increased from 7.7% in December 2018 to 11.4% in May 2020 (see Figure 5). The risk weights assigned to the debt with South African SOEs as counterparts increased from 27.7% to 28.7% over the same period, and peaked at 31.2% in December 2019 (these weights will vary depending on the specific SOE exposure). These increases reflect a weakening of the underlying indicators that determine the risk weights, providing further support to the view that sovereign risk is increasing.

[5] This internal model needs to be explicitly approved by the bank's prudential supervisor and the supervisor needs to be satisfied that the model allows for sound risk management of the bank.

Figure 5: The average risk-weight assigned to government and SOE debt by banks using internal risk based models



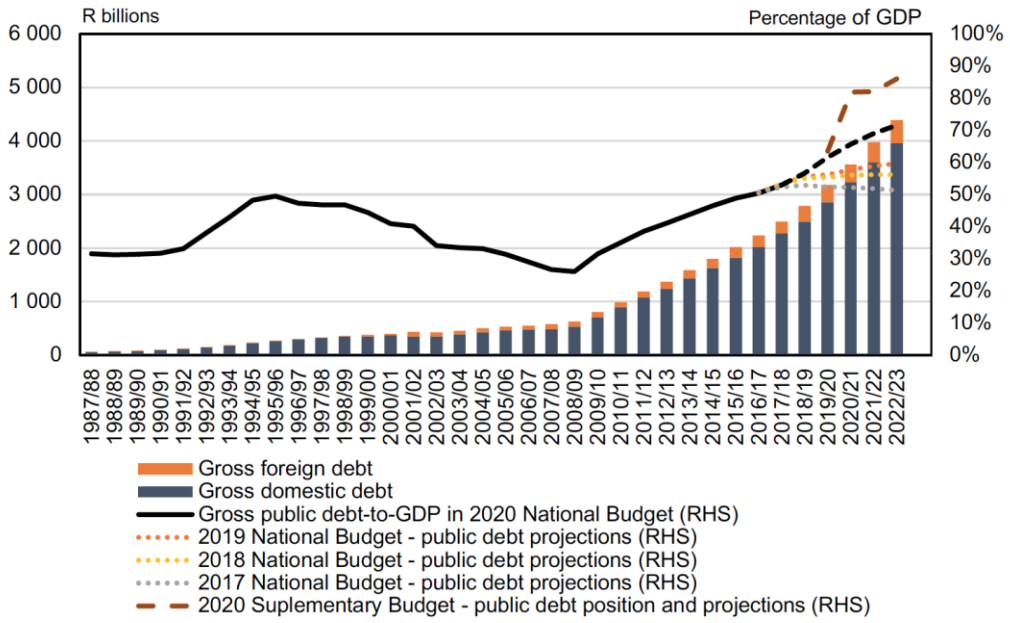
Source: SARB, Prudential Authority.

The increasing sovereign risk weights are placing upward pressure on banks' capital requirements. At a time when the SARB is relaxing capital requirements to ensure a continued flow of credit into the economy, rising risk weights on sovereign exposures threaten to partially negate the capital relief.

Of particular concern for financial stability is the consistent upward revision to the government's debt-to-GDP projections over recent years. The 2017 Budget Review projected a gross public debt-to-GDP ratio of 51.3% in 2022/23, which was revised up to a post-Apartheid high of 71.6% in the 2020 National Budget (see Figure 6). This was revised upwards even further to 86% in the 2020 Supplementary Budget. NT has projected a budget deficit of 14.6% of GDP in 2020/21 (the largest in more than a century), up from an estimated 6.8% in the February National Budget (NT, 2020c). These estimates put the country at risk of debt distress, as the IMF identifies 70% public-debt-to-GDP as a high-risk-of-debt-distress threshold (IMF, 2013)[6] in its debt sustainability framework for emerging market economies (IMF, 2020a).

6 High risk is when the indicator is above 75% of the benchmarks for that indicator. Low risk is below 25% of the benchmark for emerging markets. Between 25% and 75% a country is deemed to be at a moderate risk.

Figure 6: South Africa's public debt. Public debt developments (gross foreign and outstanding domestic debt, in R billion) and total public debt as a percentage of GDP (including outlooks for debt-to-GDP from different budget reviews).



Sources: National Treasury, Budget Review 2020 and Supplementary Budget Review 2020.

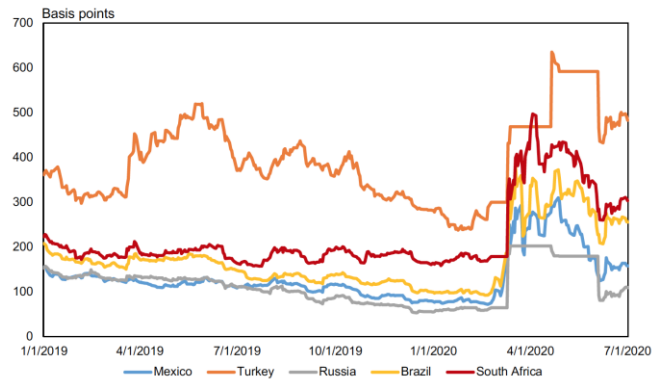
The degree to which fiscal policy has put the economy at risk is demonstrated by the adjustment required to stabilise the debt. The government was running a persistent primary deficit prior to the COVID-19 outbreak[7]. These deficits reflect, to a large extent, significant financial support for SOEs and tax revenue underperformance in recent years. The primary deficit is projected to increase sharply from 2.7% of GDP in 2019/20 to 9.7% in 2020/21. Debt stabilisation (which is key to ensuring fiscal sustainability, given the elevated level of debt) requires that a primary surplus is achieved over the medium term. The quantum of fiscal adjustment that will be required to achieve this is very large. Although not without precedent, successful fiscal adjustments in excess of 10% of GDP over a medium-term horizon are rare (Thomson, 2019). To some extent the fiscal deficit in 2020 reflects the economy's automatic stabilisers as tax revenues fall and government stimulus increases in response to a deep recession. The degree to which these stabilisers are unwound will depend on the performance of the economy as the COVID-19 shock subsides. The SARB's latest

7 The primary balance is defined as the overall fiscal balance, excluding net interest payments.

forecast suggests that the level of output in 2022 will be below that of 2018. Thus, government may have to undertake a sizeable fiscal consolidation even as economic activity remains weak, which implies that fiscal drag could contribute to a muted recovery over the coming years. As financial firms are likely to work down capital buffers in response to a rise in non-performing loans caused by COVID-19, it is important to consider how such buffers will be rebuilt. In the absence of a strong and sustained recovery, they may not be. This could leave South Africa with a fragile fiscus and weak banking sector in the years to come. Such an outcome would weigh on the potential growth of the economy and increase vulnerability to systemic risk.

Sovereign credit default swap (CDS) spreads for South Africa reflect negative investor sentiment regarding sovereign risk. CDS spreads in emerging markets were narrowing in line with the improvements in global financial conditions before the effects of COVID-19 started to emerge early in 2020 (see Figure 7). In March 2020 there was a significant widening of the CDS spreads. In South Africa, CDS widened temporarily to above the level of Turkey and have remained well above that of Brazil. Both countries have lower sovereign credit ratings than South Africa. Since March 2020 there has been a gradual narrowing of the CDS in South Africa and other emerging markets. This was followed by a gradual increase since June, but not the levels experienced in March. This suggests that the market has largely priced in the possibility of further sovereign rating downgrades.

Figure 7: Credit default swap spreads. Emerging markets' 5-year sovereign credit default swap spreads (in basis points)



Note: Data updated to 1 July 2020.

Source: Bloomberg.

The South African banking sector and its depositors have historically received implicit protection through the government's safety net. During bank failures the government often plays an important role in providing capital injections or guarantees to allow a bank to continue to operate or, if the bank is wound down, funding to pay out depositors. However, this safety net is not guaranteed, it depends on the size of the failing bank(s) and the fiscal space available to government. The SARB in conjunction with NT is currently developing a legislative framework to formalise the processes surrounding bank resolution and depositor protection. These reforms are contained in the Financial Sector Laws Amendment Bill (FSLAB). Among other things, the FSLAB will establish a resolution authority to facilitate the orderly resolution of a designated financial institution, in the event of its failure. Secondly, FSLAB aims to protect depositors through the establishment of an explicit deposit insurance scheme (SARB, 2017). A key objective of this framework is to limit the requirement for public sector funds in the event of a bank failure. However, the FSLAB has not been promulgated and the framework still has to be phased in. This is worrisome given the financial risks currently posed by COVID-19. The use of the safety net may continue to require the mobilisation of large amounts of public funds, potentially resulting in additional pressures on fiscal sustainability. South Africa's banking sector is also highly concentrated, further warranting close monitoring of this channel.

In March 2020, Fitch and Moody's downgraded five of South Africa's banks to sub- investment grade with a negative outlook. Fitch's decision was driven by the "expected negative impact from the coronavirus outbreak on the banks' operating environment and key financial metrics, notwithstanding uncertainty as to the full economic and financial market implications." Fitch believes that the South African operating environment is particularly vulnerable to the pandemic, because of the country's "highly dense and vulnerable communities, heightened macro-economic risks […] and pressures on the country's public finances" (Fitch Ratings, 2020). Moody's explained that the banks' high sovereign exposure, "mainly in the form of government debt securities held as part of their prudential liquidity requirements", was one of the drivers for their decision (Moody's, 2020). These downgrades followed similar downgrades to the sovereign credit rating. Credit rating agencies have noted that large domestic banks are likely to be rated at the same level as the sovereign as long as they maintain high exposures to the sovereign and as long as there is no

formalised deposit insurance and bank resolution framework in place.

Economic forecasts for South Africa were already weak before the COVID-19 outbreak, but have further deteriorated. GDP growth forecasts for 2020 have been revised downwards from 1.2% mid-January to minus 6.1% mid-April. Unemployment was already problematic at 28.7% at the end of 2019 but is expected to increase further to 35.3% this year by the IMF (2020b). Affordability measures for both the household and non-financial corporate sectors reflect a weakening debt service capacity. Impaired advances as a share of total loans in the South African banking sector have been increasing, from below 2.8% in 2017Q3 to 4.3% in April 2020. These developments will put further pressure on the financial health of both the banking sector, through a possible decrease in profitability, and the sovereign, through a decrease in expected tax revenue.

The South African banking sector is highly capitalised and has large buffers of high- quality liquid assets, but the resilience of the sector could be overstated. Banks are compliant with the international standards set by the Basel Committee on Banking Supervision and have built significant buffers over the past two decades with the introduction of the Basel regulatory frameworks. Nevertheless, the increased resilience is partly the result of larger exposures to the sovereign as these assets qualify to be categorised as safe and liquid.

A key near term financial stability threat is a scenario in which government is unable to fund itself at sustainable interest rates in the bond market. The very large funding requirements of government over the next 12 – 18 months as a result of the COVID-19 pandemic could prove difficult for investors to meet at rates which are compatible with debt sustainability. This is because large holders of government bonds (including pension funds and insurers) may need to reduce rather than increase their holdings as the economic climate could result in a balance sheet contraction for these entities. Under this scenario, funding from multilateral agencies may be required.

A related risk is that the secondary bond market becomes illiquid as sellers outnumber buyers. Under this scenario financial instability could occur for various reasons. From the perspective of the banking sector, holdings of government bonds

account for approximately 80% of total high quality liquid asset (HQLA) holdings. HQLAs are required to be held by regulation as a mitigant to liquidity risk. In the event of a spate of depositor withdrawals, HQLAs are intended to be sellable on demand (without meaningful losses) to allow banks to provide cash to depositors. Depositors may become concerned about the ability of a bank to honour its obligations in the event that the government bond market becomes and remains dysfunctional, particularly if this occurs during a time of stress for the bank.

3. Conclusion

The bank-sovereign nexus can pose financial stability risks even if government debt remains sustainable. In fact, attempts to ensure fiscal sustainability in the face of a deep recession could put additional pressure on banks. In this case, government may be unable or unwilling to provide funds for recapitalisation or depositor protection in the event of a bank failure, which could give rise to contagion. Secondly, a procyclical tightening of fiscal policy to stabilise public debt could give rise to a deeper and/or more prolonged recession with severe consequences for bank profitability.

The risk that government becomes unable to fund itself without policy interventions is increasing. Financial stability risks are even greater in the event that government is unable to fund itself at sustainable rates of interest. If the debt is believed to be at risk of becoming unsustainable, investors will charge higher interest rates and the likelihood of the debt actually being unsustainable will increase. This scenario would have immediate adverse effects on the financial system. Banks would make large mark-to-market losses on their bond holdings. The government bond market may become dysfunctional, raising the risk that banks are unable to liquidate their bond holdings should they face a liquidity stress event, a fact which could make such an event more likely. It is probable that further sovereign rating downgrades would occur, further lifting the risk weights attached to sovereign exposures (for IRB banks) and forcing tighter credit conditions. Balance of payments stress would also be likely under this scenario. Finally, the funding costs of banks and their associated lending rates would be expected to rise along with that of the sovereign, raising pressure on bank margins, and posing additional debt service challenges. This scenario may call for the involvement of multi-lateral agencies or extraordinary policy measures to

ensure that government remains sustainably funded.

The Bank-Sovereign nexus is unquestionably a financial stability threat. It is necessary to consider all options to militate against this threat, knowing that it may take years to abate.

Alex Smith
Mia van der Linde
Menno van der Ven
Financial Stability Department
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Abbreviations

DNB	-	De Nederlandsche Bank
ECB	-	European Central Bank
IMF	-	International Monetary Fund
NT	-	National Treasury
SARB	-	South African Reserve Bank

TOPICAL BRIEFING: No. 2

Financial Stability Department

South African Reserve Bank

December 2020

Assessing South African non-financial corporate sector weakness under COVID-19

Abstract

Non-financial corporate balance sheets have been strained over the past few years, with subdued economic growth and weak sentiment weighing on its performance. Unfortunately, the impact of COVID-19 is likely to exacerbate the sector's weakness. The vulnerabilities in the sector are broad-based and characterised by weak earnings and high debt levels. There are indications that firm debt levels exceed both earnings and equity, raising concerns about the possible solvency issues that may arise during this period. While the policy measures employed by the various economic role players should limit the fallout from the pandemic, concerns remain about their sufficiency, sustainability and the implications for NFC balance sheets post-COVID-19. The development of capital requirements for NFCs in the future could expand the number of backstops accessible to firms during periods of distress and thus, support both financial and macroeconomic stability.

1. Introduction

The unprecedented disruption presented by COVID-19 has had significant economic as well as social implications for advanced and developing countries alike. The adverse impact of the pandemic has threatened the growth outlook for countries given the strict lockdown measures that placed a halt on global supply chains and, consequently economic activity. In April 2020, the International Monetary Fund (IMF) expected global and domestic growth to contract by 3% and 5.8%, respectively in 2020 as a result of the pandemic, substantially worse than the contractions observed during the 2007/2008 Global Financial Crisis (GFC)[8]. Updated projections by the IMF paint an even bleaker picture, reflecting the uncertainty about the extent of the economic impact of the pandemic as well as uncertainty about the pace at which economies will be able to recover[9].

In an effort to limit the spread of the virus, the SA government implemented strict lockdown measures which commenced on 27 March 2020. These measures included the curtailment of non-essential economic activity, placing significant strain on already vulnerable non-financial corporates (NFCs). Lockdown measures have since been relaxed, with the introduction of a risk-adjusted regulations strategy that consists of five levels (five being the strictest). The economy is currently operating at level two, which has seen the majority of sectors reopening, but with some restrictions. Despite the relaxation measures, ongoing restrictions (weighing on business' ability to operate at maximum capacity) and relatively muted demand during this uncertain period suggests that businesses are unlikely to swiftly and fully recover to pre-COVID-19 levels anytime soon. While domestic COVID-19 infections have slowed dramatically over the past few weeks, the possibility of a second wave remains, thus raising fears of a reintroduction of stricter lockdown measures (as has been observed in China, the United States and Europe).

The weak pre-COVID-19 economic and NFC balance sheet fundamentals combined with expectations for a COVID-19 induced recession raises concerns about the

[8] International Monetary Fund, World Economic Outlook, April 2020
[9] International Monetary Fund, World Economic Outlook Update, June 2020.

sector's resilience, particularly the expected impact on firms' earnings and debt-service capacity. Furthermore, the weakness in the NFC sector will eventually negatively impact domestic labour market dynamics, with severe consequences for household financial positions. These concerns are confirmed (in real-time), with Statistics SA (Stats SA) business survey results indicating that almost 90% of respondents reported a lower-than-normal turnover, while over 36% reported the laying off of staff in the short term[10]. The longer the crisis persists, the greater the strain on corporate and household balance sheets which will result in a spike in defaults that could spill-over into the financial system.

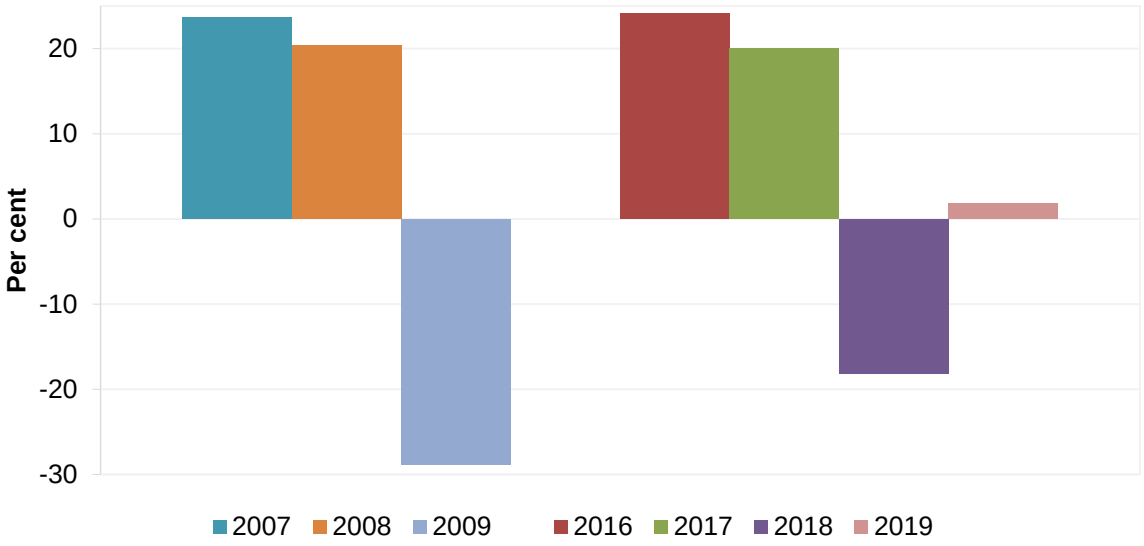
This report provides an analysis of the current vulnerabilities in the NFC sector and how these could impact household and financial system stability (specifically banking system stability). Furthermore, it explores the measures implemented to support NFCs and concludes with a recommendation on macroprudential policy measures.

2. Broad-based vulnerabilities characterised by weak earnings and higher debt levels

NFC balance sheets faced strain pre-COVID-19 as deteriorating economic growth and weak business and consumer confidence weighed on the sector's performance (Appendix A). In 2019, nominal earnings grew by 1.8% (year-on-year) well below the annual average inflation rate of 4.1%. This follows a deep contraction of 18.1% observed in the previous year. The sector's earnings are likely to record a significant decline this year as a result of the pandemic and consequent economic restrictions. In 2009, at the height of the GFC, growth in NFC earnings declined by almost 30% and this was in the absence of restrictions to business activity (Figure 1). Furthermore, according to the Institute for International Finance (IIF)[11], the disruption to global supply chains has resulted in a rapid downgrade of earnings, with emerging markets expected to perform the worst.

[10] Statistics South Africa, Business impact survey of the COVID-19 pandemic in South Africa, May 2020
[11] Institute of International Finance, *COVID-19 infects corporate bond markets*, March 2020

Figure 1: Aggregated EBIT[12]



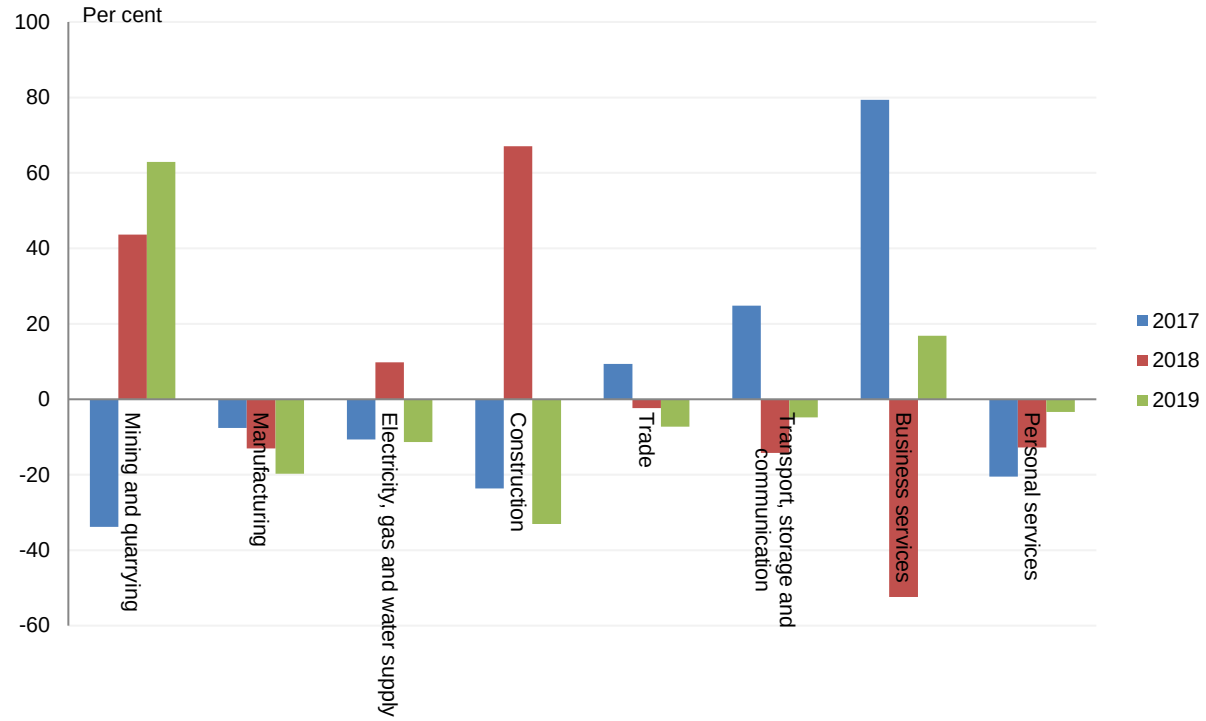
Source: Statistics South Africa and author's computations

The earnings profile for the respective industries paints an even bleaker picture (Figure 2). Most industries recorded earnings growth below zero, at least once, in the past three years. At the end of 2019, only the mining and quarrying, transport, storage and communication, business services and personal services industries recorded improved earnings. However, for the transport, storage and communication and personal services, these growth rates were negative. The construction, manufacturing, and electricity industries recorded the worst earnings in 2019. While the relaxation of lockdown measures will help firms generate a portion of their income, the disruption to business as usual and the impact on demand will weigh heavily on profitability. In particular, businesses in the trade (restaurant, salons, hotels, accommodation and entertainment, etc.) and transport (air travel, ocean travel, etc.) industries may continue to be impacted by ongoing measures (capacity restrictions, health and safety protocols) and by a change in consumer behaviour in the short to medium term given fear of exposure to the virus. The COVID-19 shock will ultimately impact NFC cash flows as firms struggle to reduce operating costs in line with deteriorating earnings. According to Bank for International Settlements (BIS) estimates, following a 10% drop in earnings, operating expenses, on average, fall by only 6%[13].

[12] Earnings Before Interest and Taxation (EBIT) is an alternative measure of profitability. Aggregate EBIT includes state-owned enterprises and excludes agriculture, financial intermediation, insurance, government and educational institutions.

[13] Bank for International Settlements, *COVID-19 and corporate sector liquidity*, April 2020.

