Impacts of banking regulation on the South African economy and society

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ABSTRACT

The Global Financial Crisis of 2008 (GFC) ushered in significant improvements in banking regulation. In the South African case, this has led to lower leverage and a banking sector that is better capitalised than prior to 2008. This has not prevented material failures of banks, however the system is arguably more resilient and empirically there has been a lower frequency of bank failures. South African banks have significantly changed their asset mix, reducing exposure to retail consumers while increasing exposure to corporates. Within retail lending segments, banks have reduced relative exposure to mortgages and have increased exposure to other loan classes that are for consumption purposes. This paper demonstrates that there is empirical evidence that household saving and investment rates have reduced since the shift in lending practices. This has potentially also resulted in weaker economic growth in South Africa. Clearly, mortgages are used to acquire a real asset which in most cases results in wealth creation. This is because house prices have generally appreciated above inflation and have allowed borrowers to build up an asset base and a culture of investing. This study shows that the changes in lending practices are more likely a function of regulation as opposed to consumer behaviour. There are three areas of the regulation that have potentially caused this phenomenon. Firstly, capital regulations for credit risk under Basel II+ have changed the economics of mortgages relative to unsecured, short-term loans. Secondly, the Liquidity Coverage Ratio has potentially favoured shorter term loans while

also increasing the amount of liquid assets that banks have to hold. Third, the Net Stable Funding Ratio has potentially reduced the ability to lend over long terms as is the case with mortgages.

Keywords
Solvency, Basel, capital regulation, liquidity regulation, mortgages, savings, economic growth

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1. INTRODUCTION

In this paper, we are concerned with the question of whether regulation has an influence on the mix of assets on a bank's balance sheet, rather than overall credit extension. We discuss the credit risk and liquidity requirements for different asset classes under Basel III and argue that they may have an impact on the perceived risk-reward trade-off for bank asset allocation.

The paper specifically focuses on South Africa, with a focus on how the flow of funds from banks to households and government has changed since the implementation of Basel II. We consider the impact these changes may have had on overall savings and investment in the South African economy. We suggest that there is a direct link between the level of mortgage penetration in a market and the level of savings. This link was explored by analysing savings rates during various lending regimes.

The data suggest that during times of strong mortgage growth, savings rates of households tends to be structurally higher than during times of tepid mortgage growth. We also show that this is possibly due to the total return of home ownership exceeding the typical interest rate applicable. Therefore, this form of lending activity by banks has had a positive impact on household wealth creation, savings and GDP growth. Certain aspects of the capital and liquidity regulations have resulted in mortgages falling out of favour with banks, while consumption-focused lending (e.g. personal unsecured loans) has become more profitable. Thus, it is plausible that the regulations have had indirect, negative results for the South African economy.

This view needs to be balanced against the clear evidence that the regulations have resulted in a safer banking system. However, it is important to debate these trade-offs and perhaps there are some modifications to the regulation that can be made which can return South Africa to stronger growth and household wealth creation.

The rest of the paper is organised as follows. Section 2 provides an overview of the liquidity and credit risk capital requirements under Basel II & III, and discusses the impact these may have on the overall economy, with reference to literature. Section 3 describes Basel III. Section 4 demonstrates that mortgages can create wealth and contribute to

economic growth. Section 5 discusses detail behind the capital and liquidity regulations and the implications for changes in the pattern of lending. In Section 6 we cover the South African case. Here, we use Black-Litterman reverse optimisation to estimate the changes in the returns expectations for different classes of household lending, and discuss the factors that may have led to these changes (Black & Litterman, 1992). We also show evidence that the changes in lending practices were more a function of regulations than consumer demand patterns. We conclude in Section 7 with some overall observation of the role of public interest within a prudential regulatory framework.

2. BACKGROUND TO THE BASEL FRAMEWORK FOR BANKING REGULATION

The Basel regulatory regimes provide a set of guidelines for bank regulators. They were designed to harmonise bank regulation across jurisdictions. The first Basel Accord (Basel I) was published in 1988, introducing a risk-based approach for bank capital requirements (BCBS, 1988). Basel I was based on a risk-weighting approach, with the risk weights generally differing at an asset class level. In the traditional actuarial approach to reserving, the reserves are based on an estimate of shortfall (assets less liabilities). The approach in banking is not too dissimilar, with the aims of capital regulation to ensure adequate capital in the event of stress scenarios. The risk weights are applied to each asset class and the initial Basel regulations required 8% of the risk-weighted asset value to be held as capital. This was a shortcoming since it did not allow for differences in risk characteristics *within* each asset class. It is not clear based on the initial proposal paper (BCBS, 1987) as to how the figure of 8% was derived. The initial proposal paper mentioned that ten countries favoured a figure of 8%, although this was not the initial official target of the Basel Committee.