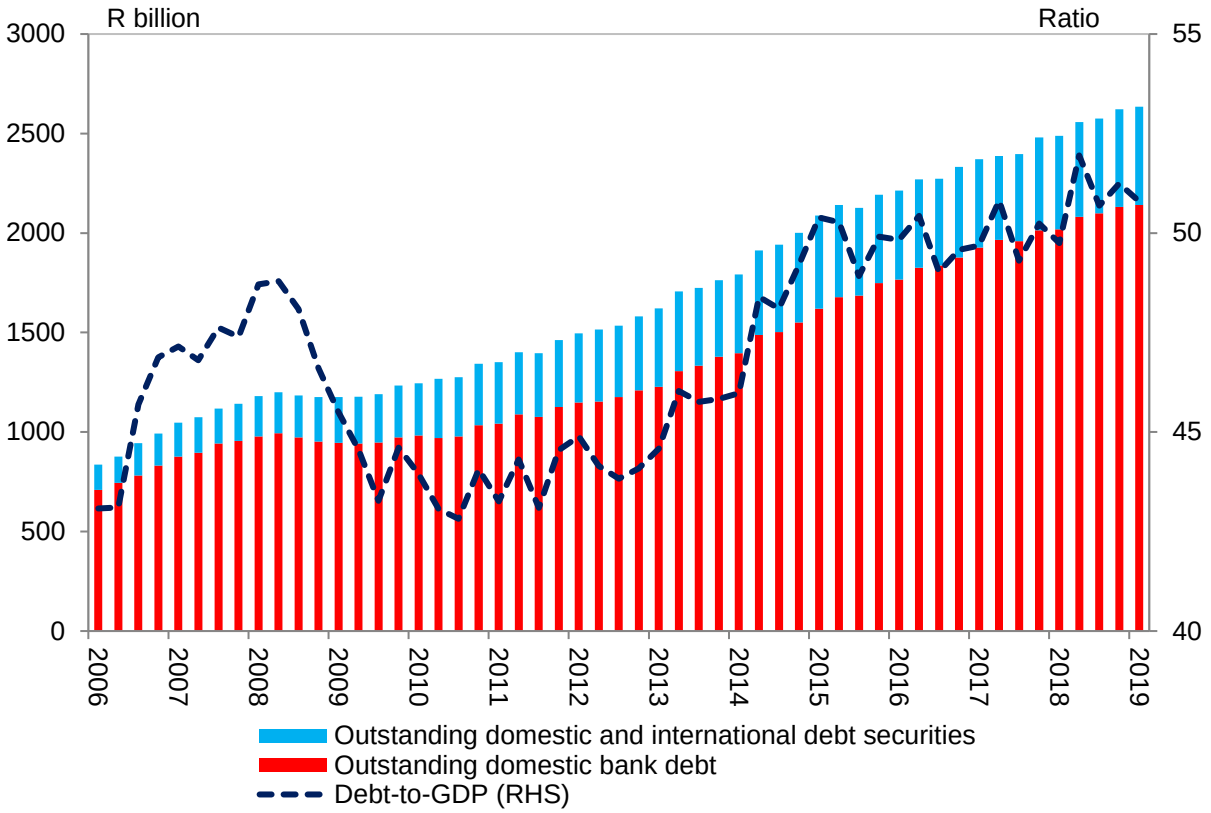
Figure 2: EBIT by industry



Source: Statistics South Africa and author's computations

Concerns about the performance of domestic firms are amplified by the sector's relatively high debt levels. NFCs currently have debt, in nominal terms, of just over R2.6 trillion (Figure 3). State-owned enterprises account for approximately 36% of this debt. The sector's debt-to-GDP has accelerated consistently since around 2010, with the ratio currently standing at 50.8%, relatively higher than the 42% observed pre-GFC. Almost 40% of NFC debt is denominated in foreign currency, increasing the sector's exposure to refinancing and currency risk (Appendix B). Although, the global accommodative monetary policy partially limits the sector's exposure to refinancing risk, it remains elevated given that it reflects prevailing economic and credit market conditions.

Figure 3: NFC debt[14]

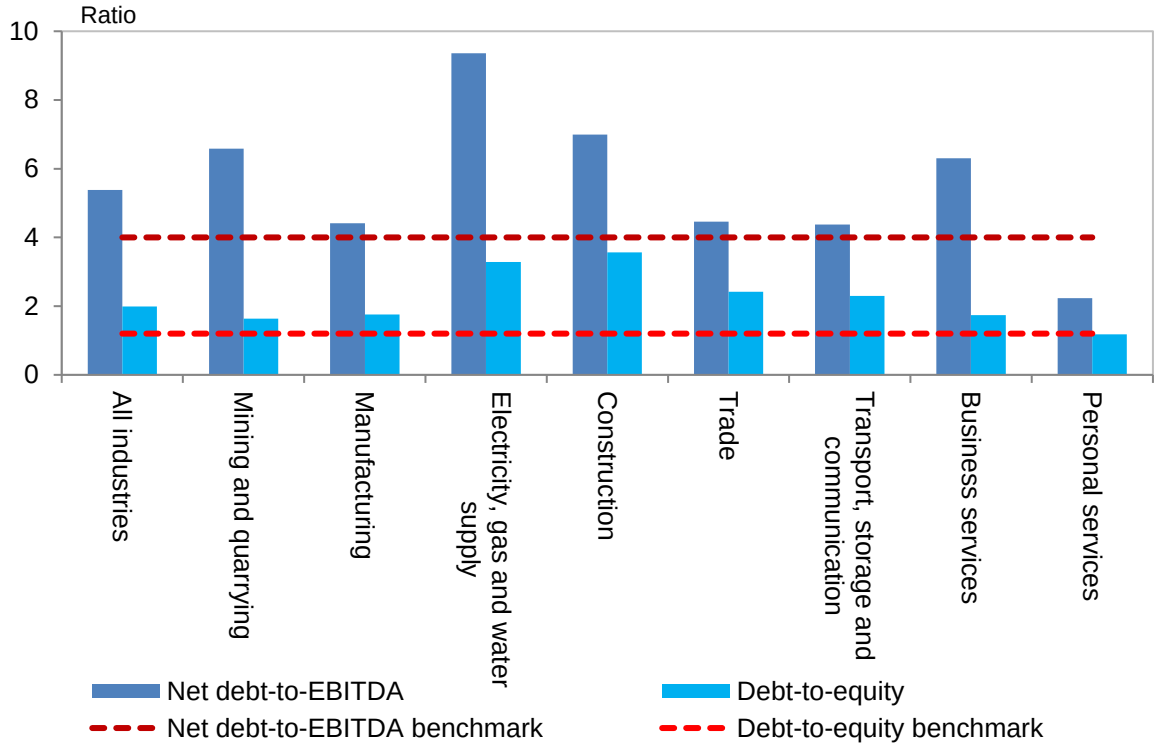


Source: South African Reserve Bank, Bank for International Settlements and author's computations.

The vulnerability of the NFC sector as a whole is further highlighted by metrics showing that debt is relatively higher than both earnings and equity (Figure 4). With the exception of personal services, all industries have debt-to-equity ratios[15] above the benchmark, indicating that debt is the primary source of finance for most domestic NFCs. A similar trend is observed with the net debt-to EBITDA[16] ratio as some of the industries with the weakest earnings (as depicted in Figure 2) display a significantly higher debt burden. High levels of debt relative to equity and earnings could amplify losses, worsen cash flow stress and weaken debt-service capacity. This could, in turn, result in deteriorating credit worthiness, rising refinancing risks and higher corporate defaults that could impact the financial system[17].

[14] Debt securities data is subject to an exchange rate effect. Value may be slightly over- or underestimated.
[15] The debt-to-equity ratio indicates how capital has been raised to finance operations. It is calculated by dividing a firm's total liabilities by its shareholder equity. A debt-to-equity ratio of 2.5 indicates that outstanding debt is 2.5 times larger than equity.
[16] Net debt is debt net of cash and cash equivalents.
[17] International Monetary Fund, *Stress testing corporate balance sheets in emerging markets*, 2016

Figure 4: Net debt-to-EBITDA[18] and debt-to-equity[19]



Source: Statistics South Africa and author's computations

As at the end the 2018[20]

3. Larger firms have the weakest debt-service capacity and average cash buffers are insufficient

Higher debt burdens and low earnings profiles have translated into weaker debt-service capacity. Despite remaining above the benchmark, most industries have recorded a successive deterioration in their ability to sufficiently raise cash to cover their interest expenses since 2016 (Appendix C). On average, large and medium firms have lower interest coverage ratios (ICR[21]) while small firms appear to be in a better financial position (Figure 5). Large firms in the electricity, gas and water supply, construction and business services industries recorded ICRs below the benchmark at

[18] As a general rule, firms with a net debt-to-EBITDA ratio higher than 4 are considered highly leveraged. See IMF Global Financial Stability Review, April 2018.

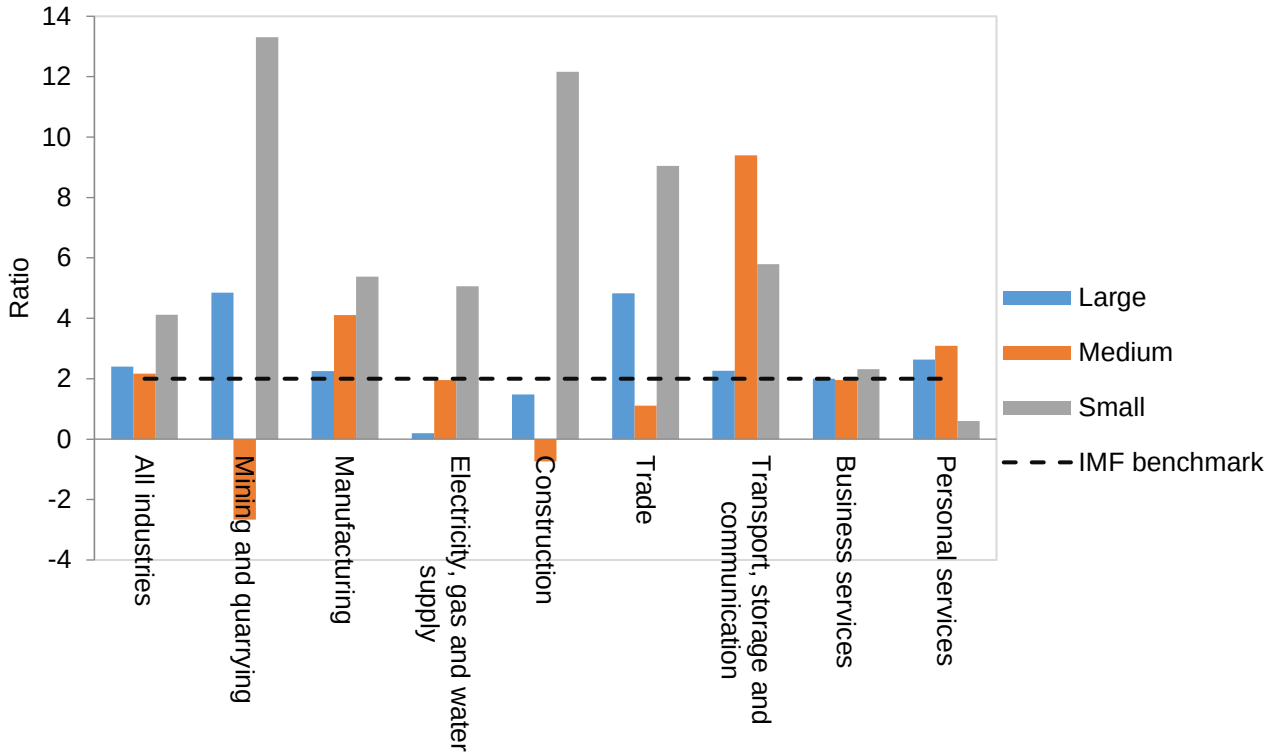
[19] A debt-to-equity benchmark of 1.2 is used in this paper; this is consistent with a 2017 emerging market study. See Board of Governors of the Federal Reserve System, *Emerging Market Non-Financial Corporate Debt: How Concerned Should We Be?* June 2017.

[20] Annual Financial Statistics, December 2019. Metrics used are as at the end of 2018

[21] The ICR measures a firm's ability to honour its debt payments. The ratio is calculated by dividing EBIT by interest expenses.

the end of 2019, indicating that these firms did not generate enough earnings to cover their interest expenses. The same was found for medium-sized firms in the mining and quarrying; electricity, gas and water supply; construction; trade and, business services industries. Only small firms in the personal services industry recorded an ICR below the benchmark. The weakness in the debt-service capacity of firms in the trade; transport, storage and communications and business services industries is particularly concerning given the ongoing effects of lockdown restrictions on these industries.

Figure 5: ICR by size of firm



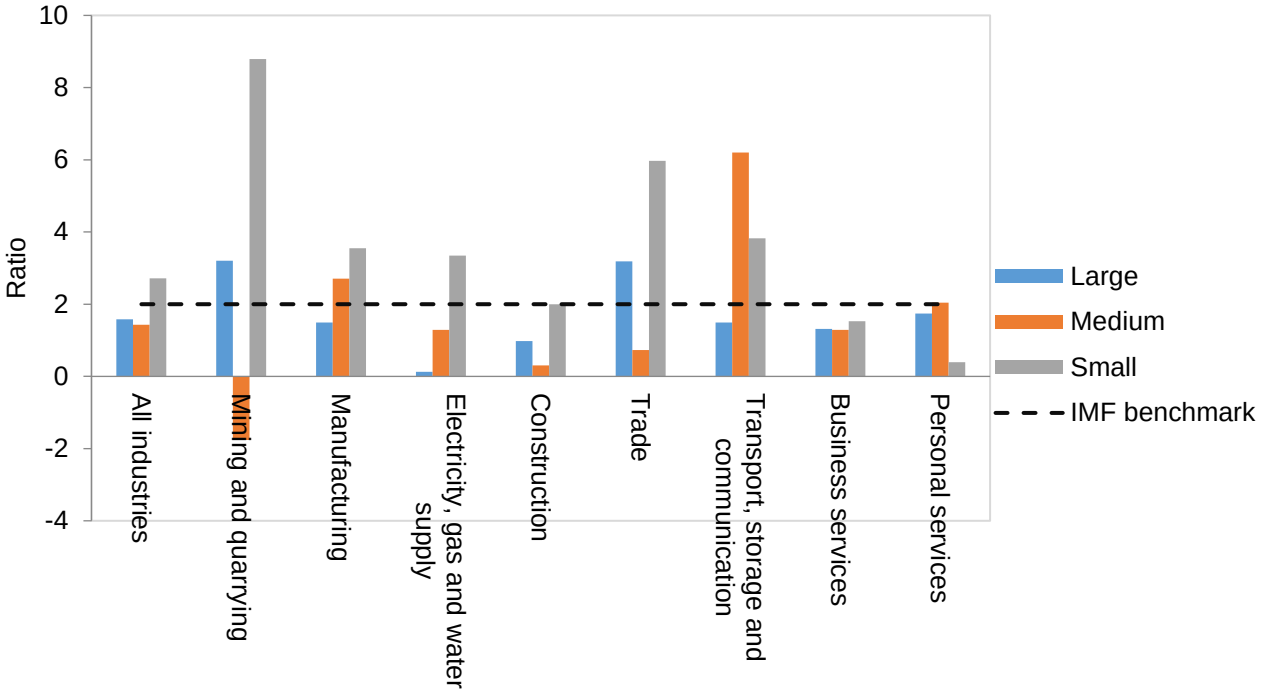
Source: Statistics South Africa and author's computations
As at the end of 2019

Pre-COVID-19 tests[22] (stressed ICR) for the NFC sector have already provided an indication of firms' resilience in the event of economic or financial shocks. The stressed ICR shows that firms in the large and medium sized could experience significant debt-service constraints during stress periods (Figure 6). This suggests that some large and medium sized firms could require as much financial assistance as smaller businesses during the current crisis. The fact that this scenario does not account for a disruption

[22] These shocks include a combination of a 6% increase in borrowing costs and a 30% decline in earnings. This is consistent with what was experienced by domestic non-financial firms in 2009.

in operations implies that the COVID-19 shock will result in significantly worse outcomes for all firms, specifically for those in industries most affected by lockdown measures.

Figure 6: Stressed ICR by size of firm



Source: Statistics South Africa and author's computations
As at the end of 2019

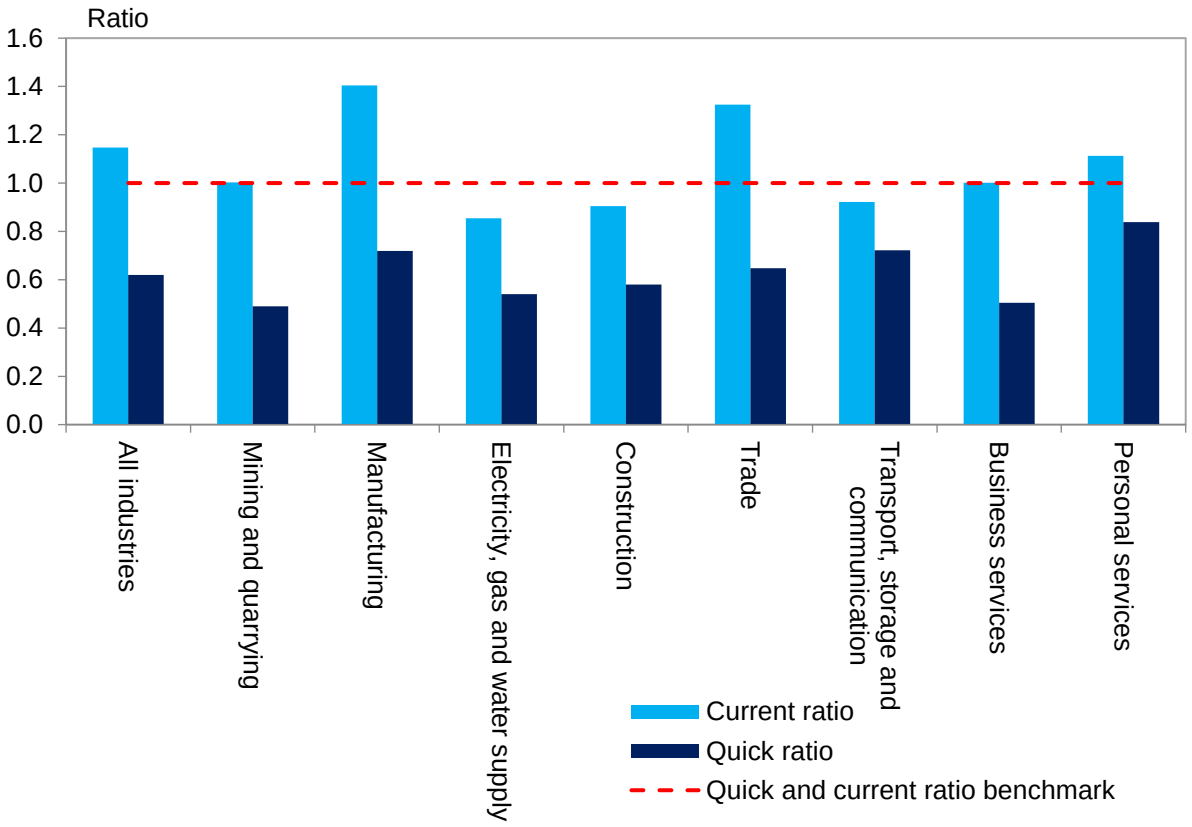
Aside from the signs of weak debt-service capacity, the quick and current ratios[23] for the sector suggest that some industries' cash buffers could possibly be insufficient to support firms during this period (Figure 7). The current ratio, which is a less conservative measure of liquidity, indicates that electricity, gas and water supply; construction and transport, storage and communications are the only industries with insufficient cash buffers. However, an assessment of the sector's quick ratio (which is considered a better measure of liquidity) provides a different result[24]. The quick ratio shows that all industries are trending below the benchmark of 1, implying that most firms may experience difficulty meeting their short-term liabilities if they do not sell assets (inventory or marketable securities) or acquire financing (debt and/or equity).

[23] The quick and current ratio are indicators of a firm's short-term liquidity position and also measure a firm's ability to meet its short-term liabilities using its most liquid assets. The quick ratio is considered a conservative version of the current ratio as it excludes inventory and other current assets. The quick ratio is calculated by dividing current assets minus inventories divided by current liabilities. The current ratio is calculated by simply dividing current assets by current liabilities.

[24] The quick ratio is considered a better measure of short-term liquidity since it focuses on the more liquid assets (such as cash, marketable securities and receivables) and excludes inventories (which can be difficult to convert into cash in the short-term).

Recent data has shown that firms ramped up their cash holdings at the start of the pandemic, with the sector's bank deposits increasing to double digits for the first time since 2015/2016 (Appendix D). This is a positive development, but could also serve as an indication of concern about the sufficiency of their current buffers given uncertain economic conditions.

Figure 7: Quick and current ratios[25]



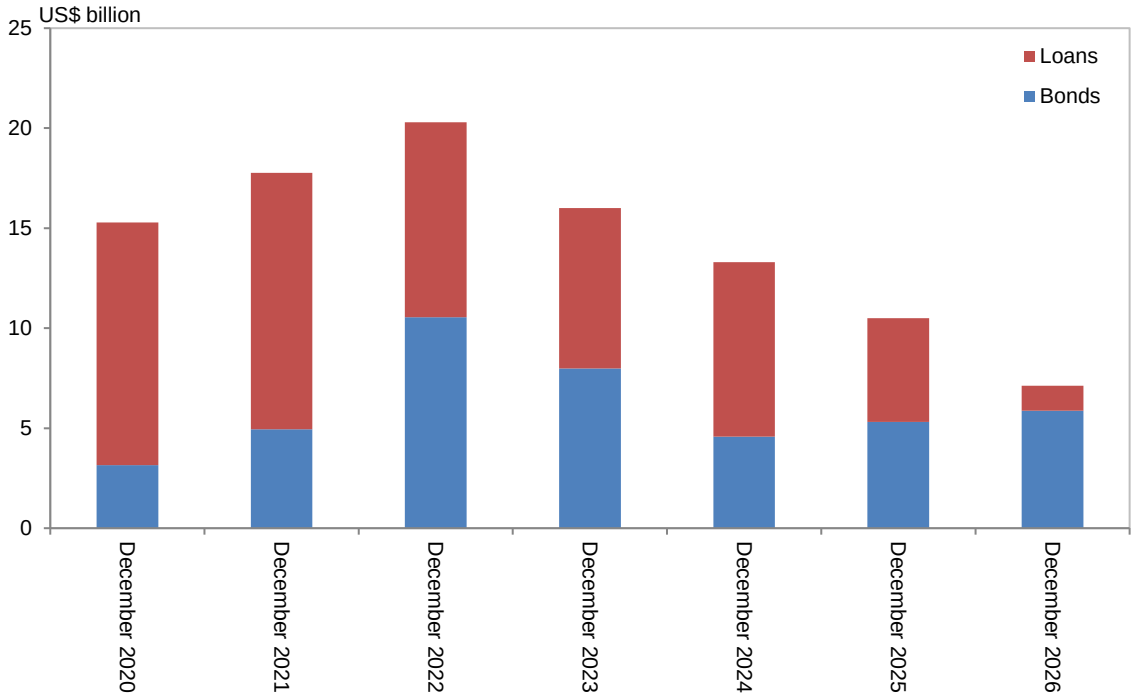
Source: Statistics South Africa and author's computations
As at the end the 2018[26]

Domestic firms' weak financial positions are concerning given that approximately US$15.3 billion (R293 billion) of the sector's outstanding debt is scheduled to mature in 2020 (Figure 8). Over 73% of the maturing debt is in the form of bank loans, highlighting the exposure of the banking sector to NFCs. Although the low-interest rate environment allows firms to refinance this debt at a cheaper cost, weak economic

[25] Acceptable quick and current ratios should lie above 1. See Stats SA's *Woking capital: How do municipalities fare?* July 2020
[26] Annual Financial Statistics, December 2019. Metrics used are as at the end of 2018. Although slightly outdated, the current and quick ratios for the respective industries have largely been consistent over the past few years and are thus a close representation of current firm liquidity positions (Appendix E and F).

growth (and demand) and the current inherent risks in NFC balance sheets may impact firms' ability to refinance their debt or even do so at favourable terms[27].

Figure 8: NFC debt maturity profile

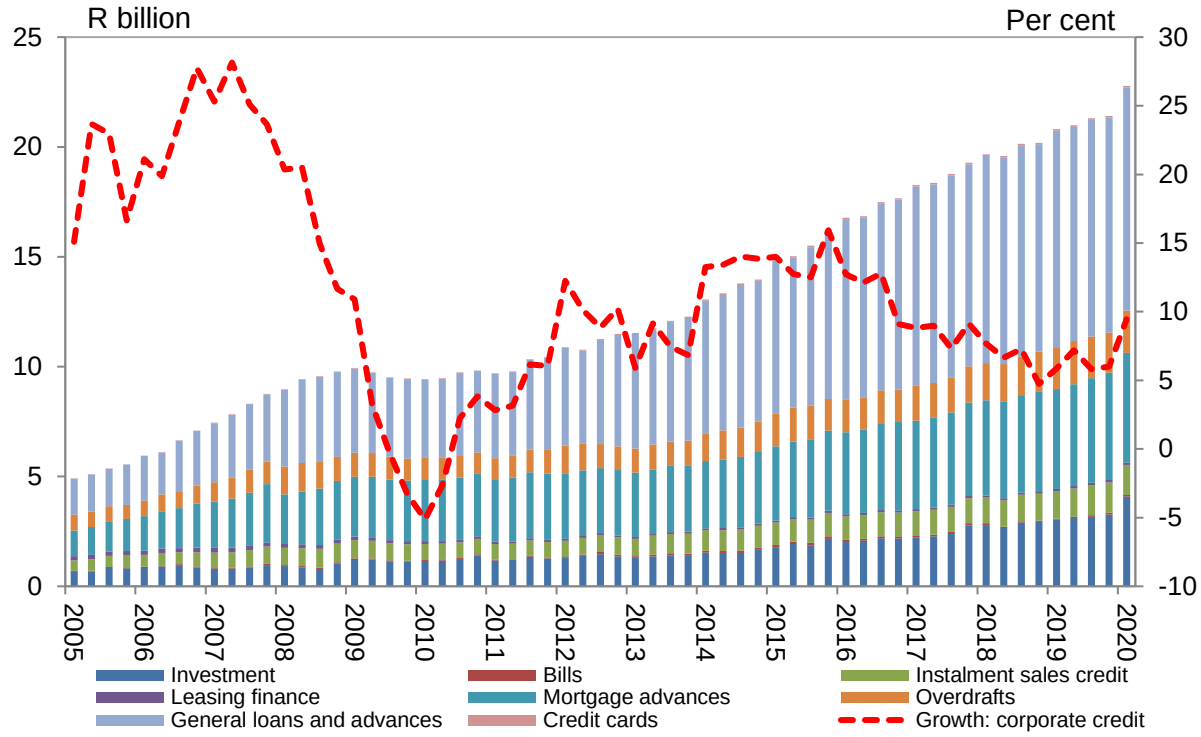


Source: Institute for International Finance and author's computations

The current environment has fuelled worries about the possible liquidity constraints that NFCs may experience. In fact, liquidity and funding pressures were observed in domestic corporate bond markets [28] at the height of the pandemic. Bond markets have since stabilised but NFC flows have remained weak. It appears that banks may have closed (at least to some extent) the funding gap that materialised as fears surrounding the economic impact of the pandemic spread. At the end of the first quarter of 2020, credit extension to NFCs recorded a year-on-year growth of 9.5% (compared to 5.9% in the first quarter of 2019) (Figure 9). While this is a positive sign, it is still too soon to assess the true impact of COVID-19 on bank lending. During the GFC, growth in bank lending slowed significantly from over 20% at the start of the 2008 to -5% at the start of 2010. Should history repeat itself, lending may slow in the coming quarters as banks become reluctant to renew or extend credit lines during this period.

[27] Bank for International Settlements, *COVID-19 and corporate sector liquidity*, April 2020
[28] SARB Financial Markets Department, *Developments in South Africa's Corporate Bond Markets*, April and June 2020.

Figure 9: Credit extension to NFCs



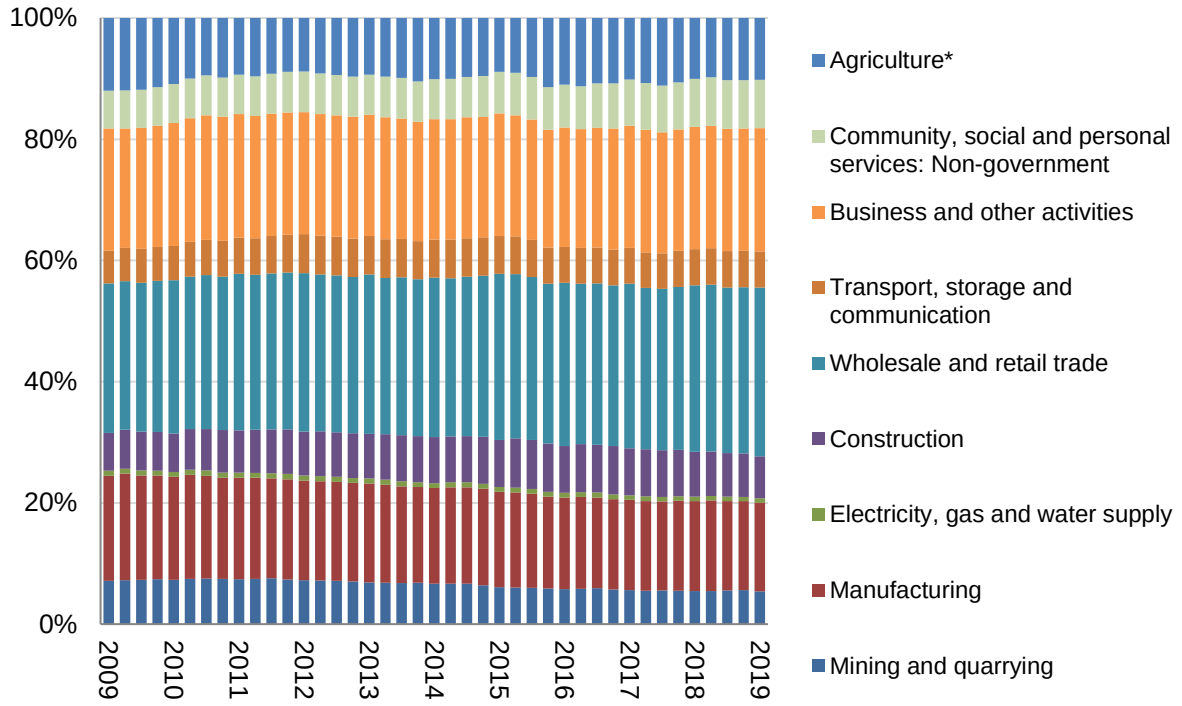
Source: South African Reserve Bank and author's computations

4. Impact on households and the risks for financial stability

Inevitably, corporate distress will spill over into other parts of the economy, specifically to the household sector. NFCs currently account for approximately 75% of total domestic employment (Appendix G) and the distress they face will result in salary cuts, retrenchments or liquidations. As indicated by the Stats SA business survey[29], only about 50% of responding firms expected their workforce size to remain the same, while 45.6% expected the workforce to decrease (10.4% were unsure and 5.4% expect it to increase). Furthermore, projections by the National Treasury state that, under the worst case scenario, SA unemployment could rise to over 50%[30]. Most of the jobs shed will be from industries hardest hit by lockdown measures, such as trade, construction, manufacturing, transport and business services. These industries are some of the largest contributors to SA employment (Figure 10).

[29] Statistics South Africa, *Business impact survey of the COVID-19 pandemic in South Africa*, May 2020
[30] National Treasury, *Financial and economic impact of COVID-19 on the economy and budget*, April 2020

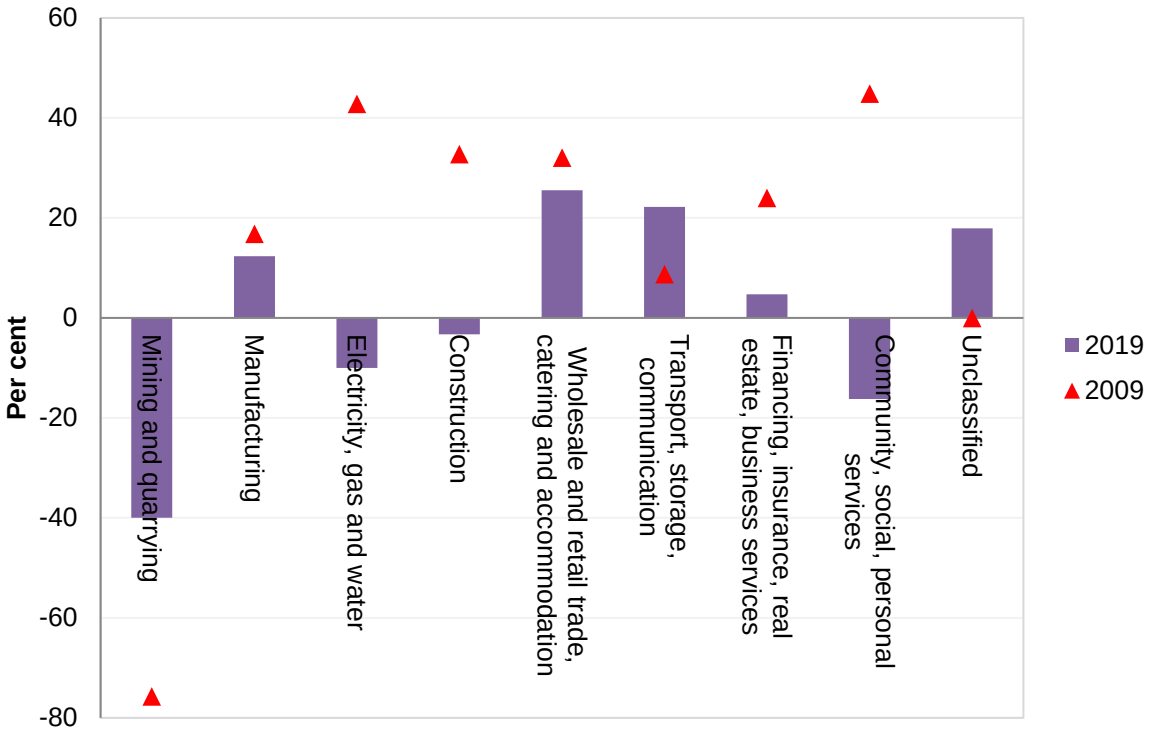
Figure 10: Share of employment by industry



Source: Statistics South Africa and author's computations

While COVID-19 will be partly responsible for the expected increase in job losses, a number of industries experienced a large surge in business closures in 2019 (Figure 11). Almost 2050 firms (financial and non-financial) were liquidated in 2019 (the highest since 2014), approximately 1400 of these were NFCs. In fact, some of the industries that are expected to shed the most jobs (due to the COVID-19 shock) recorded growth in liquidations of over 25% last year. Domestic firms recorded growth in liquidations of up to 45% at the end of 2009; this was largely driven by a global and domestic demand shock. The initial impact of COVID-19 resulted in both a supply and demand shock so firm closures could fare worse than they did during the GFC. Although the relaxation of lockdown measures has left firms with just a demand shock, uncertainty about the pace at which the pandemic will progress and concerns of a second wave of infections raises the likelihood of a second round of strict lockdowns that will again interrupt business activity.

Figure 11: Growth in liquidations by industry



Source: Statistics South Africa and author's computations

Most corporates and households have (some still will) experience a complete or partial loss of income during this period and this will lead to a spike in the probability of default for both sectors. This magnifies the potential risk to the financial system, specifically the banking sector given that households and corporates have a combined R4 trillion of outstanding bank debt with over 80% of the credit extended to them originating from the banking sector (Appendix H and I). Banks currently have a combined total gross credit exposure[31] of approximately 61% to the NFC (33.1%) and household (27.9%) sectors (Table 1), implying that a prolonged and unexpected deterioration in these sector's balance sheets could have a direct and systemic impact on the banking system (and ultimately, financial stability).

[31] This includes on and off balance sheet repos, derivatives and securities financing transactions exposure

Table 1: Banking sector gross credit exposure (GCE) to households and NFCs

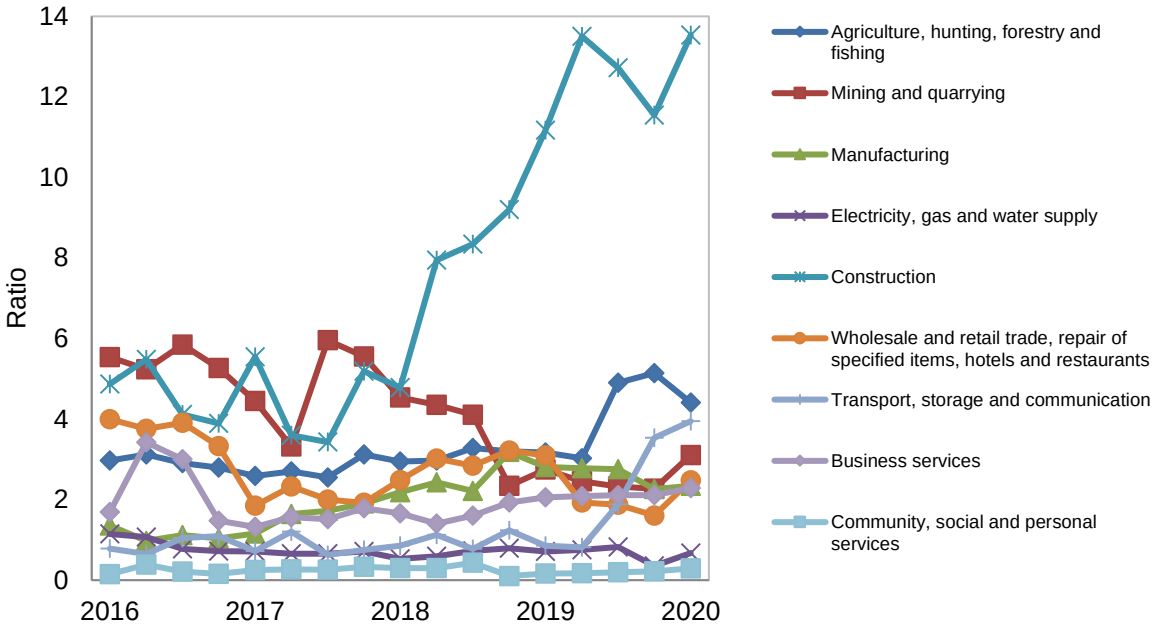
Industry/sector	Share of total GCE
Agriculture, hunting, forestry and fishing	2%
Mining and quarrying	3%
Manufacturing	5%
Electricity, gas and water supply	2%
Construction	1%
Wholesale and retail trade	5%
Transport, storage and communication	3%
Business services	4%
Community, social and personal services	6%
Other	2%
Households	28%
Total	**61%**

Source: BA210 and author's computations

The existing stress on the corporate sector's balance sheet has largely resulted in acceleration in small, medium and large business defaults since mid-2017 (Appendix J). With the exception of the agricultural sector, firms in all other industries experienced difficulty repaying their debt in the first quarter of 2020 (Figure 12a). While the surge in the default ratio can partly be attributed to lockdown measures, these only came into effect closer to the end of March 2020, indicating that ratios in the coming months could be worse. Despite expectations for higher defaults in 2020, banks appear to be sufficiently equipped to absorb some of the expected losses. Banks have a minimum of 40% and a maximum of 57% coverage[32] for the mining and quarrying, business services and personal services industries (Figure 12b). However, their coverage for other industries, that are likely to be hardest hit by the pandemic, appears to be relatively lower. In particular, banks have coverage of 31%, 29% and 19% for the manufacturing, trade and transport, storage and communications industries respectively. Under normal circumstances, it would be unusual to expect defaults for these industries to increase by double digits (or even exceed their coverage). However uncertainty about the duration (and magnitude) of the pandemic and the possibility of future stricter lockdowns make it difficult to ascertain whether banks are sufficiently covered for unexpected losses from these particular industries.

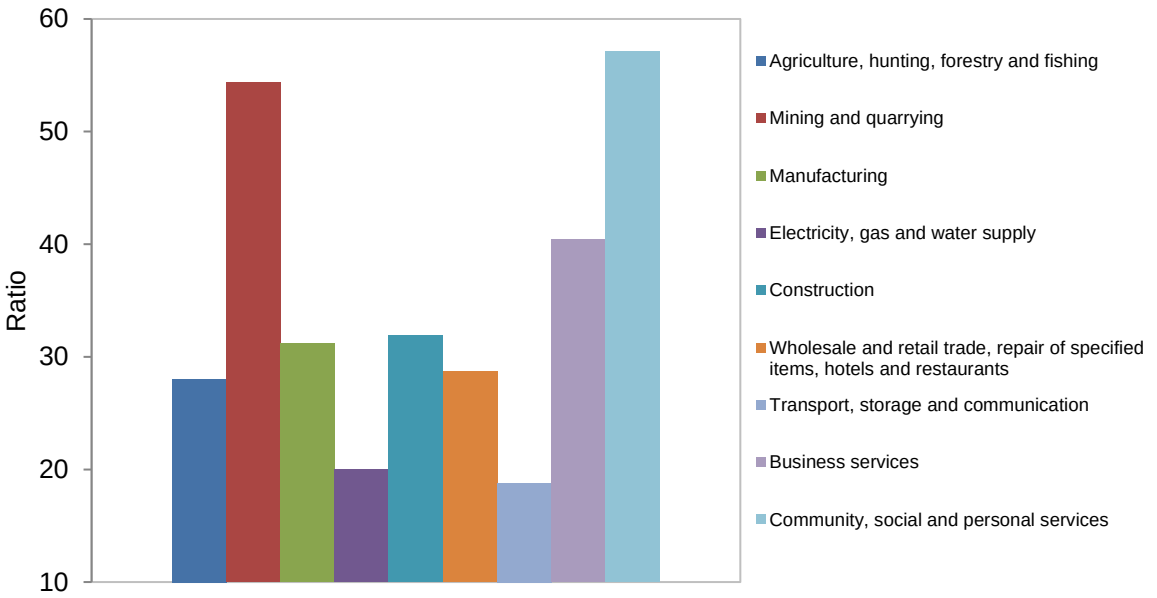
[32] A coverage ratio measures an institution's ability to absorb losses from its defaults (non-performing loans – NPLs). Calculated as credit impairments (provisions) divided by defaults (NPLs).

Figure 12a: Sectoral default ratios[33]



Source: BA210

Figure 12b: Sectoral coverage ratios[34]



Source: BA210

[33] The default ratio is calculated as defaults as a portion of on-balance sheet credit exposures.
[34] Sectoral coverage ratios as at the first quarter of 2020.

5. Mitigating measures

Countries across the globe have employed a wide range of fiscal, monetary and macro-financial measures to support the real economy and financial markets. For example, the US Federal Reserve announced plans to purchase corporate bonds in an effort to direct liquidity to the sector. Furthermore, the US, Canadian and Australian governments provided COVID-19 relief loans for firms[35]. South Africa has been no different with financial sector regulators, the central bank, government and banks providing some form of support for financially distressed firms during this period. This support, not only, provides a much needed backstop for firms that would have struggled to remain afloat otherwise but also limits the threat to the financial system that could have materialised through a sharp increase in credit risk.

The South African Reserve Bank (SARB) used expansionary monetary policy (lowered interest rates by a combined 225 basis points between 19 March and 23 July), asset purchases and open market operations[36] to support and ease liquidity constraints in the domestic market. The Prudential Authority (PA) complemented SARB efforts by providing banks with various regulatory relief measures[37]. These measures included, providing capital relief on restructured loans (to households and businesses) that were in good standing pre-COVID-19[38], lowering the liquidity coverage ratio[39] and the Pillar 2A capital buffer from 1% (of risk-weighted assets) to 0%. For additional capital relief, the PA has provided guidelines for banks to access their capital conservation buffer (2.5% of risk-weighted assets). In an effort to help bank capital preservation, the PA also issued guidance on dividend and cash bonus distributions. The policy actions taken by the SARB and the PA provide indirect support for the corporate sector. These actions aim to support financial intermediation and maintain the supply of credit to the real economy, allowing firms to easily access credit during this period. Expectations for client distress and the regulatory relief provided by the PA has allowed banks to

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35 International Monetary Fund, Policy Tracker, 2020

36 Increased the number of repo auctions, reduced the upper and lower limits of the standing facility to lend at repo and borrow at repo less 200 bps, raising the size of the weekly refinancing operations as needed and extend the main refinancing instrument maturities from 3 to 12 months

37 Prudential Authority, *Press release on regulatory relief measures and guidance to the banking sector in response to COVID-19*, April 2020

38 Loans that are restructured due to COVID-19 will not carry a higher capital charge

39 The LCR outlines the proportion of liquid assets that have to be held relative to expected/ anticipated outflows

provide households and businesses with some financial relief. This relief largely comprises of payment holidays on loans, credit cards and overdrafts.

A consortium of commercial and industrial property owners, Property Industry Group[40] also announced an industry-wide relief package for retail tenants that are hardest hit by the pandemic[41]. This relief package included rental discounts (rent will be fully or partially waived) and interest-free rental payment holidays[42] up to 1 July 2020. The primary focus is on small, medium and micro-enterprises, across all sectors, however, the group will also support large corporates impacted by the pandemic.

Government has also provided some support measures. The COVID-19 Temporary Employer/Employee Relief Scheme (TERS) provides assistance to firms and employees that are unable to pay/receive salaries as a result of the pandemic. The South African Revenue Service provided for the deferral and postponement of some taxes. COVID-19 relief funds are being offered by the Industrial Development Corporation (R800 million - largely for manufacturing businesses), Department of Small Business Development (R500 million) and Department of Tourism (R200 million). The government also announced a R500 billion fiscal support package, of which R200 billion will be used to create a joint (National Treasury, SARB and commercial banks) COVID-19 guaranteed loan scheme to provide support to small and medium enterprises (SMEs) with a turnover below R300 million.

While the above mentioned factors could mitigate and lessen some of the risks that could materialise from this pandemic, concerns still remain about whether they are sufficient (or even sustainable) and the possible implications for NFC balance sheets post the crisis. The financial relief provided by the banking sector and the commercial property sector is limited to a few months of payment holidays and reserved for businesses that were in good standing pre-COVID-19. Ongoing uncertainty surrounding the duration and magnitude of this pandemic and specifically, lockdown measures suggests that firms would likely not have recovered by then. Therefore a

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[40] The consortium which was formed to coordinate the commercial real estate sector's response to COVID-19 is made up of The South African Real Estate Investment Trust (SA Reit) Association, the SA Property Owner's Association and the SA Council of Shopping Centres

[41] https://eprop.co.za/commercial-property-news/item/22041-the-property-industry-group-announces-its-retail-tenant-assistance-relief-package

[42] Rent will be recovered over six to nine months as at 1 July 2020.

number of firms may require an extension. Specific to banking sector relief, interest could still be charged on the outstanding amount of a loan, essentially increasing their total repayment. And on the other hand, it is important to consider whether it would be prudent and financially viable for banks (and commercial property owners) to provide relief beyond these months.

Most of the government funding is either reserved for a particular industry, such as manufacturing and tourism or limited to size (SMEs). The support for SMEs is definitely crucial given their contribution to employment creation. However, we cannot assume that large corporates have sufficient financial capacity to withstand the impact of the pandemic. As previously highlighted, large corporates appear to be the weakest (low ICRs, weak average cash buffers and high foreign-currency debt exposure) and are likely to be just as negatively impacted small businesses during this pandemic. Comair and Edcon[43] are two such as examples. Defaults by large corporates could significantly impact financial stability given the size of their debt and the exposure of various parts of the economy to these firms.

Lastly, ensuring supply of liquidity is an important part of managing a crisis and protecting the real economy. However, given the sector's already high debt levels, there are concerns about the rise in firm leverage and the pace of their recovery (and consequently profit generation) after the pandemic. The weakness of firms pre-COVID-19 combined with the halt in operations (due to lockdown measures) and the additional (and to some extent unavoidable) debt burden suggests that the impact of this pandemic may linger for long.

6. Conclusion and macroprudential policy recommendation

Pre-COVID-19 corporate weakness exposed the vulnerability of the sector to economic and financial shocks that have not only threatened their survival but also that of households. Elevated credit risk from both the household and corporate sector could have severe consequences for the financial system. The expectation for a

[43] Edcon faced financial woes just over a year ago before receiving assistance from the Public Investment Corporation and other creditors. The pandemic just exacerbated its financial vulnerability. See: https://www.fin24.com/Companies/Retail/edcon-like-saa-on-life-support-for-a-long-time-analyst-20200328-2

significant decline in economic growth exacerbates the impact on corporate performance and raises concerns about the pace of the sector's recovery. Weak growth and demand prospects as well as limited cash buffers suggest that firms are likely to take on additional debt during this period and exit the pandemic even more leveraged.

The range of measures employed by policymakers, regulators, government, banks other role players provides corporates with some much needed support. However, concerns remain about the reach of these measures (specifically the support for large corporates that have shown significant weakness), their sustainability (given uncertainty about the duration of the pandemic and lockdown measures) and the impact on NFC balance sheets post-COVID-19.

The 2007/2008 GFC highlighted the importance of having a sound, safe and well capitalised financial system. This system has served the SA economy well so far. However, this pandemic has also highlighted the risk that weak firms pose for overall macroeconomic and financial stability. The magnitude of the risks to the banking sector is yet to be seen given uncertainty about the duration of the pandemic and the possibility of a second wave (and thus another around of strict lockdown measures). Therefore, in future, it may be beneficial to consider the introduction of direct capital requirements for the NFC sector[44]. Although an unusual and untested (like many other macroprudential tools) policy tool, it would not only expand the number of backstops accessible to firms during periods of distress but also limit the financial burden on government and other financial sector role players. This could also protect employment and thus ensure that labour markets remain somewhat stable during- and post-crisis periods. Direct capital buffers for NFCs would ultimately benefit both financial and macroeconomic stability[45].

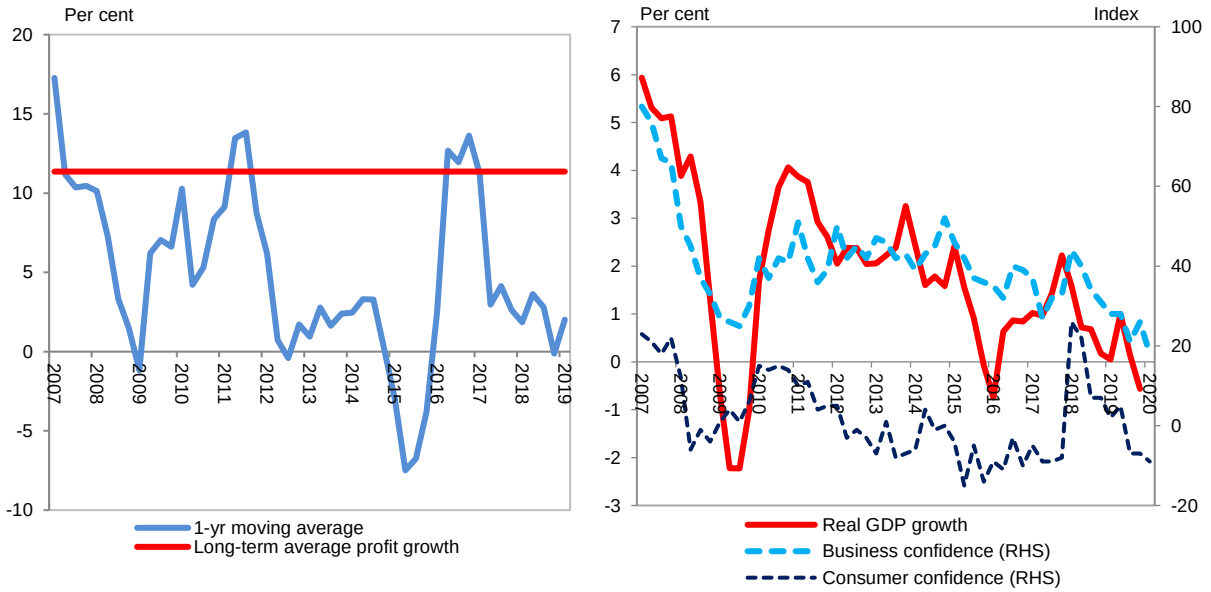
Liandra da Silva
Macroprudential Analysis Division
September 2020

[44] Not to be confused with a sectoral capital buffer (or sectoral countercyclical capital buffer – SCCyB) which imposes additional capital requirements on banks that are exposed to the targeted sector. The suggested capital requirements would be directly imposed on firms.. See *Identifying Systemically Important Companies by Using the Credit Network of an Entire Nation*, International Institute for Applied Systems Analysis, 2018.

[45] The proposed macroprudential policy recommendation requires more extensive research.

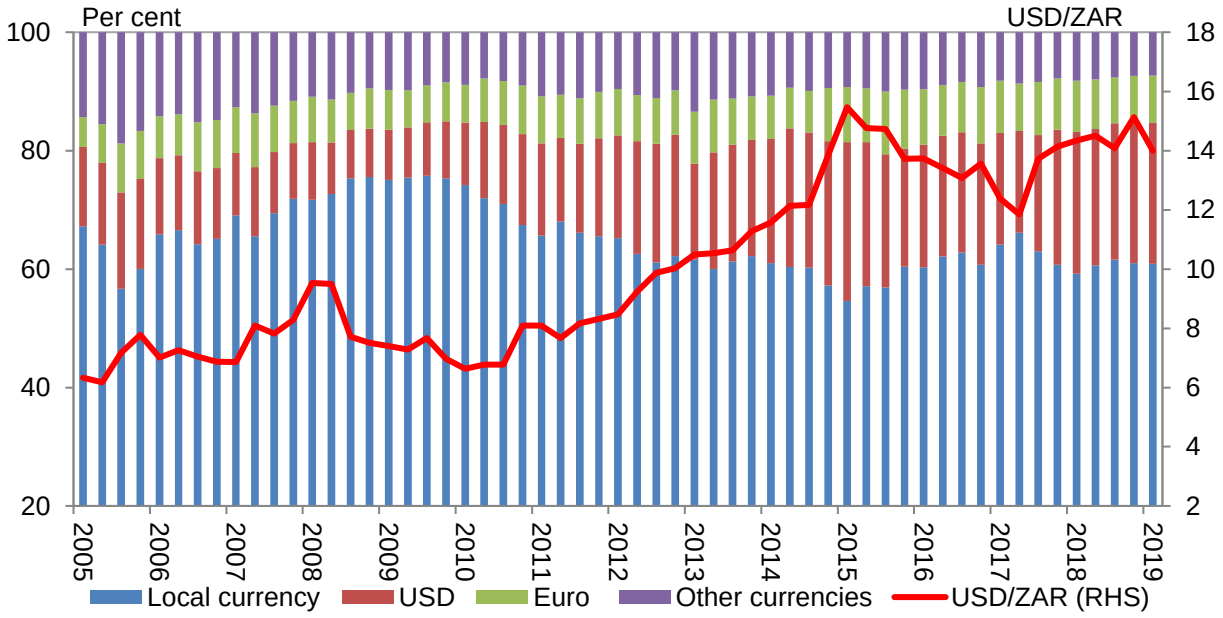
Appendices

Appendix A: Corporate earnings[46], economic growth and confidence indices



Source: South African Reserve Bank, Statistics South Africa and FNB/BER, Stellenbosch University

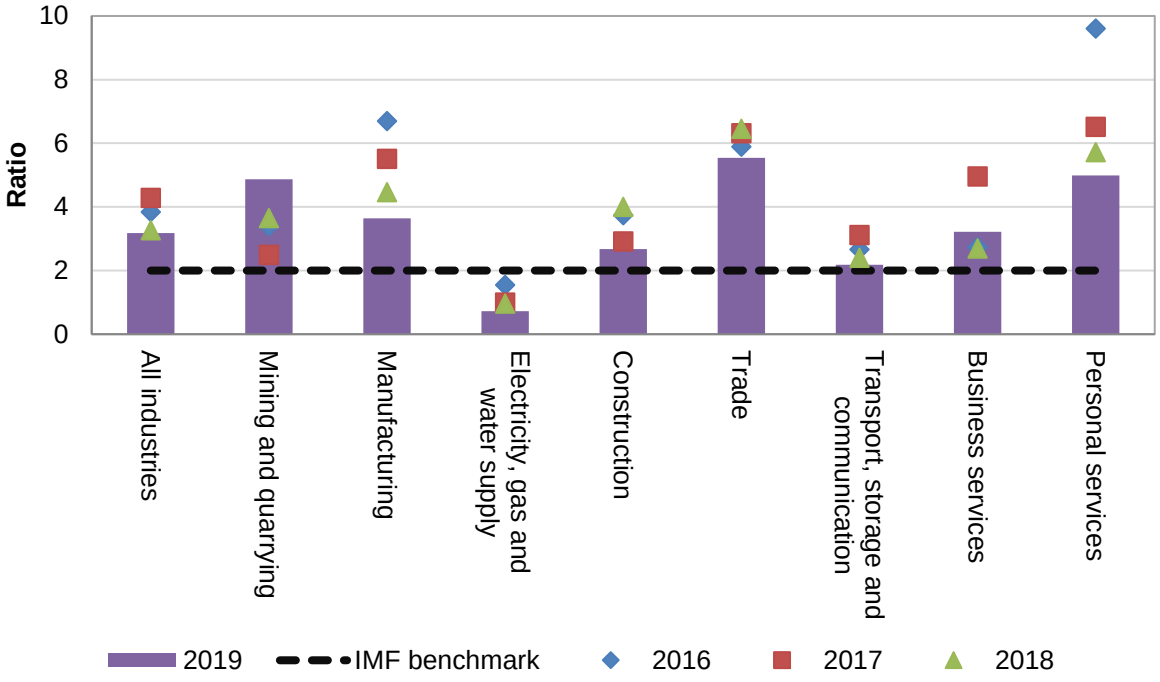
Appendix B: NFC debt by currency composition



Source: Institute of International Finance, Bloomberg and author's computations

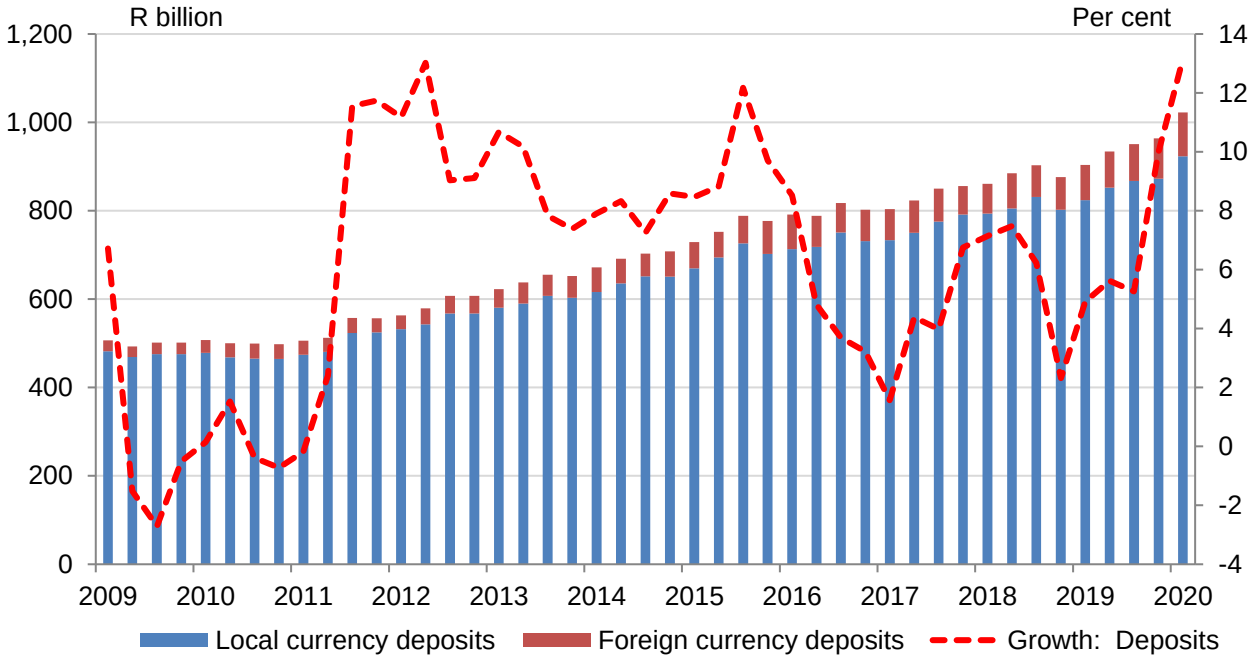
[46] Net operating surplus is used a measure of earnings in this graphical representation

Appendix C: ICR



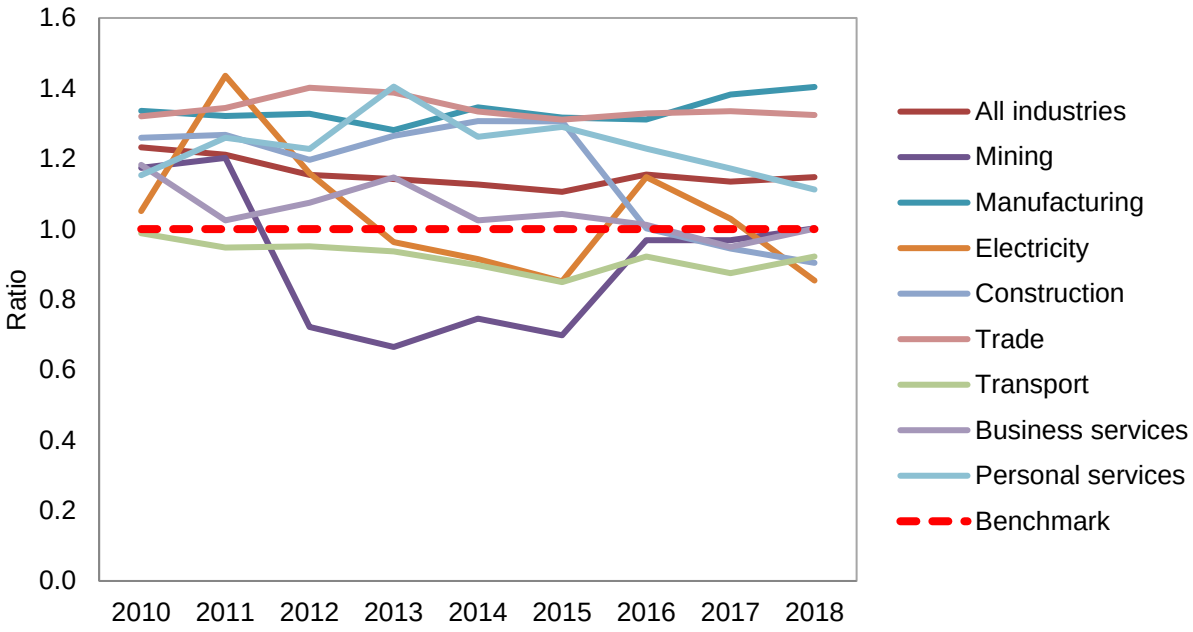
Source: Statistics South Africa and author's computations

Appendix D: Corporate bank deposits



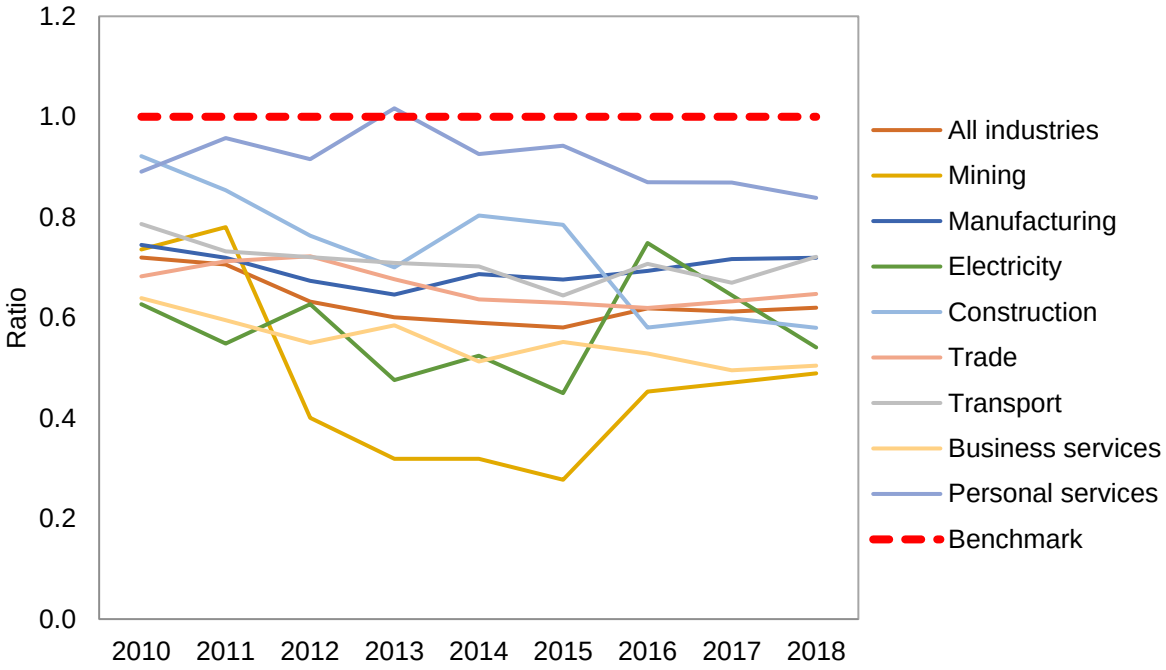
Source: South African Reserve and author's computations

Appendix E: Current ratio



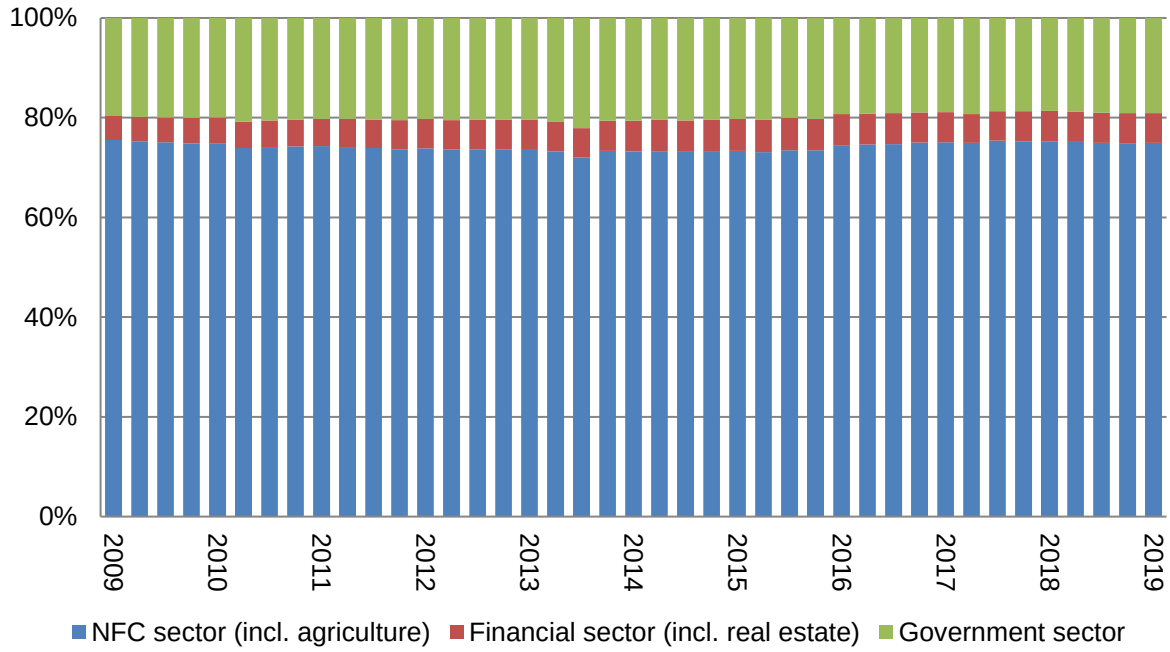
Source: Statistics South Africa and author's computations

Appendix F: Quick ratio



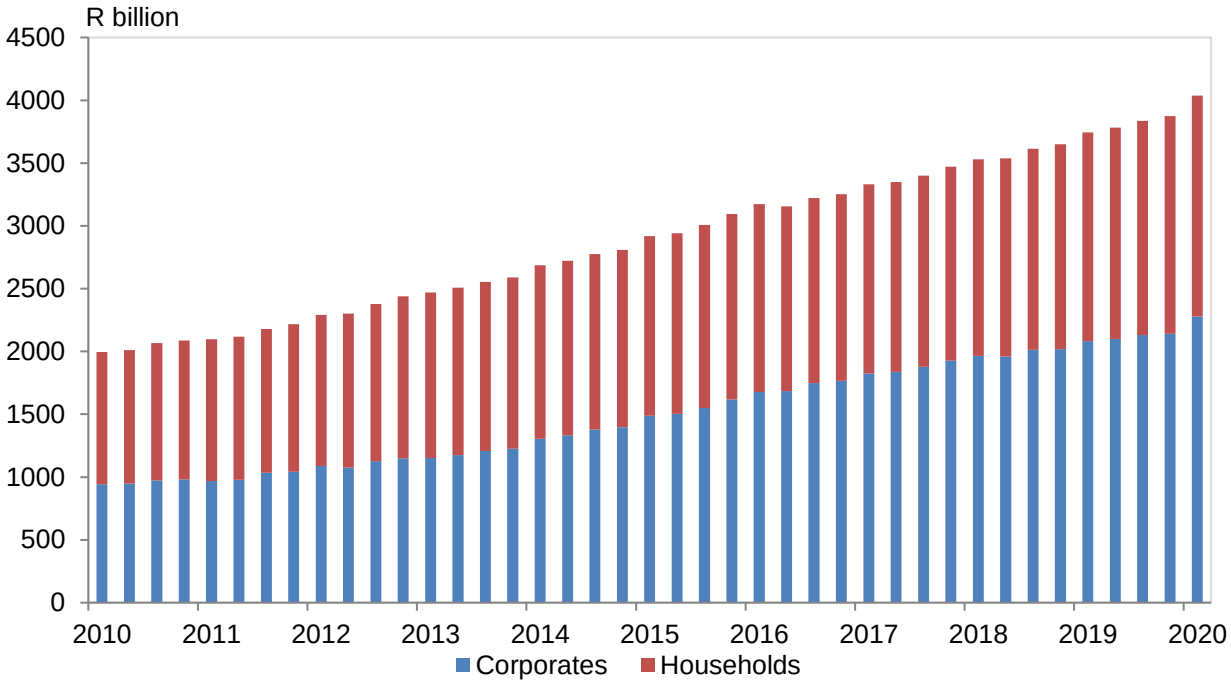
Source: Statistics South Africa and author's computations

Appendix G: Employment by sector



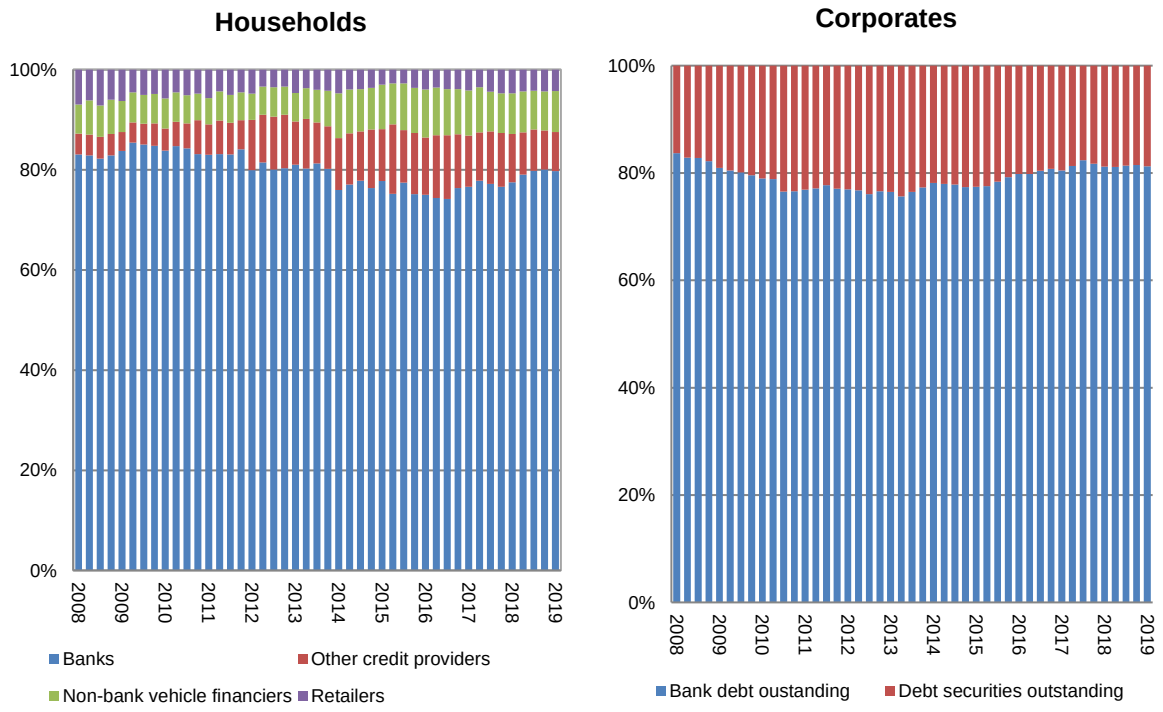
Source: Statistics South Africa and author's computations

Appendix H: Outstanding stock of corporate and household bank debt



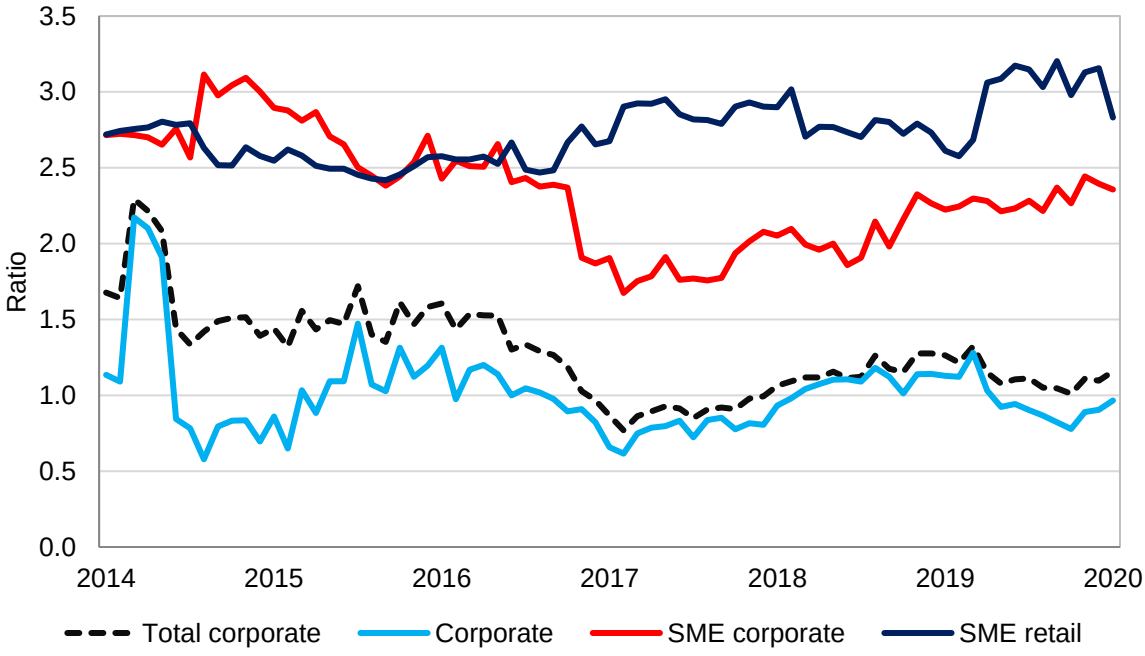
Source: South African Reserve Bank

Appendix I: Outstanding stock of household and corporate debt by industry



Source: National Credit Regulator, South African Reserve Bank and Bank for International Settlements

Appendix J: Corporate default ratio



Source: BA210

TOPICAL BRIEFING: No. 3

Financial Stability Department

SOUTH AFRICAN RESERVE BANK

December 2020

Financial stability implications of establishing South Africa as a regional financial centre[47]

1. Introduction and background

As part of its vision 2030 of achieving full employment, decent work and sustainable livelihoods for South Africa (SA), the National Development Plan (NDP) suggested that policy should focus on promoting demand for South African products in domestic and foreign markets by developing areas of competitive advantage. The proposal is for SA companies to be encouraged to participate in regional infrastructure projects and to promote industrialisation through integrated regional supply chains. The NDP envisaged SA developing strategic relationships across the continent, through negotiation of trade deals and leveraging project finance for regional investments.

A component of SA's strategy of being a driver of regional growth included the "establishment of a Financial Centre for Africa" which would involve a greater commitment to financial resources being "devoted to funding projects in the region with linkages to South African companies". The plan also suggests that SA "has not used its sophisticated financial services industry sufficiently to foster growth and create employment" and that, with government support, the sector can "expand aggressively on the continent, with strong linkages to the South African economy"[48]. This has implications for SA's financial stability, and, in particular, macroprudential policy. The

[47] The research assistance provided by Engie Salimane, Gerhard van Deventer and Joy Putini, as part of the working group of the Capital Markets and Funding work stream of the President's Commission on the fourth industrial revolution, is gratefully acknowledged.

[48] NPC, 2013: 130 & 151

expansion of large SA financial groups into other African jurisdictions can introduce risk to the SA financial system, with the potential of the system's vulnerabilities to amplify shocks from the region, or to transmit shocks to other jurisdictions' financial systems. A further dimension of this could be the ability of the SA financial sector to use developments in technology to advance cross-border flows and payments in the region, or for SA residents to use financial technology in other African jurisdictions for cross-border transactions. This paper discusses the potential financial stability implications for the SA financial system becoming a regional financial centre.

2. Types of financial centres

There are different types of financial centres, for example, international financial centres (such as London and New York), regional financial centres (such as Frankfurt and Chicago), and offshore financial centres (such as Cayman Islands and Dublin, Ireland)[3]. Financial centres have been found to play a disproportionate role in facilitating trade in international assets and liabilities, particularly foreign direct investment (FDI). In 2015, financial centres were found to account for almost half of the worlds FDI claims[49]. A regional financial centre generally focuses on a defined geographic area, whereas an international financial centre aspires to have global reach. Offshore financial centres (OFC) include the provision of financial services by banks and other agents to non-residents[50]. The growth in OFCs was fuelled by financial sector policy, where offshore financial institutions enjoyed certain advantages such as tax advantages, political and economic certainty, lower reserve requirements and ineffective or weak regulation (including a lack of consolidated banking supervision and ineffective anti-money laundering frameworks). Historically, risks arising from OFCs have largely been a result of the interlinkages between onshore banks operating in regulated jurisdictions and more opaque offshore funds operating in less regulated financial centres. For example, during the 1997/98 Asian and Latin American financial crisis, the lack of effective consolidated banking supervision proved to be an important reason for regulatory arbitrage through the transfer of assets and liabilities between onshore operations and operations established in OFCs. However, although there are costs to financial centres, benefits (like increased employment,

[49] See https://blogs.imf.org/2017/06/13/chart-of-the-week-fdi-in-financial-centers/
[50] https://en.wikipedia.org/wiki/Financial_centre

increased tax revenues, and the multiplier effect of bank expenditure in the economy) outweigh these costs, even for small open island economies[51].

2.1 The growth of SA's financial services offerings on the continent

The International Monetary Fund (IMF) noted that SA is an important economy in sub-Saharan Africa (SSA) such that, when it has high economic growth, the entire region benefits[52]. It also noted that SA has a large and sophisticated financial sector comparable to that of advanced economies [53]. Cape Town and Johannesburg are the only two SA cities ranked in the top 100 financial centres of the Global Financial Services Index[54]. In the 2019 ranking, Johannesburg was classified as an emerging international financial centre, whereas, Cape Town was ranked as a relatively deep local financial centre.

Many large SA financial institutions have been focusing on growing and increasing their financial activities (and revenues) from rest-of-Africa operations, particularly since the 2008/09 global financial crisis (GFC). A number of SA banking and insurance groups have also built businesses in Europe and Asia. The IMF noted that this expansion poses challenges to African regulators and supervisors[55]. There are also large cross-border remittance flows from SA to other countries in the Southern Africa Development Committee (SADC) region, but most of these flows are through informal channels (using the cross-border bus and taxi networks)[56]. These flows are due to SA being a major destination for economic migrants from other African countries. Finmark Trust estimated these remittances to be in the range of between R9.3 billion and R13 billion annually, from the approximately 3.3 million SADC migrants living in South Africa (with Zimbabwe being the main destination for migrants). World Bank research suggested that 80% of migrants in SA remitted money to their home countries via

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51 Tschoegl, 1989.
52 IMF podcasts, South Africa: escaping the growth doldrums. 29 January 2020. Available at: https://www.imf.org/en/News/Podcasts/All-Podcasts/2020/01/30/south-africa-review-2020. Accessed 2 February 2020.
53 IMF, 2014.
54 Long Finance and Financial Centre Futures, 2019.
55 IMF, 13 February 2017. Pan-African banking finding its stride. Available online: https://www.imf.org/en/News/Articles/2017/02/10/NA021317-Pan-African-Banking-Finding-its-Stride. (Accessed 2 February 2020).
56 Finmark Trust, https://www.finmark.org.za/wp-content/uploads/2016/07/remittances-from-south-africa-to-sadc.pdf. (Accessed 26 May 2020).

informal channels. The World Bank has been working actively with standard setting bodies on initiatives aimed at improving the efficiency and safety of remittances[57].

3. Initiatives to position South Africa as a regional financial centre

SA's standing as a gateway to Africa is relative to the country's standing in relation to other jurisdictions[58].

3.1 African regional financial centres

In Africa, Morocco, Nigeria, Kenya, Mauritius and Botswana have existing regional financial services offerings or have stated ambitions to expand their financial service offerings on the continent. More recently, jurisdictions in the Middle East have started focusing on offering financial services which facilitates trade and investment flows between Africa, the Middle East and Europe, and in particular, Dubai in the United Arab Emirates[59]. In Africa, SA has a number of established advantages, including a sophisticated financial sector, a well-developed road and rail network, as well as airports with departures to many parts of the continent. However, geographically, being on the southern tip of the continent, SA is not a natural hub. Furthermore, the exchange rate of the rand is a volatile currency that contributes to increased currency risk for multinationals that operate in multiple jurisdictions. A mitigating factor is that the rand is also widely traded outside of the country's financial markets, thereby being relatively liquid in nature[11].

3.2 South African financial sector policies to encourage a regional financial sector

There have been various financial sector policy changes that support regional financial integration and the deepening of linkages between the SA financial system and the region's financial systems.

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57 World Bank, 2018.

58 Sandretto, M. 2016. South Africa: still the gateway to Africa? Available at https://www.howwemadeitinafrica.com/south-africa-still-gateway-africa/56591/. Accessed 20 May 2020.

59 See Dubai International Financial Centre https://www.difc.ae/.

3.2.1 Investment policies

In 2004, the limits on the use of domestic capital to fund offshore investment were removed and changes were made to facilitate inward listings by foreign companies on the Johannesburg Stock Exchange (JSE). The formal approval process for investments of up to R500 million per year was removed. In 2010, international headquarter company rules were introduced to encourage international companies to invest in Africa using SA as a base. In the 2013 Budget Review, the National Treasury (NT) proposed the HoldCo concept that would be registered with the SARB's Financial Surveillance Department. The HoldCo concept was to allow listed JSE entities to establish one subsidiary to hold African and offshore operations. These entities would not be subject to foreign exchange restrictions, provided they complied with certain conditions[60].

3.2.2 Financial sector policies

In the 2016 budget review, NT suggested that there is substantial potential to support economic growth, both in SA and the continent by, for example, increasing SA's market share of the rest of Africa services imports[61]. NT suggested that a series of reforms have, and continue to, position South Africa as a regional financial hub, with 17% of the revenues for South Africa's four largest banks originating from the rest of Africa. These reforms include the following:

- As previously mentioned, subsidiaries of banking and insurance groups being allowed to apply for "HoldCo" status[62], subject to the Governor's approval following consultation with the Prudential Authority and Financial Surveillance Department.

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60 NT MTBPS 2013: Annexure W3. Available at http://www.treasury.gov.za/documents/national%20budget/2013/review/Annexure%20W3.pdf. Accessed 20 May 2020.

61 NT MTBPS 2016: 169

62 "HoldCo" status is a reference to exchange controls. Exchange Control regulations are legal provisions that limit the extent to which South African residents and companies may transfer funds overseas. HoldCo refers to a South African registered entity, which is regarded as "non-resident" for Exchange Control regulatory purposes. For further information, refer to https://www.resbank.co.za/RegulationAndSupervision/FinancialSurveillanceAndExchangeControl/Pages/Financial%20Surveillance%20and%20Exchange%20Control-Home.aspx and https://www.resbank.co.za/RegulationAndSupervision/FinancialSurveillanceAndExchangeControl/Guidelines/Operations%20Manual/Manual%20Section%20B.4%20-%20INTERNATIONAL%20HEAD%20QUARTER%20and%20SOUTH%20AFRICAN%20HOLDING%20COMPANIES.pdf. Accessed 15 January 2020.

- The introduction of a multi-currency settlement system to allow SADC central banks and financial institutions to allow settlement on-shore[63], as well as to facilitate the introduction of domestically settled, foreign-currency denominated bonds.
- Linking legal and regulatory frameworks for central securities depositories to facilitate cross-border settlement between domestic and foreign depositories[64].
- Establishing a licencing regime for central counterparties (CCPs) in the Financial Sector Regulation Act, Act 9 of 2019 (FSR Act)[65]. This is intended to facilitate the trade in domestic derivatives with foreign financial institutions, as well as to house the CCPs operations in South Africa (but also offer these services to other African financial institutions).

3.2.3 Exchange Control Regulations

Another initiative to deepen integration is the gradual relaxation of exchange controls in relation to SA residents. Since 1994, there has been a gradual elimination of exchange controls, with the current limitations being largely non-restrictive/limited restrictions for the majority of SA residents (or private individuals)[66]. Institutional investors' foreign portfolio investment allowances have also been gradually eased to 30% of retail assets (this is the case of retirement funds and the underwritten policy business of long-term insurers) and 40% of retail assets for investment managers, collective investment scheme management companies and the investment linked business of long-term insurers. Institutional investors are also allowed to invest an additional 10% of their total retail assets by acquiring foreign currency denominated portfolio assets in the rest of Africa through foreign currency transfers from SA or by

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[63] In support of payment system integration, the SARB operates the SADC Integrated Regional Electronic Settlement System (SIRESS) which is a cross-border real-time gross settlement system operating in the SADC region. SIRESS was implemented on 22 July 2013, provides for settlement in both South African rands and US dollars. For further information, refer to https://www.resbank.co.za/RegulationAndSupervision/NationalPaymentSystem(NPS)/RTGSOperation/Documents/20181228%20SADC-RTGS%20(SIRESS)%20PFMI%20Self-assessment%202018%20published.pdf. Accessed 15 January 2020.

[64] For example, the South African CSD, STRATE, is a member of the Liquidity Alliance, a grouping of CSDs that use a common collateral management platform which enables domestic assets to remain in custody within the domestic infrastructure and the domestic jurisdiction. For further information, refer to https://www.clearstream.com/resource/blob/1318234/b93927c587f28e22c1fa2cf97974a630/liquidity-alliance-flyer-2015-data.pdf.

[65] Subsequently, during December 2019, the Financial Sector Conduct Authority and the Prudential Authority released a joint standard setting out the licencing requirements for CCP applications. For further information, refer to http://www.resbank.co.za/Publications/Detail-Item-View/Pages/Publications.aspx?sarbweb=3b6aa07d-92ab-441f-b7bf-bb7dfb1bedb4&sarblist=21b5222e-7125-4e55-bb65-56fd3333371e&sarbitem=9624.

[66] South African residents over 18 years in age can use a single discretionary allowance limited to R1 million per calendar year for any legal purpose abroad. Residents can, in addition to the single discretionary allowance, invest up to R10 million outside of the common monetary area (CMA) per calendar year. For further information, refer to https://www.resbank.co.za/RegulationAndSupervision/FinancialSurveillanceAndExchangeControl/FAQs/Pages/Individuals.aspx.

acquiring inward listed investments on the JSE Limited[67]. Other changes included the abolition of exchange controls on all current-account transactions and on non-residents, as well as increased leniency towards applications for direct foreign investment by SA corporates.

Furthermore, in the 2019 Medium Term Budget Policy Statement (MTBPS), the Minister of Finance proposed a new capital flow management framework to replace the current system of exchange controls. The new framework effectively involves a shift from the current negative bias framework to a positive bias framework. Currently, all foreign-currency transactions are prohibited, with the exception of a defined list of transactions. This system effectively constrains trade and cross-border flows. Over 12 months, a new system will be implemented, the core rationale being that all foreign-currency transactions are allowed, except for a list of risk-based capital flow measures[68]. In 2020, to further support SA's growth as a financial hub for Africa, the government undertook to accelerate the following reforms:

- To classify all debt, derivatives and exchange traded instruments referencing foreign assets, that are inward listed, traded and settled in Rand on SA exhanges, as domestic;
- To lift the "loop structure" restriction[69] for companies, including private equity funds, from January 2021; and
- Replace the prior-approval process for SA corporate offshore bond and note issurance with a framework and reporting conditions to be determined by the South African Reserve Bank.

Furthermore, NT undertook to explore further measures to strengthen specific measures to enhance SA as a gateway into Africa, including the listing of non-Rand denominated instruments, collateral for derivative exposures and potential ways for

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[67] Refer to https://www.resbank.co.za/RegulationAndSupervision/FinancialSurveillanceAndExchangeControl/FAQs/Pages/Portfolio%20investments.aspx.

[68] Refer to Annexure A of the 2019 Medium Term Budget Policy Statement.

[69] "Loop structures" prevent SA residents from holding SA assets indirectly through a non-resident entity (See https://www.saica.co.za/integritax/2008/1690_Loop_structures.htm)

financial services providers and assets managers to manage collective investment schemes of foreign assets from SA[70].

3.2.4 Polices to advance technological development

Another initiative to support this integration initiative is the Presidential Commission on the fourth Industrial Revolution (PC4IR), which was established in April 2019 to identify relevant policies, strategies and action plans that will position South Africa as a competitive global player[71]. The objectives of the PC4IR include the following:

- Develop an integrated country strategy and plan to respond to the 4IR including detailed interventions to be carried out achieving global competitiveness of the key economic sectors;
- Make recommendations on interventions to enable innovation and entrepreneurship, and for small, medium and micro enterprises (SMMEs) to take advantage of the 4IR;
- Advise on strategies to mobilise resources to support the 4IR interventions; and
- Make recommendations on mechanisms to measure the impact of interventions on 4IR.

The PC4IR provides the opportunity to deepen SA's regional financial centre to include private equity and venture capital to fund innovation in SA and the region, with the potential to create an innovation ecosystem which attracts projects from SA, as well as the rest of the continent.

The development of financial technology (fintech) has the potential to transform the financial services sector by, for example, the easing of facilitating cross-border transactions. The work done by the Intergovernmental Fintech Working Group (IFWG) on crypto assets, as well as establishing a regulatory sandbox[72] will assist in supporting SA's regional financial centre ambitions. Furthermore, the SARB has been

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[70] See NT's Explanatory note on financial sector MTBPS announcements, available here https://www.gov.za/sites/default/files/gcis_documents/explanatory_note.pdf.

[71] See http://www.thepresidency.gov.za/press-statements/president-appoints-commission-fourth-industrial-revolution. Accessed 21 November 2019.

[72] SARB, 2019

investigating the feasibility of issuing a retail central bank digital currency (CBDC), accessible to the general public, as electronic legal tender[73]. However, the issue of a CBDC would have implications for the Common Monetary Area, which is also subject to monetary policy based on SA objectives[74]. A stablecoin[75] used on a centralised global payment platform based on the blockchain (like that proposed in terms of the Libra project[76]) could increase regional cross-border payments and lead to increased regional economic integration (but also poses a risk of disintermediation of the domestic payment systems. Further research is needed on this topic).

3.3 Regional policies to encourage financial integration

Regional financial integration is also supported by the SADC through the signing of the Protocol on Investment and Finance (FIP)[77]. The FIP targets enhanced socio-economic development and deeper regional integration through, among other initiatives, accelerating growth, investment and employment through increased co-operation, coordination and management of macroeconomic, monetary and fiscal policies and to establish macroeconomic stability as a precondition to sustainable economic growth in the region. The FIP was implemented in terms of the strategic guidelines provided in the SADC Regional Indicative Strategic Development Plan, which sets specific timelines for regional integration[78]. More recently, SA signed up to the African Union's (AU) African Continental Free Trade Area (AfCFTA), which came into effect on 30 May 2019. Following its ratification, all member states of the AU are legally required to allow African goods to be traded[79]. More recently, although government's lockdown measures to address the Covid-19 pandemic have reduced regional trade temporarily, successful implementation of the AfCFTA is also likely to support regional financial integration over the medium to longer term.

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[73] SARB, May 2019. Central bank digital currency feasibility project. Available online: https://www.resbank.co.za/AboutUs/Departments/FinancialServices/ProcNew/Lists/News%20and%20Publications/Attachments/40/CBDC%20EOI%20briefing%20session%2020190514.pdf. (Accessed 2 February 2020).

[74] Tavlas, 2007.

[75] Stablecoins are crypto assets that are designed to minimise the volatility of the price by pegging the asset to another crypto asset, fiat currency or precious metal prices (Wikipedia available from https://en.wikipedia.org/wiki/Stablecoin).

[76] https://libra.org/en-US/open-competitive-network/#overview

[77] SADC, 2015

[78] SARB, 2018.

[79] Mattheis & Staeger, 2019

3.4 Summary

There has been a sustained and deliberate initiative over the years to position SA as a regional financial centre as well as to achieve deeper regional financial integration. The intentions set out in the NDP and budget review highlight that this is likely to be a continued focus area for SA policy makers, especially as a potential source of economic growth[80]. Fintech is also resulting in increased facilitation of integration through easier and more cost effective cross-border payment solutions. With this background of policy initiatives and fintech already underway to establish and/or deepening regional financial integration, it is relevant to consider potential risks to financial stability as well as existing and potential policies to support financial stability.

4. Systemic risks related to financial centres

Iceland provides one of the best examples of systemic risks arising from the growth in the banking sector's foreign operations, which were supported by the government's incentives to increase the domestic economy's linkages with overseas markets. Similar to SA, Iceland has a small, open economy but, unlike SA, it has a small population as well as one of the highest gross domestic product (GDP) per capita among Organisation for Economic Co-operation and Development (OECD) countries.

4.1 The Icelandic case

In the years leading to the Icelandic boom during the 2000s, structural reforms led to the privatisation of state owned enterprises (including banks), the implementation of inflation targeting and the introduction of a floating exchange rate regime. During the years following the financial reforms in 2001, three large commercial Icelandic banks, which accounted for 85% of the banking system, expanded offshore using foreign currency financing. A number of factors fuelled this growth from 2000 to 2006,

[80] A number of large South African banking and insurance groups have gradually widened their operations to the rest of Africa, and have stated objectives of achieving revenue targets from the rest of Africa. However, with relaxation of exchange Controls, South Africans used offshore investment managers rather than using onshore South African asset management expertise. This is a potential target area for policy makers to support the South African investment industry to manage and service South African's direct investments outside of the Republic.

including favourable economic conditions in Iceland, limited competition as well as the liberalisation of cross-border capital movements.

The Central Bank of Iceland (CBI) was responsible for financial stability and acted as the lender of last resort to the banking sector, protecting the soundness of the financial system. However, in 2006, the CBI's foreign currency reserves were insufficient to withstand a systemic shock given that most of the banks' liabilities were denominated in foreign currency and, in order to rein in inflation, the CBI started hiking rates. However, concern was growing about the use of a strong domestic currency to borrow offshore and using high domestic interest rates to attract foreign capital. At the time the three largest banks were increasingly reliant on the capital markets for funding, they had relatively low loan loss reserves (at 0.8%) and they had a significant amount of foreign currency denominated loans (most of these loans were to Icelandic businesses whose earnings were denominated mainly in Icelandic krona). However, banks had similar portions of foreign-currency denominated liabilities to offset the loans, but, since their equity was denominated in krona, a depreciation of the krona would lead to a deterioration of their regulatory capital ratios.

Furthermore, in the period from 2003 to 2007, there was increasing foreign investor interest in Iceland, mainly driven by the "carry trade"[81]. During 2008, the krona dropped by 24% against the euro leading to an increase in inflation, prompting the CBI to raise interest rates. The events that occurred during the GFC resulted in a lack of liquidity on the foreign financial markets and lead to the banks being unable to refinance their debts on the interbank market, resulting in the collapse of the three major commercial banks. There was a sharp depreciation of the krona against the euro limiting CBI's ability to support the banks and limiting the government's ability to service external debts. These events, ultimately, resulted in a deep recession.

Once the government announced the first investment in one of the commercial banks, the rating agencies downgraded the credit ratings for all three commercial banks. This led to a run on the banks by the foreign depositors, resulting in an expectation that the Icelandic government would cover foreign depositor's potential losses. This lead to

[81] "Carry trade" is an income strategy that typically involves borrowing at a low-interest rate in one currency and converting it into another currency to invest in an asset that provides a higher rate of return. See Investopedia.com.

Icelandic government confirming to the United Kingdom (UK) government that the Iceland deposit guarantee scheme would not apply to branches outside of Iceland. Foreign depositor claims would have amounted to approximately 60% of Iceland's GDP at the time. The situation led to a political fallout with the UK after the UK government invoked anti-terrorism legislation to impose financial sanctions and freeze accounts at UK branches of Icelandic banks. As a result, Iceland was treated as a terrorist state and was unable to move money across its borders. Ultimately, the Icelandic government re-established the krona's currency peg to a basket of currencies, took control of the three largest commercial banks and reached an agreement to repay foreign depositors following a stringent monetary and fiscal stabilisation plan agreed to with the IMF[82]. The IMF noted that their support for Iceland, at 18% of Iceland's GDP or 1190% of Iceland's quota in the IMF, was one of the largest relative to the size of their economy[83].

4.2 Lessons for South Africa

Iceland's experience is relevant for SA's ambitions to develop a regional financial centre. Similar to the Icelandic case, South Africa's large banking and insurance groups have consistently been expanding their presence in SSA in recent years. Financial services, real estate and business services sectors in 2019 contributed almost 21% of GDP, the largest value add to SAs GDP. Of the six designated Systemically Important Financial Institutions (SIFIs), the total gross assets of the largest SIFI in 2019 (the Standard Bank Group Limited) amounted to R2.2 trillion, which was 72% of SA's GDP in 2019. Having a SIFI call on SA authorities for solvency and liquidity support, as commonly occurred in other jurisdictions during the GFC, presents a clear risk to SA's financial system.

Furthermore, following the GFC, it has not always been clear what contribution financial services makes to GDP – there is a trade-off between efficient risk management and risk taking[84], although it is acknowledged that deep and efficient financial markets contribute to more efficient allocation of productive capital[85].

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82 (Centonze, 2011)
83 https://www.imf.org/en/Countries/ISL/iceland-lending-case-study. Accessed 16 May 2020.
84 Haldane and Madouros, 2011
85 Wurgler, 2000

However, finance also contributes to business-cycle volatility as well as to tail risk (due to the rapid growth in financial aggregates)[86]. In terms of financial policy initiatives, SA has taken a cautious approach to opening its financial markets to regional financial markets, with changes in exchange controls being carefully phased in over decades. Furthermore, unlike the Icelandic example, SA has had low, single digit GDP growth since 2015.

4.3 Tax avoidance and money laundering risks

A recent trend associated with FDI flows routed through financial centres are the increased tendency of multinational companies to relocate legal bases to lower-tax nations while retaining key operations in the higher tax country of origin (for example, some of the largest technology companies have been accused of aggressive tax avoidance by shifting revenues and profits through tax havens such as Luxembourg[87]). The tax haven status of OFC have experienced a significant reputational damage following internet leaks, such as the so called Panama Papers, Mauritius Leaks and Paradise Papers regarding Bermuda[88]. In order to address this weakness, the OECD, with support from the Group of Twenty (G20), have taken action by establishing the base erosion and profit sharing (or BEPS) initiative[89]. Another key risk for financial centres is the effective monitoring and enforcement of the international standards for anti-money laundering (AML) and countering the financing of terrorism (CFT). An example of the risk of weak AML/CFT enforcement is the case of the Cypriot financial system which was accused of weak money laundering enforcement, leading to the US Department of the Treasury applying sanctions to 12 Russians accused of channelling illicit funds from tax fraud through Cypriot banks[90].

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86 Popov and Smets, 2011

87 https://www.irishtimes.com/business/technology/big-six-tech-companies-accused-of-aggressive-tax-avoidance-1.4101815. Accessed 20 May 2020.

88 https://www.icij.org/investigations/panama-papers/what-is-a-tax-haven-offshore-finance-explained/ Accessed 20 May 2020.

89 https://www.oecd.org/tax/beps/background-brief-inclusive-framework-for-beps-implementation.pdf Accessed 20 May 2020.

90 https://www.ft.com/content/3ac3f02a-6962-11e2-b254-00144feab49a and https://www.treasury.gov/press-center/press-releases/Pages/jl2408.aspx. Accessed 20 May 2020.

4.4 Risks of unregulated credit intermediation

Another example of systemic risk is the use of funding from “shadow” banks[91] during the Asian financial crisis in the late 1990s. Banks in Thailand and other South East Asian countries accessed liquidity from large, undetected and poorly accounted for offshore funds, increasing liquidity, foreign currency and credit risks. The failure of Bank of Credit and Commerce International (BCCI) highlighted the risks of OFCs to other jurisdictions (the BCCI failure ultimately resulted in the development and inclusion of consolidated supervision by the Basel Committee on Banking Supervision (BCBS) in the Basel regulatory framework).

5. Financial stability considerations for a developing a regional financial centre

Some of the key risks arising for financial systems with linkages to OFCs arise from financial institution’s complex structures, as well as inadequate AML/CFT detection and/or enforcement. However, the international standard setting bodies have, over the years, proposed a number of mitigating factors to these risks, including, for example, increased consolidated and conglomerate supervision of groups as well as minimum standards for AML/CFT.

5.1 Potential systemic risks of a regional financial centre

SA is a member of the Financial Action Task Force (FATF), an international standard setting body for AML/CFT. The FATF established a program for mutual evaluations of FATF member countries, which provides details on anti-money laundering practices. Weaknesses in compliance with global AML/CFT standards could ultimately lead to SA being classified on the FATF List of Countries that are identified as having strategic AML deficiencies. SA’s sophisticated financial system with high transaction volumes and large, cash-based markets are attractive for transnational and organised crime syndicates. Further regional integration will heighten these risks. The major findings

[91] “Shadow banking”, also known as non-bank financial intermediation (NBFI) is defined by the Financial Stability Board as “credit intermediation involving entities outside the regular banking system” (see https://www.fsb.org/wp-content/uploads/c_130129y.pdf).

from FATF's most recent mutual evaluation (ME) report of SA's implementation of AML/CFT standards noted that SA had made good progress in developing its system for combating money laundering since the last ME and that the Financial Intelligence Centre was an effective financial intelligence unit. Some identified vulnerabilities included the lack of statistics to assess the effectiveness of the ML offence, not having tested provisions criminalising the financing of terrorism, not having addressed the issue of beneficial ownership as well as the need to adopt measures dealing with politically exposed persons and correspondent banking[92].

There are a number of members in the SADC that have been cited with or exhibited weak AML standards. For example, following an investigation in 2016, the former Mozambique Finance Minister was indicted by a New York Federal court for money laundering and other crimes using the US financial system[93]. In Botswana, the 2017 Mutual Evaluation Report found that the money laundering legal framework had major deficiencies, and the competent authorities had varied capacity and understanding of their responsibilities. This resulted in FATF increasing its monitoring of the country and it encouraged other members to consider this status when conducting their risk analysis of the country. Zimbabwe is another country that is subject to increased monitoring from FATF[94].

SA SIFIs have a significant presence in various rest-of-Africa jurisdictions, including Botswana and Zimbabwe. Although the SIFI's exposure to these jurisdictions in comparison to the group's total exposure is generally small, the exposure to FATF listed 'increased monitoring' jurisdictions could heighten the risk of correspondent banking relationships being terminated. The increased regulatory focus on AML/CFT in recent years has required global financial institutions to try to detect cross-border payments that are used for money laundering and terrorist financing purposes. With the risk of significant fines and damage to reputation, the cost-benefit of this type of business has increased and has resulted in these institutions reducing business to

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92 2009 Mutual Evaluation of South Africa, available at https://www.fatf-gafi.org/countries/#South%20Africa.

93 United States Department of State Bureau of International Narcotics and Law Enforcement Affairs. International Narcotics Control Strategy Report Volume II. Money Laundering. March 2019. Available: https://www.state.gov/wp-content/uploads/2019/03/INCSR-Vol-INCSR-Vol.-2-pdf.pdf (Accessed 2 June 2020).

94 FATF jurisdictions under increased monitoring – 21 February 2020. Available http://www.fatf-gafi.org/countries/d-i/iceland/documents/increased-monitoring-february-2020.html (Accessed 2 June 2020).

higher risk jurisdictions (or "de-risking")[95]. From 2013 to 2015, Angola experienced a 37% reduction in foreign counterparts, restricting the country's access to foreign currency and cross-border trade[96].

Although not a major vulnerability for the SA financial system currently, the IMF's October 2019 Global Financial Stability Report highlighted that a key vulnerability in the global financial system is the rise in corporate debt burdens in conjunction with the growing reliance on external borrowing by emerging market and frontier economies[97]. Accommodative monetary policy conditions in certain advanced economies have led to a sustained lower level of interest rates in the short-term, causing multinational corporates to access low-cost funding in US dollars. This has led to a build-up of financial vulnerabilities in the medium term. Increased integration of the SA financial system with the region increases the risk of the system being exposed to corporates and non-bank financial institutions that could experience difficulties servicing their foreign currency obligations as they become due, should global financial conditions suddenly tighten (as witnessed recently with the high risk aversion relating to the COVID-19 pandemic). A liquidity shortage of US dollars by participants in a regional financial centre could be a challenge for SA which, unlike certain other developed[98] and emerging market[99] central banks, does not have direct swap lines to access US dollars from the US Federal Reserve.

Policy design for the ongoing development of a regional financial centre will continue to be an important determinant of potential systemic risks to the SA financial system. The potential risks will be different depending whether the policy incentives result in higher offshore banking, asset management, insurance, or other financial services sectors' growth. For example, unlike other emerging markets, SA appears to have a weak causal link between capital inflow surges and excessive credit growth[100]. Some reasons cited for the SA financial system's resilience to surges in capital flows include:

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95 See When Money can no longer travel. June 2017. IMF Finance and development. Volume 54 no 2. Available https://www.imf.org/external/pubs/ft/fandd/2017/06/adriano.htm (Accessed 2 June 2020).

96 https://www.thebanker.com/De-risking-in-Africa

97 IMF, October 2019

98 Board of Governors of the Federal Reserve System. 2020. *Coordinated central bank action to enhance the provision of US dollar liquidity*. https://www.federalreserve.gov/newsevents/pressreleases/monetary20200315c.htm (Accessed 27 May 2020).

99 Financial Times. 2020. Fed expands dollar swap lines with central banks. https://www.ft.com/content/2ac4fe30-69e1-11ea-800d-da70cff6e4d3 (Accessed 27 May 2020).

100 Hassan, 2015.

- SA banks' access to large amounts of domestic retail and wholesale funding;
- SA's capital controls that cause domestic institutional investors to repatriate foreign currency holdings when the foreign-currency holding limit is breached, as well as;
- SA's policy of limited exchange rate intervention and flexible exchange rates.

With regards to Pan-African cross-border banking groups, the IMF cited various risks and made recommendations to mitigate some of the risks identified. Some of the risks noted include the following: differences in accounting and data standards in different jurisdictions, no or poor consolidated bank supervision, challenges in cross-border coordination and information sharing, weak supervisory capacity, limited cross-border crisis management and resolution framework development, and undemanding prudential regulation and enforcement.

5.2 Management of risks arising from financial centres

The IMF made a number of recommendations to address these risks, including some relating to financial stability, such as the establishment of a Pan-African Banking Supervisory Oversight Committee to drive cooperation and harmonisation. It suggested that the oversight committee could review national stress testing exercises, to ensure consistency as well as to inform different countries' tests. There should also be consideration of multiregional stress exercises for Pan-African banks. The Committee could also consider harmonised application of macroprudential policies, as well as the regional dimension for the application of systemically important designations to Pan-African banks. Other recommendations related to having clear understanding across jurisdictions of respective responsibilities for resolution preparedness in the event of difficulties. This would include reviewing legal frameworks, and considering strategies to minimise public sector costs[101].

[101] IMF, 2015.

Many of the IMF's recommended safeguards and countermeasures for OFCs relate to microprudential supervision, in particular, consolidated supervision. Increased cooperation between the home and host supervisor was suggested by, for example, improved information sharing (for example, granting access to the home country records of the affiliate, or, for example, making the home country include, as a condition of approval for the entity applying for operation in an OFC, that there is a clear understanding with the host country supervisor for the need to share supervisory information).

For both Pan-African banks and OFCs, the IMF suggests some type of group supervision. It is important for microprudential supervision to focus on bank, insurance and collective investment scheme's management of foreign currency, liquidity (in particular, maturity) and credit risks at the group level. In order to manage group risk, these financial institutions need to have the information technology abilities, as well as appropriately designed data structures to monitor and report these risks to their boards and supervisors at a group level. The PA has been in the process of implementing the BCBS's *Principles for effective risk data aggregation and risk reporting*[102] (RDAR) for domestic systemically important banks[103]. The RDAR principles were designed to assist banks in improving their ability to aggregate risk data and reporting, thereby improving their ability to manage their group risk. It is also envisaged that the RDAR principles will improve the banking groups' resolvability. However, these types of principles should also be considered for other significant financial sector participants such as the insurance and collective investment scheme industries.

5.2.1 Using group information versus regulated entity information for risk monitoring

Another challenge is collecting and monitoring financial information at the group level rather than at the individual bank or insurer level. For example, monitoring of foreign currency exposure of SA banks is often based on the BA900 series of economic returns, which includes information relating to the foreign currency position, international claims and international liabilities of SA banking operations. For example, Absa Bank's foreign currency deposits constituted almost 77% of Absa Group's

[102] BCBS, 2013.
[103] SARB D2/2015.

foreign currency deposits in 2019, a 7% increase from 2018. However, on the asset side, the bank's foreign currency loans constituted almost all of the group's foreign currency loans in 2019 and 2018[104]. Limiting monitoring of foreign currency positions to the SA bank operations could ignore prevalent currency risk and/or term mismatches at the group level (foreign currency risk is particularly relevant for SA banking groups, where their largest businesses generate rand, but they depend on foreign currency to fund operations outside of SA - especially given the volatile nature of the rand)[105]. Most SA banking groups have established a centralised model for cross-border operations, with centralised governance and systems at their SA head office[106]. An advantage of this approach is that group-wide risk management, IT systems and governance policies are controlled from head office, which also creates a single, central point for group supervision and external audit.

A potential approach to address the limited group information is by designating financial institutions as systemically important in terms of section 29 of the Financial Sector Regulation Act, Act No. 9 of 2017 (FSR Act). This systemic designation gives the SARB the ability to impose requirements to, for example, risk management, reporting (statistical returns) and resolution at a group level. Although, currently, six banking groups have been designated as systemically important[107], the SIFI designation is not limited to the banking sector. However, in practice, there has been no exercise of the additional powers provided for in the FSR Act to a SIFI.

5.2.2 Interconnectedness of South African financial institutions

Furthermore, a key vulnerability of the SA financial system is the high level of interconnectedness (which increases the risk of contagion) due to the dominance of a few, large financial institutions. One approach to build resilience of the system is the PA's focus on the conglomerate supervision of internationally active financial groups as part of their five year regulatory strategy[108]. Conglomerate supervision is seen as

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[104] Absa Group and Absa Bank 2019 financial statements.

[105] There is a natural hedging of foreign currency where the SA subsidiaries are required to manage currency and liquidity risk in country. However, when establishing and/or acquiring foreign operations, the group may need to fund the subsidiaries which could give rise to FX risk. This could also be a risk depending on the term structure of the subsidiary – for example, where the subsidiary originates long term assets but is dependent on short term liabilities.

[106] IMF presentation on cross-border banking and regulatory reforms. 2017. *Pan-African Banks: Opportunities and Challenges for cross-border oversight*. High level conference IMF Africa Training Institute, Mauritius.

[107] SARB second edition Financial Stability Review, 2019.

[108] PA regulatory strategy for 2018 to 2021. Available at www.resbank.co.za.

a critical supervisory tool to help ensure that these groups are efficiently regulated and supervised. The FSR Act creates an empowering framework that allows the PA to make prudential standards for the regulation and supervision of financial conglomerates in South Africa. One of the objectives of conglomerate supervision is to obtain a holistic view of group-wide activities, intragroup relationships and large exposures. Non-financial entities that fall within the same group as a PA-regulated financial institution may be scoped into the financial conglomerate, depending on the risk such entity poses to the regulated financial institution.

5.2.3 Challenges of inconsistent regulatory standards for cross-border supervision

There is also uneven adoption of international standards in African jurisdictions, with each jurisdiction being in different stages of adopting the Basel framework and international accounting standards. This is different to, for example, the cross-border operations of EU banks in Central and Eastern Europe, which have a similar level of adoption of standards and this presents challenges to effective conglomerate supervision. One option to reduce this risk is the PA's approach of increasing cross-border supervisory visits to African operations of SA banking groups, including conducting joint AML/CFT inspections with host supervisory authorities.

In terms of investment, Ecobank (20% of which is owned by Nedbank Group), Standard Bank Group and FirstRand Group account for the largest investors in African cross-border subsidiaries[109]. SA banking group's governance of subsidiaries commonly takes the approach that each banking subsidiary is operated as a stand-alone operation, and the subsidiaries are responsible for their own risk management (within the group's risk management policy framework), as well as being responsible for raising funding from their own balance sheet. However, there is a reputational risk to the group, should the subsidiary experience distress, and when under pressure during stressed financial conditions, the group's management could revisit this stance. The direction of contagion of a shock for a centralised type of operation is likely to be from the home country to the host countries, especially where the host country operations are systemic. For banks, the management of reputational

[109] IMF, 2019. Absa Group Limited was excluded in the study because of the Barclays Bank Plc ownership (a non-African banking group).

risk is set out in terms of Pillar 2 of the Basel framework and recognises that this multidimensional risk can lead to the provision of implicit support arising from negative perceptions of customers, counterparties, investors, and regulators which could negatively affect the bank's balance sheet position[110]. The IAIS's insurance core principles direct that supervisors require insurers and their intermediaries to treat customers fairly in order to minimise the risk of insurers using business models that pose reputational risk[111].

The case of the European Union (EU) provides a context for how cross-border banking supervision could pose challenges for SA. Similar to SA, the EU has a number of large financial groups whose head offices are situated in jurisdictions with sophisticated financial markets, and which have subsidiaries in the emerging markets of Central and Eastern Europe. One challenge noted, arises from concerns by non-euro area EU host supervisors that insufficient attention is paid by the EU's Single Supervisory Mechanism and the Single Resolution Board to the systemically important subsidiaries in the host country because they do not represent a significant share of the assets, liabilities, revenues, or capital of the banking group. This is similar to SA banking groups where the rest-of-Africa operations are generally not significant to the groups' balance sheets. Another challenge related to the resolution framework for EU conglomerates, especially with regards to single or multiple points of entry. Separate points of entry allow the host authority the flexibility of ring-fencing the subsidiary should the group experience distress. However, a single point of entry would provide for the issuance of bail-in capital at the group level. An advantage of the EU's resolution framework is the provision for binding cross-border cooperation and consensus-based joint decision making, as well as mediation by the European Banking Authority in the case of disagreements.

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[110] Basel Committee on Banking Supervision Supervisory Review Practice 30 (risk management) paragraphs 30.29 – 30.36. Available at https://www.bis.org/basel_framework/chapter/SRP/30.htm.

[111] International Association of Insurance Supervisors Insurance Core Principle 19, conduct of business. Available at https://www.iaisweb.org/index.cfm?event=icp:getICPList&nodeId=25227&icpAction=listIcps&icp_id=20&showStandard=1&showGuidance=1&showIntroGuidance=1. The Financial Sector Conduct Authority (FSCA) has developed a market conduct framework for SA, that incorporates a principles and outcomes-based regulatory approach to ensure that financial institutions treat customers fairly (see https://www.fsca.co.za/Regulatory%20Frameworks/Pages/Treating-customers-fairly.aspx).

Another challenge is the enforcement of non-zero risk weights and exposure limits on the holdings of sovereign debt issued by non-EU hosts at the consolidated level, which increases the risk-weightings for the subsidiaries and requires them to hold more regulatory capital at the consolidated level (and raises the cost of financing for host governments). There are also concerns that the home country forces the host to divest from non-EU non-performing loans, which could influence the credit conditions in the host country[112]. These are challenges that the SARB Resolution Authority and the PA is/are likely to encounter in the exercise of their supervisory framework and in the development of a resolution framework for designated institutions, including financial market infrastructures.

5.2.4 Managing cross-border risks from financial market infrastructures

Due to their inherent systemic nature, robust financial market infrastructures (FMIs) are important in supporting and promoting SA's regional financial centre. In September 2018, the SARB published a policy paper relating to the review of the National Payment System Act (NPS Act). One of the key drivers of the review included that the international standards for payment infrastructures (the 2012 Principles for Financial Market Infrastructures or PFMIs) had not yet been adopted into the NPS Act. The PFMIs seek to harmonise and strengthen risk management applicable to systemically important payment systems (SIPS), centralised security depositories, securities settlement systems, and central counterparties. Another driver was SADC's goals to integrate the finance and investment sectors through the FIP (including the alignment of the South African Mobile Money Framework with the SADC's Mobile Money Guidelines). Based on guidance from the CPMI, the SARB recognised two cross-border payment systems as systemically important, namely the continuous linked settlement (CLS) system (which settles foreign exchange transactions in designated currencies) and the SADC real time gross settlement (RTGS) system (which settles cross-border transfers that require immediate settlement)[113].

[112] Fortán, Beck, D'Hulster, Lintner and Unsal, 2019
[113] SARB, 2018 (position paper)

The SARB has committed to full adoption and implementation of the PFMIs through domestic legislation for SIPS. The implementation of international payment standards is important to promote domestic financial system resilience, especially in light of the ongoing development of a regional financial centre. Similar to the SARB's role in relation to SIFIs provided for in the FSR Act, the review to NPS Act recommends that the SARB should be able to designate SIFIs and SIPSs, and should have the power to require these institutions to comply with any financial stability requirements that may be imposed by the SARB. The Resolution Authority should have the ability to resolve institutions that could present a systemic risk to the domestic financial system.

For critical service providers that provide their services to operations in other jurisdictions, the review recommends that the SARB enter into cooperative arrangements to ensure effective supervision, regulation and oversight of these service providers. The review also recommends that where domestically licensed operators or payment, clearing or settlement systems should provide payment services to regional or international customers or participate in regional or international systems, prior SARB approval should be sort. Furthermore, only SA law, or an equivalent regulatory framework should apply.

5.2.5 Cross-border risks from financial technology

The SARB is also exploring the concept of a central bank digital currency (CBDC)[114]. The review also recommends that the SARB may want to, in future, allow or require settlement in other emerging currencies or allow settlement by other settlement systems, subject to specific requirements contained in subordinate legislation. A CBDC could potentially promote increased regional integration where, for example, participants in the Zimbabwean monetary system have, on more than one occasion, exhibited a generalised loss of confidence in the official currency, where the majority of the remittances are from SA, and the majority of trade is with SA. Another aspect to this is the expansion of central bank services to support other regional central banks as well as the increased use of the rand regionally. This strategy was executed by the New York Federal Reserve's (NYFed) Foreign and International Monetary Authorities

[114] The Global Treasurer. May 2019. South Africa Reserve Bank wants to test CBDC based on native currency. https://www.theglobaltreasurer.com/SARB-wants-to-test-CBDC-based-on-native-currency (Accessed 30 May 2020).

programme to support the role of the US dollar as the principle global reserve currency and international medium of exchange. The NYFed does by, for example, providing secure, confidential access to US markets, payments and securities depositories, and networks[115].

5.3 Relevance to macroprudential policy

With reference to section 3 above, the NT's proposed new capital flow management framework allows for all foreign currency transactions, with the exception of certain specified capital flow measures, to contribute towards/enhance financial stability. The exceptions include:

- SA corporates are not allowed to shift their primary domicile, unless approved by the Minister of Finance;
- Current prudential limits on SA banks and institutional investors remain;
- SA banks' effective net open positon in foreign currency shall not exceed 10% of qualifying capital and reserves;
- The domestic treasury management company policy and international headquarter company policy will remain in place;
- The export of intellectual property for fair value to non-related parties will not be subject to approval; and
- The loop structure policy will remain in place.

As was Iceland's experience leading up to and during the GFC, capital flows can be a source of systemic risk to the financial sector, particularly for emerging markets. The IMF suggests that a combination of capital flow measures (CFMs) and macroprudential measures[116] could be appropriate to mitigate these risks, depending on the circumstances. SA already has measures in place which fit into the IMF's framework for macroprudential measures - for example, the PA (a microprudential

[115] Federal Reserve Bank of New York. September 2015. Providing banking services to central banks and relevance to monetary policy implementation. https://www.newyorkfed.org/medialibrary/media/banking/international/09.29.2015-cbias-1.30pm.pdf (accessed 15 October 2020).

[116] The IMF distinguish between capital flow measures (CFMs) and macroprudential policy measures. CFMs are designed to limit capital flows, and include those that discriminate on the basis of residency and those that do not. Macroprudential measures are designed to limit systemic financial risk, including risks associated with capital flows (IMF, 2015).

supervisor) has broad, non-institution specific, limits on bank's exposure to foreign currency.

The IMF suggests that limits on banks' foreign exchange derivative contracts as a percentage of bank capital is a macroprudential measure because "it limits the banks' reliance on short-term external funding and exposure to the financial sector to systemic liquidity risks associated with a sudden stop in capital flows". Other types of measures alluded to by the IMF include measures to increase the cost of derivative transactions, measures introduced during capital flow volatility and measures which limit the systemic impact of large movements of capital flows (for example, when foreigners purchase or sell significant interests in SA corporates). In light of the revised open approach to exchange controls and SA's intentions to continued regional financial integration, the SARB should conduct further research into the effectiveness and efficacy of types of macroprudential measures and tools to limit systemic risk arising from capital flows.

Another macroprudential cross-border measure is the application of the countercyclical capital buffer (CCyB), which is designed to minimise the degree of cross-border spillovers and regulatory arbitrage. The design of the CCyB includes a feature of jurisdictional reciprocity. This requires that the authority that activates the buffer in a jurisdiction is expected to promptly inform its foreign counterparts. It also requires that the authorities in other jurisdictions should require that their banks apply the buffer to the exposures in that jurisdiction. Reciprocity is mandatory for all BCBS member jurisdictions (SA is a member jurisdiction) for a CCyB up to the maximum limit of 2.5%. SA phased-in its implementation of the CCyB from 2016 but, due to benign credit conditions, has never activated the buffer at the bank or group level. As a result, reciprocity where SA has activated the CCyB has not been tested in practice, although some SIFIs report holding regulatory capital for the purposes of a CCyB due to their operations in other jurisdictions[117].

[117] For example, in the Basel Pillar 3 report for 2019, FirstRand Limited reported 0.18% and FirstRand Bank Limited reported 0.05% of their minimum capital requirement was for a countercyclical capital buffer. This was due to a CCyB requirement of 1% for their operations in the UK. Standard Bank Group Limited reported a 0.0005% CCyB for the first half of 2018.

With regards to macroprudential supervision, further research is required into the potential systemic risks to the SA financial system where SA financial market infrastructures (like payment and settlement systems, securities exchanges and central securities depositories) are used to facilitate cross-border transactions for the regional financial centre (this is beyond the scope of this paper). Another area for research is the potential for systemic risk arising from the use of fintech applications to facilitate cross-border trade in the regional financial centre. This is particularly relevant to crypto assets which, by their nature, provide simple cost-efficient and effective solutions for transferring money between jurisdictions, especially for jurisdictions which are focusing on increasing financial inclusion. SA has a large population of economic migrants that remit money to the rest of Africa, and are subjected to a high cost of remittance services in SA. For example, the World Bank estimated that sending US$200 from SA to Angola can cost more than 20% of the remittance[118].

In April 2020, the Intergovernmental Fintech Working Group[119] (IFWG) released a policy position paper for comment on the group's view of the risks and rewards associated with crypto assets. The paper notes that the borderless, anonymous and pseudonymous nature of crypto assets can create risks to the financial system, which include the use of crypto assets for illicit financial flows (circumventing the AML/CFT legislative framework), and circumventing SA's exchange controls (which results in inaccurate balance of payments data and movement of capital data).

The paper includes 30 recommendations, the essence of which is to include crypto assets (and related services) into the existing regulatory framework. This would include requiring registration as accountable institutions for the FIC (thereby requiring adherence to AML/CFT requirements), as well as developing and implementing a cross-border regulatory framework to monitor cross-border flows using crypto assets. Monitoring cross-border flows is likely to be a challenge. SA authorities may be able to require crypto asset service providers (CASP) and crypto asset trading platforms (CATP) within jurisdiction of the Republic to adhere to SA legislation, but this

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[118] https://remittanceprices.worldbank.org/en/corridor/South-Africa/Angola

[119] A grouping of financial sector regulators and policy makers, including NT, SARB, FSCA, FIC, NCR and SARS, whose aim is to develop a common understanding of fintech developments, as well as regulatory and policy implications for the financial sector and the economy.

legislation will not apply to CASPs and CATPs outside of SA (especially CASPs and CATPs outside of SA but within the Southern Africa region – the region targeted by the regional financial centre).

6. Conclusion and recommendations

In conclusion, the continued development of SA as a regional financial centre has much promise to be a source of economic growth for the economy and leverage its sophisticated financial sector. However, the ongoing phased-in development needs to be carefully balanced against the various financial stability risks that integration could pose to SA's existing financial system. Broadly, these risks relate to a lack of data on group operations for supervision purposes, immature cross-border supervisory and financial stability cooperation, the uneven regional implementation of international standards, the ongoing development of public and private technological payment instruments, non-financial corporates increasing exposure to liabilities denominated in US dollars and the reputational risk arising from the malfunction and/or failure of a regional FMI (including those arising from inadequate management of AML/CFT risk).

An important mitigating factor to these risks, commonly alluded to in the FSR Act, is increased cooperation and collaboration among authorities both within and outside SA. An important step towards this would be to implement something similar to the IMF's recommendation for a Pan-African financial stability oversight committee, or a SADC regional financial stability committee, that works towards consistent cross-border policies included in macroprudential policy frameworks and resolution frameworks. Furthermore, SA's existing policies to enhance the financial system's resilience should be reviewed to provide for any cross-border considerations necessary. Other recommendations include implementing the proposed recommendations on crypto assets; conduct further research into the effects of potential implementation of macroprudential tools on regional financial systems, financial flows as well as the potential development of public and private virtual payment instruments; finalise resolution policies and financial conglomerate

supervision for financial groups; and improving the quantitative information available on risks that SA's financial groups are exposed to.

Hugh Campbell[120]
Macroprudential Analysis Division
Financial Stability Department
November 2020

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TOPICAL BRIEFING: No. 4

Financial Stability Department

SOUTH AFRICAN RESERVE BANK

December 2020

Stress-testing interconnected portfolios in the South African banking sector

Abstract

The paper conducts stress-tests on South African banks by calibrating a model of price-mediated contagion. Using longitudinal data of balance sheet positions of the largest 10 banks from 2010 to 2020, two types of shocks are studied: one to a non-marketable asset of the largest retail bank and the other to a marketable asset held by all banks. Overall, the paper finds that second-order feedback effects from bank' de-leveraging are muted and that the concentrated structure of the banking system has a positive effect on shock absorption. However, a gradual trend towards more similar asset portfolios in the past 10 years has increased the exposure to the price-mediated contagion channel.

Keywords: Stress-testing, portfolio similarity, fire-sale externalities

1 Introduction

Amplification and feedback effects that compound losses in financial networks are at the centre of attention to understand systemic risk. Price-mediated contagion becomes particularly potent when banks hold similar portfolios as price shocks amplify relative to common balance sheet asset holdings. This paper investigates this type of contagion channel and conducts stress-tests on South African banks across two types of shocks; one to a non-marketable asset of an individual bank and the other to a marketable asset held by all banks. I rank individual banks according to their contribution to systemic risk arising from this contagion channel.

The paper is particularly concerned with the following questions: 1) How can we quantify price spillover amplification in the South African banking system? Are they relevant for systemic risk? 2) Which Bank contributes more to this amplification process? 3) Has the exposure to this type of systemic risk changed over time? and 4) What is the role of portfolio similarity?

The main results are the following: the amplification of losses in second and third order de-leveraging rounds is largely contained when the initial shock hits the portfolios of unsecured loans to the largest retail bank. This is because the bank and the liquidity reserves are large enough to absorb the shock, while the structure of the financial system characterised by large, few banks has a positive absorptive effect on financial system stability. In the case of a shock to the marketable asset held by all banks (SA Government bonds), banks' de-leveraging behaviour becomes more pronounced, however, they do not exceed the magnitude of the initial impact. Again, the concentrated structure of the banking system has a positive effect on shock absorption.

When examining each bank's contribution to spillover loses, their systemic relevance is fairly stable over time. The top 4 banks each contribute between 20 and 27% of exposure to price-mediated contagion, while similarly moving "closer together" in terms of asset size, leverage and portfolio composition. However, this development has lead to a gradual increase in exposure to this type of contagion channel for the overall banking sector. As banks become more similar in their balance sheet set-up,

the price-mediated contagion channel becomes more potent. While still being at low levels, the aggregate sector vulnerability to this type of contagion has doubled between 2010 and 2020.

Last, but not least, the paper finds that leverage, while being an important factor for spillover losses in general, has decreased in the South African banking sector in the last 10 years, therefore mitigating the risk of indirect contagion[121].

What is price-mediated contagion?

This paper studies shock scenarios to quantify systemic losses arising from the price-mediated contagion channel, also known as fire-sale externalities. Fire-sales occur in situations where financial institutions experience sudden constraints, e.g. a large liquidity requirement, which lead to forced liquidation of assets [1]. When a bank faces a liquidity crisis and is forced to sell-off assets in a short amount of time to meet counterparties' claims, it accepts prices that can be substantially below market value, so-called fire-sale prices. The discount on the market value is higher, the more illiquid the asset. Fire-sale externalities pose a threat to the financial system because they amplify price shocks across assets and institutions and thus, may lead to liquidation spirals (see e.g. [2], [3]). This type of contagion becomes particularly potent when banks hold similar portfolios as price shocks amplify relative to common balance sheet asset holding patterns [4].

Measuring similarity: What are common asset holdings of South African banks and how do they affect financial stability? The similarity between two banks *m* and *n* can be measured as the Euclidean distance (ED) between them in *K*-dimensional space as in [5]:

$$\text{Distance}_{m,n,t} = \sqrt{\sum_{k=1}^{K} \left(w_{m,k,t} - w_{n,k,t}\right)^2}$$

[121] The source code and replication files for this paper can be found at: https://github.com/blackrhinoabm and https://github.com/t1nak/ba900. All errors are my own. [University of Cape Town]

where $w_{m,k,t}$ is the portfolio weight invested in asset class k by bank m. Figure 3 shows the pair-wise euclidean distance between the top 10 banks as of February 2020. The five largest banks (A to E) are much closer in portfolio composition than the rest (G to J).

Figure 1: Pair-wise euclidean distance between top 10 banks as of February 2020. The closer (darker) the value to 0, the more similar the portfolios. Source: SARB's BA 900 forms, aggregated to 27 asset classes.

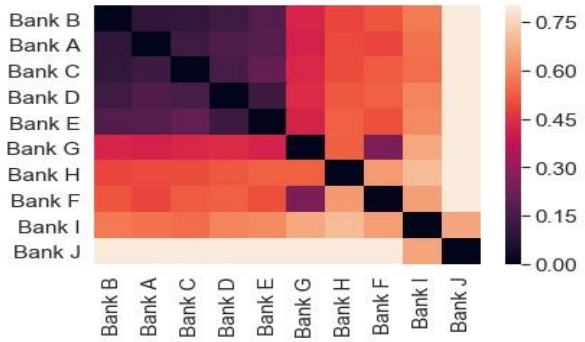
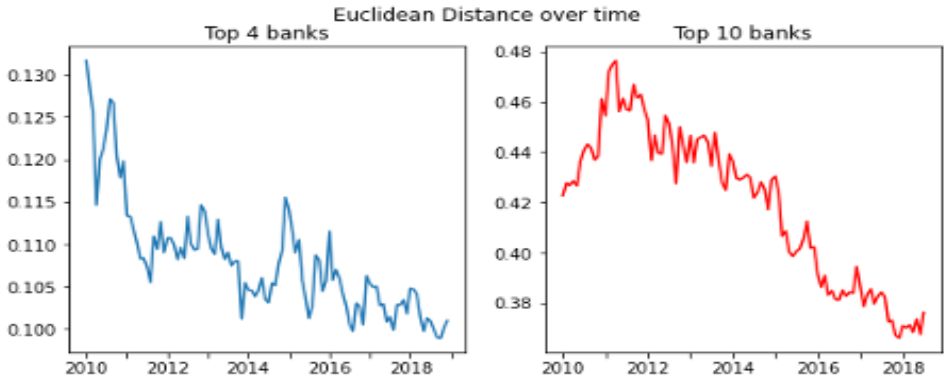


Figure 2: Average euclidean distance, 2010 to 2020.



The figures show that South African banks have become more similar in terms of asset composition over the past 10 years, potentially aggravating the systemic risk arising from overlapping portfolios in the sector [6].

Literature

Greenwood *et al* (2015) [3] were one of the first authors to calibrate an indirect price-mediated contagion model to empirical data. Their framework uses a constant holding structure and fixed leverage ratio to study the effect of a debt haircut for European sovereign bonds on capital losses in the European banking system. Duarte *et al* 2013 [7] apply Greenwood ***et al's*** model to a panel data analysis of US broker-dealer banks to investigate the effect of price declines in assets financed by repurchase-agreements. They find that a one percent decline in the price of all assets financed with repos leads to losses owing to fire-sale spillovers accumulating to eight percent of total equity. Greenwood *et al* (2015)'s framework is also the basis of Cont and Schaanning 2017's [8] recent stress-test analysis of the European banking sector. They extend the original framework by introducing asymmetric liquidation behaviour and a concave price impact function which depends on assets' market depth and selling volumes. They perform a stress-test on the European banking sector and show that the quantification of systemic losses based on those kind of indirect fire-sale contagion effects yields substantially different results than traditional stress-test methods.

2 Model

To quantify price spillover effects from different shock scenarios, the paper employs a computational stress-test simulation model. Computational models are useful to conduct policy-relevant research because they can be studied by incorporating more realistic assumption and behaviour. Adding layers of complexity to mathematical models comes with the caveat that these models are very difficult to solve analytically and hence, need to be studied by simulation.

The framework of the model is similar to Greenwood *et al* (2015) [3] but is extended by incorporating a cash liquidity buffer and allowing for changing portfolio weights. The purpose of the model is to describe sequential rounds of price spillovers and bank de-leveraging following an initial external shock. It's important to define banks' balance sheets and portfolio weights m_k for each asset class before proceeding with the shock implementation.

Assume a set of n banks $B = \{1,...,n\}$ and k asset classes $K = \{1,...,k\}$, with $K = \{C,LB,TB\}$. We define a subset of asset classes Cash $C = \{k^c\}$, trading book assets $TB = \{1,...,k^{tb}\}$ and loan book assets $LB = \{1,...,k^{lb}\}$. Each individual bank b_i has total assets a_i with portfolio weight w_k on asset k such that $^P{}_k\, w_k = 1$. On the liability side, bank i has debt d_i and equity capital e_i, resulting in leverage $l_i = d_i/e_i$.

Balance sheet

Asset		Liabilities
Cash w_{kc}	a_i	Equity e_i
Loan Book w_{klb}	a_i	Debt d_i
Trading Book w_{ktb}	a_i	

Algorithm and parameters

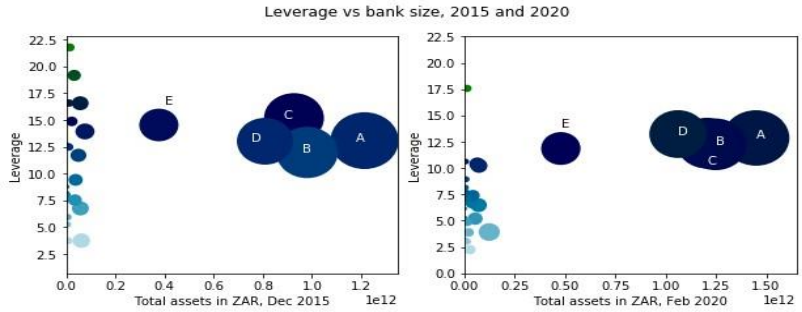
In addition to the definition of banks' balance sheets, it's important to formulate assumptions that guide the simulation. A full description can be found in Annex A. In short, when banks are exposed to an initial shock, they move away from their target leverage position. They respond by scaling down their asset side by either depleting their liquidity reserves or liquidating assets. If this happens on a large scale, cumulative banks' sales lead to a price effect which in turn induces a second round (and third and fourth order etc) price shock. It's those second-degree price spillover that are at the heart of the fire-sale externality channel. The price effect depends on the illiquidity parameter ρ_k, which determines the magnitude of feedback effects. In the simulation, I choose ρ_k, in the same neighborhood as in Greenwood *et al*. (2015)[122]. Furthermore, there are two important vulnerability indicators that are derived from the framework: 1) *Aggregate Vulnerability*, i.e. the percentage of aggregate banking system equity that are wiped out by **only** spillover effects, and 2) *systemicness*, i.e. each bank's contribution to this Aggregate Vulnerability [3].

[122] Greenwood *et al*. (2015) use an illiquidity parameter of $10^{-}13$, which means that a selling volume of USD 10 bn leads to a price drop of 0,1%, or 10 basis points. The estimate is empirically found in studies from the European bond market (see e.g. Duffie 2010, Newman 2003)

3 Data and Simulation Study

I use balance sheet data for the largest ten banks from the BA 900 forms of the South African Reserve Bank and simulate general shock scenarios. The aim is to quantify systemic losses arising from the fire-sale contagion channel, as well as individual banks' contribution to overall fragility of the financial system conditional on the shock. Banks' portfolios consist of 27 asset classes which are aggregated from the BA 900 forms. A key characteristic of the banking sector is its high concentration of assets among few retail banks, i.e. the four largest banks account for approx. 80% of total assets in the sector. Figure depicts the relationship between banks' size and leverage ratios in 2015 and 2020.

Figure 3: Leverage and total asset of top10 banks in December 2015 and February 2020. Bubble size represents market share in terms of assets.

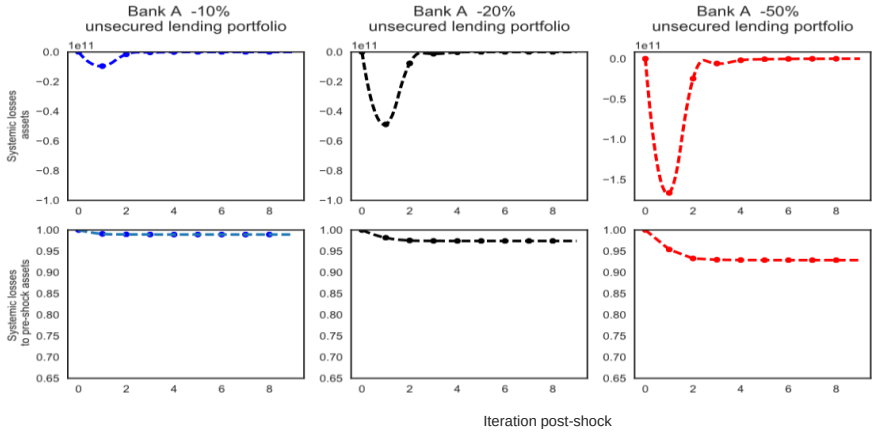


Stress-test scenarios

This section describes the stress-test scenarios conducted to identify determinants of banking sector fragility to pricemediated contagion. The shock scenarios are hypothetical and chosen to be artificially large to maximise stress-testing exposure.

Scenario 1 - loan portfolio of individual bank

Figure 4: Systemic asset losses over multiple rounds following a shock on Bank A's household unsecured lending portfolio. Left: Initial de-valuation shock is 10%. Middle: 20% de-valuation Right: 50% de-valuation. Lower charts show the effect of on total assets in the banking system (1 is 100% pre-shock assets). Source: Author's simulation based on SARB BA 900 forms' balance sheet data for February 2020.



The largest bank in the banking system is *Bank A* with approximately R1.45 tn total assets for February 2020. As the unsecured lending category is the part of the loan book that is most exposed to defaults, we study knock-on effects from a hypothetical devaluation shock of -10%, -20% and -50%. The number of periods post-shock is chosen large enough so the system reaches a steady state.

The lower panel in Figure 4 shows the evolution of total assets in the banking sector. In all three cases, systemic losses peak in the first iteration post-shock and level off in subsequent periods. These losses can be attributed to Bank A's direct exposure to defaults in the unsecured lending segment, as well as to de-leveraging effects on the part of other banks. The hypothetical cumulative effect on total assets as a share of pre-shock assets in the banking system is shown in the lower charts. A 10% shock reduces pre-shock banking system assets by 1%, a 20% shock by 3% and a 50% shock by 7%. Thus, from the perspective of a fire-sale contagion channel, defaulting unsecured loans on the part of Bank A have an insignificant effect on the stability in the South African banking sector overall. This finding can be explained by inspecting banks' liquidity reserves and individual selling behaviour.

The heat map in Figure 5 shows the occurrence of fire-sales by bank. The rows show which bank engages in asset sales at which post-shock period. The darkest color displays asset sales in the order of R1 bn and shades reach a lighter color every R200 m. For a hypothetical de-valuation shock of -10% (left chart) on Bank A's unsecured lending portfolio, only Bank A is forced to de-leverage by selling assets. All other banks display no occurrence of de-leveraging because the secondround price effect is small enough to be absorbed by banks' liquidity buffers. In a hypothetical larger shock scenario of -50% devaluation on Bank A's unsecured lending portfolio, fire-sale externalities become more pronounced and cause asset-sales across a number of financial institutions, i.e. Bank B, Bank E and Bank G who sell assets on the market because they no longer can use liquidity reserves to pay back debt contracts necessary to de-leverage their balance sheet size. One should note that large retail banks Bank C and Bank D are unaffected even in the large shock scenario. This is the primary reason why systemic risk is muted overall.

Scenario 2 - Marketable asset of all banks

In an alternative scenario, I shock the price of a marketable asset held by all banks, i.e. South African Government bonds held in the trading book. I conduct the hypothetical scenario that the price of a basket of Government bonds drops by -10% and -30%, respectively.

Figure 5: Asset sales per bank over multiple rounds. Initial impact is a 10% (left chart) and a 50% (right chart) de-valuation shock on Bank A. Color shades range from 0 to R1 bn. Source: Author's simulation based on SARB BA 900 forms' balance sheet data for February 2020.

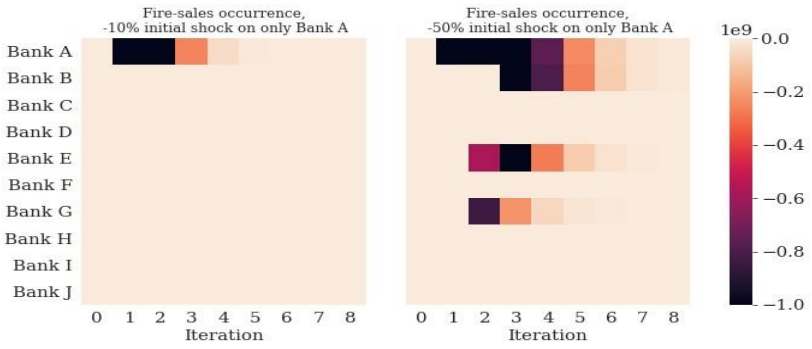
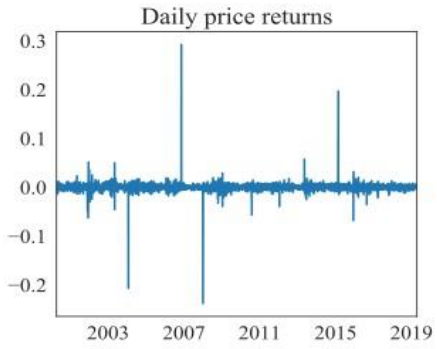


Figure 6: R186 10-year RSA Government bond daily price returns



One should note that the -30% price shock is extremely unlikely and only chosen to maximise the stress-test envelope (the largest price drop for the 10-year SA Government bond in the last 20 years was -23% on 28 January 2004, see Figure 6). Most banks are exposed to the initial shock as supposed to only Bank A in the previous scenario. To shed more light on this, the heat map in Figure 7 displays fire-sales for each bank for the 10% and 30% shock on SA government bonds. Feedback price effects are caused mainly by Bank A to E. Bank H does not experience any stress in the small shock scenario, but contributes to systemic losses given a -30% shock. Interestingly, Bank F and Bank I do not liquidate any of their assets even in the large shock scenario, which can be attributed to two reasons. Firstly, they have very little asset holdings in SA Government bonds overall and, thus, no direct exposure to the initial shock. Second, the feedback price effects that occur in subsequent iterations can be absorbed by their liquidity buffers.

Figure 7: Asset sales per bank post-shock. All banks holding SA Government bonds in their investment book are affected by a 10% (left chart) and 30% (right chart) price shock. Color shades range from 0 to R100 bn. *Source:* Author's simulation based on SARB BA 900 forms' balance sheet data for February 2020.

Contribution to spillovers by bank

The question arises as to which bank is most *systemic* and which bank is most *vulnerable*. From [3]'s framework, two stress indicators can be computed for each bank in the shock scenario: a) **systemicness**, i.e. a bank's contribution to banking sector spillover losses and b) **indirect vulnerability**, i.e. the share of the bank's equity lost 'indirectly' through other banks' de-leveraging. Bank size enters the systemicness indicator, but not the indirect vulnerability indicator, which is driven by leverage and shock exposure to the bank's assets. For example, a smaller bank can be vulnerable but not systemic. Table I shows each bank's contribution to total banking sector **spillover losses** for December 2015 and February 2020. The relevance of the top 4 banks to systemic risk is fairly stable over time (Figure 8), with Bank C overtaking Bank D in 2010. While Bank A is still the most systemic, contributing approximately 26% to total banking sector equity losses arising from price spillovers, the top 4 banks are moving closer together in terms of their role in facilitating price-mediated contagion. Interestingly, while Bank A is the largest and most systemic bank in the stress-test for February 2020, Bank B is the most vulnerable to the given shock scenarios (Table III).

Table I: Banks' 'Systemicness' is their contribution to aggregate banking sector vulnerabilities in the 30% shock scenario on SA Government Bonds for December 2015 and February 2020. Bank A is still the most systemic, contributing approximately 26% to total banking sector equity losses arising from price spillovers

Systemicness

	Dec-15	Rank	Feb-20
Bank A	28%	1	26%
Bank B	23%	2	24%
Bank C	22%	3	20%
Bank D	18%	4	19%
Bank E	7%	5	9%
Rest	2%	6	2%

Table II: Banks indirect vulnerability, i.e. their share of equity lost due to price-mediated contagion during the two stress-tests (30% shock on SA Government Bonds) for December 2015 and February 2020

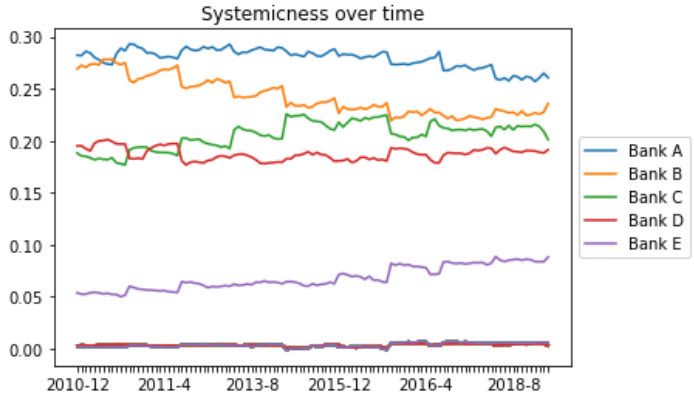
Vulnerability to spillover (IV)

	Dec-15	Rank	Feb-20	Rank
Bank B	-9.2	1	-10.2	1
Bank A	-7.7	2	-9.7	2
Bank D	-7.5	3	-10.2	3
Bank E	-7.4	4	-9.7	4
Bank C	-6.5	5	-8.2	5
Rest	-3.2	5	-3.1	6

Sensitivity analysis

When modelling feedback price effects, it's also important to inspect the sensitivity of results to parameter variation.

Figure 8: Banks systemic relevance, i.e. their contribution to spillover losses in stress-test scenario 2, over time



1) Leverage

Leverage plays a crucial role in determining losses from pricemediated contagion. To investigate this further, a wide range of simulations is carried out where the shock size and leverage parameters are gradually increased. The results can be seen in Figure 12 in the appendix which shows how total banking sector assets evolve (y-axis) following an initial price shock to SA government bonds (line graphs) and varying degrees of banking sector leverage from 1 to 2.5 times the current levels (x-axis). One

should note that the price shocks are artificially high for demonstration purposes. It becomes apparent that the spillover risk to banking sector asset losses is not linear, but increases exponentially with higher leverage ratios. Considering price shocks from 10% to 30%, a system with 1.5 times of current leverage levels is very exposed.

2) Illiquidity

The fire-sale externalities measured in the stress-tests highly depend on the illiquidity parameter ρ_k used to determine feedback price declines as a function of selling volumes. Figure 9 shows the cumulative effect on total equity in the banking sector given a 10%, 30%, 50%, 70% and 90% shock on SA government bond prices and conditional on the illiquidity parameter. For example, a 50% shock (blue line) at 4×10^{-14} leads to cumulative equity losses of 41%. However, the same shock leads to 100% banking system equity losses for a parameter exceeding 3×10^{-13}.

As the chart shows, there is a critical value for the illiquidity parameter at which the slope for cumulative losses increases sharply across all shock scenarios, i.e. 1×10^{-13}. If the price effect for bond price shocks exceeds this threshold value, the South African banking system becomes highly unstable to this type of shock. This can be further examined in the lower panel of Figure 9, where shock size, illiquiidty parameter and system equity losses are displayed in a 3D chart.

How does portfolio similarity affect systemic risk to pricemediated contagion?

Finally, I address the initial question of whether higher portfolio similarity leads to increased risk to price spillover as predicted by the literature [4]–[6]. A useful metric to determine overall fragility to spillover losses is *Aggregate Vulnerability (AV)* [3], i.e. the share of banking sector equity that is wiped out by second round feedback effects. Figure 10 shows that the AV for a 30% shock scenario on SA Government bonds is very low and ranges between 4% and 8% of banking system equity between 2010 and 2020. However, while still at subdued levels, the aggregate vulnerability doubled over this time period. What drove this development? One can rule out higher leverage ratios as factor because the average leverage ratio of the top 10 banks decreased over the time period (see Figure 3 in the appendix). One may suspect overlapping and interconnnected portfolios as driving forces behind this trend. The scatter plot in

Figure 11 shows the strong negative correlation between portfolio distance as measured by the average euclidean distance between the top 10 banks and aggregate sector vulnerability. Note that banks are the more similar, the lower the distance between their portfolios. Hence, we have this inverse correlation between distance and vulnerability. To quantify this relationship further, I perform a pooled OLS regression of the log of Aggregate Vulnerability on the log of portfolio similarity (euclidean distance). Table III shows a highly statistically significant β coefficient of -0.8, i.e. a 1% decrease in the average euclidean distance leads to an increase in aggregate sector vulnerability of 0.8%. Hence, the hypothesis that higher similarity of portfolios in the South African banking sectors leads to higher exposure to pricemediated contagion could be confirmed. No suspicious patterns in residuals were detected in the post-regression analysis (see Figure 15 and Figure 14 in Appendix B).

Figure 9: *Upper*: 2D chart of cumulative equity losses in the banking system (y-axis), illiquidity parameter (x-axis) and shocks to SA Government bonds (line graphs). The critical threshold value for banking sector fragility is 10^{-13}, i.e. a selling volume of ZAR 10 bn leads to a price drop of 0,1%, or 10 basis points. Lower: 3D chart.

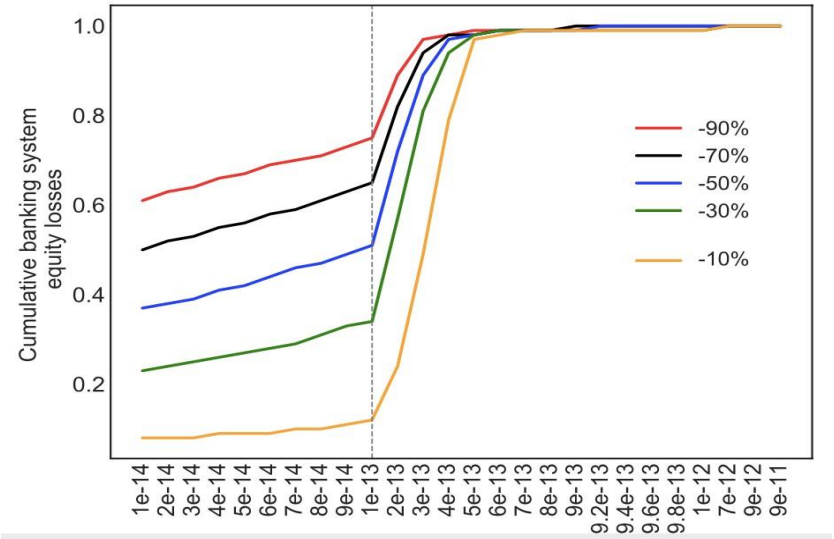


Figure 9: Lower: 3D chart.

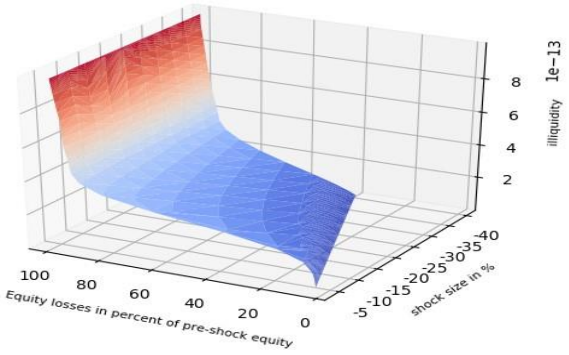


Figure 10: Aggregate banking sector vulnerability from 2010 to 2020. Y-axis has the share of banking sector equity wiped out by spillover losses, e.g. 4% in December 2012

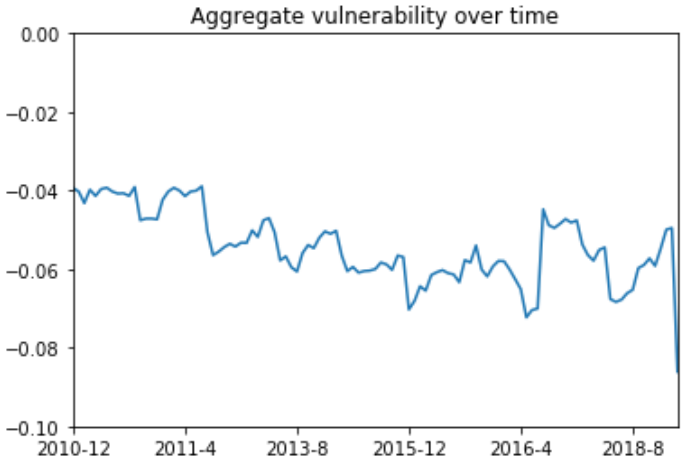


Figure 11: Scatter plot of average portfolio similarity of top 10 banks as measured by the Euclidean distance and aggregate banking sector vulnerability to spillover losses.

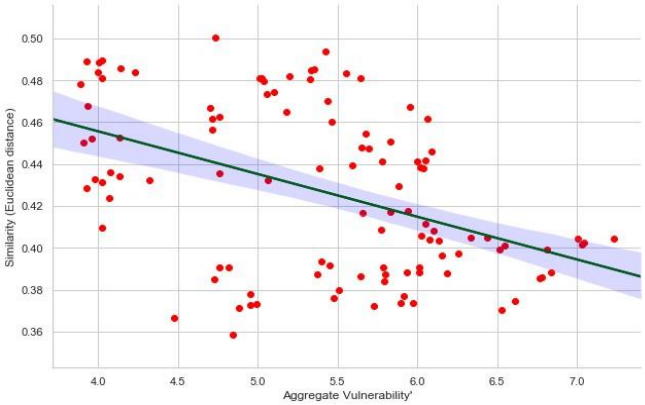


Table III: OLS Estimation. Regressing the log of Aggregate Banking Sector vulnerability on the lof of Portfolio Similarity

	(1)
VARIABLES	log Aggregate Vulnerability
log similarity	-0.806***
	(0.149)
Constant	-3.622***
	(0.128)
Observations	108
R-squared	0.196

Robust standard errors in parentheses
*** p<0.01

4 Conclusion

This paper presents stress-tests to the South African banking sector across two scenarios, a shock to the largest bank's loan portfolio and a shock to a marketable asset held by all banks, i.e. SA Government Bonds. Overall, the simulations demonstrate that second-order feedback effects from banks' deleveraging are muted. In the first scenario, asset sales are not large enough to trigger de-stabilising liquidation cascades. The main reason for this is that knock-on price effects can be absorbed by liquidity buffers of most other banks. One could argue that the characteristic of the South African banking system to be highly concentrated amongst Bank A – Bank D has a positive absorptive effect on financial system stability in terms of the firesale contagion channel. In the second stress-test simulation, most banks are

involved in de-leveraging from the initial impact, but Bank A contributes most to the spillover losses due to its connectedness in the system and the magnitude of its downsizing. Given a 30% shock to SA Government Bonds held in banks' trading book, second round equity losses amount to approximately 8% of pre-shock levels. This exposure is twice as large in 2020 as it was in 2010. Furthermore, the stress-tests confirm that banks' contribution to price spillover from contagion through common asset holdings is higher, the higher their leverage, their total assets (size), their connectedness (i.e. they own illiquid and large assets that are also held by other banks) and the larger the initial shock they are exposed. However, amplification can be substantially reduced by enlarging liquidity buffers.

Policy Implications

To mitigate the risk of price-mediated contagion in the banking system, the findings point to two crisis intervention instruments. First, the provision of emergency liquidity is crucial during a crisis to reduce the likelihood of banks' asset liquidation. The stess-test demonstrates the importance of liquidity buffers to dampen banks' de-leveraging spirals through fire-sales. Second, the results suggest that regulators put maximum leverage requirements on hold during times of stress. Maximum leverage is a regulatory instrument that prevents high risk-taking behaviour ex-ante. In times of stress, however, this regulation has the potential to aggravate the situation by incentivising deleveraging through asset liquidation. To lessen these amplification effects, banks should be allowed to have larger than normal leverage ratios temporarily until systemic risk subsides.

Tina Koziol
University of Cape Town
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Appendix A

PRICE-MEDIATED CONTAGION MODEL - EXTENSION OF GREENDWOOD *ET AL'S* 2015 FRAMEWORK

This sections describes the spillover model in detail.

Algorithm: Assume an initial exogenous shock hits the banking system, triggering the following process:[123]

1) *Direct exposure*: In time *t*, every bank holding the shocked assets incurs direct losses which can be quantified by

$$\alpha_{i,t} \sum_k w_{i,k,t} f_{k,t} \text{ for bank } b_i \quad (1)$$

where $f_{k,t} \in [-1, 0]$ is the devaluation shock on asset *k.* The bank can be hit with shocks on multiple asset classes, which is why the product of the portfolio weight and the shock value per asset class is summed up before multiplying by total assets $a_{i,t}$. This impact on bank's assets reduces equity on the liability side, which leads to an increase in the bank's leverage ratio. An important assumption of the model is *leverage targeting*, i.e. banks maintain a constant leverage ratio over time. This assumption is backed by [9], who provide some empirical evidence that large financial institutions maintain fairly stable levels of leverage in the medium term. The change in the binding leverage ratio[124][125] will prompt banks to become active in the market.

2) *Liquidity buffer*: [3] assume that banks immediately pay off debt to return to their initial leverage ratio l_i in response to the direct losses. A convenient modelling feature that follows from their assumption is that portfolio weights of the *k* assets are held constant, i.e. banks sell assets in the manner that keeps their portfolio composition the same throughout the de-leveraging phase. However, it is more realistic to assume that banks first use their liquidity buffer to pay off their debt before liquidating assets. Thus, portfolio weights are allowed to fluctuate in our

[123] The description of the framework is similar to [7], pp. 5-9

[124] This constraint is not given by regulators in our simulation. For sake of simplicity we assume that banks become active as soon as they move away from initial leverage conditions. An interesting extension of the model could investigate spillover in the case of additional regulatory leverage restrictions.

[125] It is theoretically possible that equity is wiped out entirely by a very large shock; thus the max operator limits losses to 0, i.e. there is no negative equity

model. The critical value determining the shortfall $\Gamma_{i,t}$ that bank *i* needs to cover is given by

$$\Gamma_{i,t}: \quad d_{i,t} - \left(l_i \ \max\{e_{i,t} - a_{i,t} \sum_k w_{i,k,t} f_{k,t}; 0\}\right)^4 \quad (2)$$

with $\Gamma_{i,t} \in [0, d_{i,t}]$ and

$\Gamma_{i,t} > 0$ if $f_{k,t} < 0$

$\Gamma_{i,t} = 0$ if $f_{k,t} = 0$

The intuition behind equation 2 is as follows. If the direct exposure is 0 because the shock is 0%, the shortfall bank *i* needs to cover is also 0. This is because in the absence of a shock on balance sheets, the composition of the liability side does not change, i.e. equity does not change and the difference between the previous period's debt and next period's debt is also 0. If the shock is negative, the shortfall will be larger than 0 with its maximum at the previous period's level of debt.[126]

3) *Fire-sales*: For an individual bank *i*, the algorithm checks two conditions that can occur in the face of a shock $f_{k,t}$ on its balance sheet. If the shock is too large and liquidity buffers are depleted, bank *i* starts selling assets immediately in proportion to its weights $w_{i,k,t}$[127]. In the second case, if the bank is able to absorb the shock, neither fire-sales nor spillover to other banks occur, but the balance sheet composition changes in response to transactions.

At the bank level, if the individual shortfall is larger than the bank's liquidity buffer, the total bank's de-leveraging amount is determined by the product of its leverage and its direct exposure:

$$\Omega_{i,k,t} = \begin{cases} \underbrace{\tilde{w}_{i,k,t}}_{\text{weight for asset k}} \ \underbrace{l_i}_{\text{leverage}} \underbrace{a_{i,t} \sum_k w_{i,k,t} f_{k,t}}_{\text{direct exposure}} & \text{if } \Gamma_{i,t} > \underbrace{a_{i,t} w^e_{i,k,t}}_{\text{liquidity buffer}} \\ 0 & \text{else} \end{cases} \quad (3)$$

[126] One should note here that $f_{k,t} \in [-1, 0]$.

[127] As in [3], it is assumed that these selling volumes are accommodated in the market at the initial step at no price discount

with $\tilde{w}_{i,k,\cdot}$ being the adjusted portfolio weight for asset *k* after cash operations are being taken into account. We sum up the bank-level selling volumes for asset *k* across all banks to get to the system-wide fire-sales for asset *k*:

$$Asset\ sales\ _{k,t} = \sum_i^n \Omega_{i,k,t} \quad (4)$$

Note that the first term $\tilde{w}_{i,k,\cdot}$ in 3 and 4 contains the intermediate adjusted weights that follow from cash operations. We define their derivation in equation 9, however, first in the law of motion is the adjustment of the liability side as described below.

How are balance sheets adjusted?

Whenever liquidity buffers are used, weights are adjusted proportionately according to the new total assets of bank *i*, which in turn depend on how equity and debt are affected by the direct exposure and the pay-off of debt obligations. Equity and debt in *t* + 1 are defined by:

$$e_{i,t+1} = max\{e_{i,t} - a_{i,t} \sum_k w_{i,k,t} f_{k,t}; 0\} \quad (5)$$

$$d_{i,t+1} = max\{l_i \ \ e_{i,t+1} \ ; 0\} \quad (6)$$

The sum of adjusted equity and updated debt gives total assets of bank *i* in *t* + 1 as

$$a_{i,t+1} = \max\{d_{i,t+1} + e_{i,t+1}, 0\} \quad (7)$$

On the asset side, cash is reduced by how much of the shortfall $\Gamma_{i,t}$ can be covered. In *t* + 1, its value is determined by debt pay-offs transactions. The maximum amount that is payable is $\Gamma_{i,t}$, hence new cash positions in *t* + 1 amount to:

$$c_{i,t+1} = \begin{cases} 0 & \text{if} \quad \Gamma_{i,t} \geq \underbrace{a_{i,t} w^c_{i,k,t}}_{\text{cash liquidity buffer}} \\ c_{i,t} - \Gamma_{i,t} & \text{else} \end{cases}$$

with $c_t = a_{i,t} w^c_{i,k,t}$

In the case that the cash buffer is not sufficient to de-leverage, $c_{i,t+1}$ is 0. Alternatively, the new cash position is the difference between the previous period's amount and $\Gamma_{i,t}$.

The next step is the intermediate update of portfolio weights $\sum_k w_{i,k} = 1$

As in [3], we assume that asset weights determine how much of each asset is sold in the de-leveraging process. This assumption is a drastic simplification as selling behaviour is more complex in real markets. However, it is a necessary building block which helps to gauge the extent of overlapping portfolios in the sector, while still being reasonably simple to allow for data calibration. While in [3], weights are constant, we allow for fluctuations due to cash transactions. The update process takes place between t and t + 1, which is why 'intermediate' adjusted weights are denoted with $\tilde{w}_{i,k,\cdot}$. Starting with cash, the intermediate portfolio weight is given by the ratio of the target positions:

$$\tilde{w}^c_{i,k,\cdot} = \frac{c_{i,t+1}}{a_{i,t+1}} \qquad (8)$$

Since $\tilde{w}^c_{i,k,\cdot}$ is smaller than $w^c_{i,k,t}$ $\forall f_{k,t} < 0$, the difference needs to be accounted for so that $\sum_k w_k = 1$. For sake of simplicity, we distribute the difference proportional to the existing weights. Consider the correction factor $\tau = \frac{w^c_{i,t} - \tilde{w}^c_{i,k,\cdot}}{k-1}$, so that the remaining intermediate weights are given by

$$w_{i,k,\cdot} = w_{i,k\neq c,t} + \tau \qquad \forall f_{k,t} < 0 \quad (9)$$

To re-iterate the law of motion, the intermediate weights are used in the determination of fire-sale volumes in the de-leveraging process described in equations. Once transactions materialised overnight, the intermediate weights become the new weights for the period t+1.

System-wide de-leveraging

We now turn to the spillover effects that arise from system-wide de-leveraging. Recall from equation 4 that the amount of asset k that is sold across all banks is given by

$$\Omega_{k,t} = \sum_i \tilde{w}_{i,k,\cdot} \quad l_i \quad a_{i,t} \sum_k w_{i,k,t} f_{k,t}$$

The direct exposure of bank *i* is multiplied by its leverage to determine the shortfall bank *i* needs to cover by asset sales in case liquidity buffers are depleted. This shortfall is multiplied by asset *k*'s portfolio weight $w_{i,k,t}$ to determine the proportional amount that bank *i* sells of asset *k*. The sales are summed up over all banks, leading to a total amount $\Omega_{k,t}$, i.e. the system-wide fire-sales of asset k following the initial shock $f_{k,t}$. The equity of bank *i* is reduced by direct exposure $\alpha_{i,t} \sum_k w_{i,k,t} f_k$, while debt is paid off according to $1_i(a_{i,t} \sum_k w_{i,k,t} f_{k,t})$.

4) *Price impact*: The cumulative sales lead to a price effect $\upsilon(\rho_k, \Omega_{k,t})$ which depends on the liquidity parameter ρ_k and the selling volumes $\Omega_{k,t}$. The assumption is that an exogenous buyer steps in to accommodate the selling volumes at the fire-sold price.

5) *Spillover losses*: The price effect leads to further losses on banks' balance sheets. These are the *indirect* spillover losses arising from common asset holdings. Our analysis is particularly concerned with these kind of spillover losses as they represent the amplification mechanism in the centre of the fire-sale contagion channel. It is possible to describe total spillover losses for asset *k* by

$$SP_{k,t} = \sum_i (a_{i,t} \sum_k \tilde{w}_{i,k,.}) \underbrace{\left[\rho_k \Omega_{k,t}\right]}_{f*} \quad (10)$$

where the expression inside the square brackets can be interpreted as second round shock f_{k^*} on asset k. The routine from *3.* is repeated to determine the systemwide losses $SP_{k,t}$ for asset *k* which result only from the second round fire-sale price-shock f_{k^*}. Summing up second-round sales across all asset classes gives us the system-wide spillover losses

$$\lambda_t = \sum_k SP_{k,t} \quad (11)$$

In the next step, we capture the fragility of the banking system to fire-sale spillovers by putting λ_t in relation to pre-shock banking sector equity $E_{=P_i} e_i$:

$$AV_t = \frac{\lambda_t}{E_{t-1}} \quad (12)$$

Greenwood *et al* 2015 [3] call this the *Aggregate Vulnerability* of the banking system to the preceding shock. It is further possible to break down *AV* into every bank's contribution to the overall losses in the banking system attributable to *indirect spillover losses*, i.e. $\mathrm{AV}_t = \sum_i S_{i,t}$.

To conclude, the *systemicness* of a bank depends on 4 factors and is higher, the more connected the bank is (connectedness is high when the bank owns large illiquid amounts of assets which are also held by other banks), the bigger the bank, the more leveraged the bank (l_i) and the larger the shock the bank faces.

APPENDIX B

FIGURES

Figure 12: The effect of price shocks to SA Government bonds (line graphs) to banking sector assets as a share of pre-shock levels when banks' leverage ratios are increased by factor 1 to 2.5.

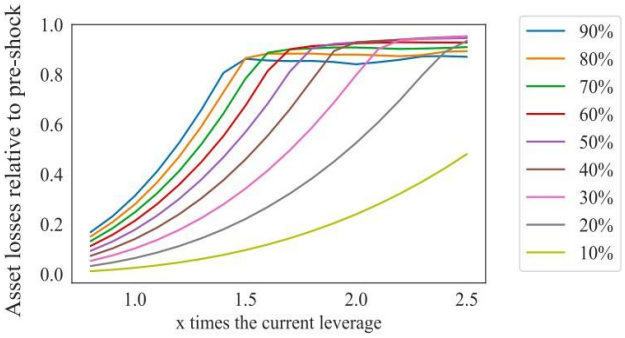


Figure 13: Average leverage ratio as defined by book debt over equity for top 10 banks fom January 2010 to February 2020

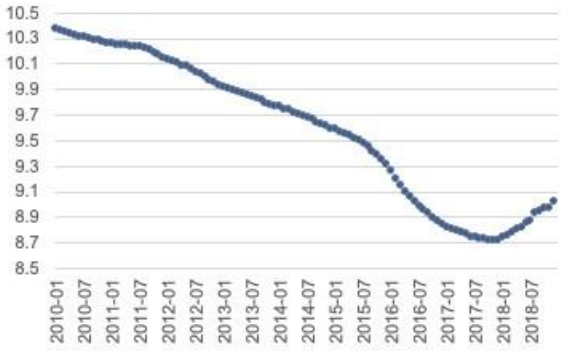


Figure 14: Residual vs fitted plot of pooled OLS regression. Residuals do not show any meaningful patterns

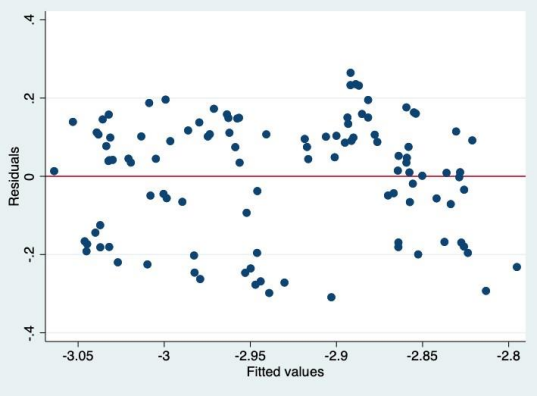
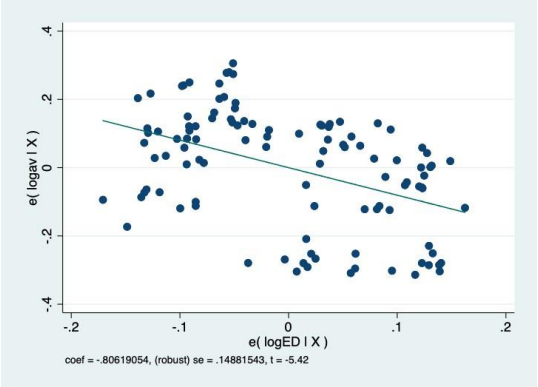


Figure 15: Added variable plot of pooled OLS regression.



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[9] T. Adrian and H.S. Shin, “Liquidity and leverage,” *Journal of Financial Intermediation*, vol. 19, no. 3, pp. 418–437, 2010. Figure 13. Average leverage ratio for top 10 banks from January 2010 to February 2020