Basel II was published in 2004, addressing some of the shortcomings of Basel I (BCBS, 2004). It came into effect in South Africa in 2008 (South Africa's Implementation of Basel II and Basel III, n.d.). The broad approach to adoption was discussed in the South African Reserve Bank's annual report of 2007 (South African Reserve Bank, 2007). Basel II allowed for a more quantitative approach for determining capital requirements, based on the specific risk characteristic of the asset and the systemic risk characteristics of the asset class, i.e. it went beyond merely accounting for risk at an asset class level. It also placed a greater focus on internal economic capital assessments and public disclosure. However, not enough focus was placed on liquidity risk, which became a major source of concern following the Great Recession in the late 2000s.

Basel III was published in 2010 (BCBS, 2010). The approach to assessing credit risk remained largely unchanged, while a greater focus was placed on liquidity risk, with the introduction of the liquidity coverage ratio and net stable funding ratio requirements. Basel III also placed more emphasis on macroprudential aspects of risks, introducing the countercyclical buffer (CCyB) to help stabilise credit extension across the credit risk cycle. The rationale was that during downturns, regulatory capital requirements may constrain

the level of credit extension, resulting in an amplification of the economic cycle. The CCyB is designed to help counteract this amplification.

The introduction of the CCyB is an acknowledgement of the fact that bank capital requirements may have a real impact on the economy. The exact nature of the impact of bank capital requirements on the real economy has been the subject of academic debate. There is generally an acknowledgement that bank lending decisions have an important role to play in the economy. For instance, the seminal work by Bernanke and Blinder (1992) showed how monetary policy is transmitted through the bank lending channels. The disagreement often relates to the question of whether bank regulation may have any influence on bank lending decisions.

Research in this area often leans on the influential work by Modigliani and Miller on the firm value theorem (Modigliani & Miller 1958, 1963). The theorem predicts that the capital structure of a business should, under certain strict conditions, have no influence on its enterprise value and cost of capital. If the theorem holds, we should not expect a bank's lending behaviour to be affected by changes in leverage requirements since these will not ultimately have an influence on the cost of capital. There is a fair amount of contention over the extent to which the required conditions for the theorem are in sufficient operation, resulting in considerable disagreement over this question. Martynova provides a survey of some of the arguments (Martynova, n.d.).

Another aspect of the debate over regulation looks at the problem from the perspective of financial repression. This perspective questions whether liquidity and reserving requirements may have a detrimental effect on savers and the overall economy. The concern stems from the observation that financial regulation can be used to encourage cheap forms of borrowing for governments, subverting market forces. These regulations have been argued to benefit borrowers at the expense of savers.

The latest regulations, Basel IV focuses on post Global Financial Crisis (GFC) reforms. This was originally intended to be implemented in January 2022; however this has since been shifted out to January 2023. Basel IV is based on the implementation of Basel III reforms and the Basel committee do not officially refer to these as Basel IV. However most industry practitioners refer to the standards in the document published by the Basel Committee in December 2017 (BCBS, 2017) as Basel IV. The main recommendations are:

— revisions in the standardised approaches for credit risk and operational risk,
— stricter guidelines on the use of internal models for credit risk,
— updated guidelines on the application of the leverage ratio, and
— revisions to the capital floor.

3. BASEL III – A STABLE FINANCIAL SYSTEM

Basel I was focused on adequate capital management with the aim of reducing the risk of bank failures. Empirical evidence shows that a critical reason for bank failure is due to inadequate liquidity management protocols (Havemann, 2019). The BCBS published

guidance which was adopted into the Basel III standards (BCBS, 2008). Therefore Basel III has a comprehensive focus on both capital and liquidity. While the purpose of this paper is to highlight the impacts on lending behaviour, it is critical to assess whether these frameworks have actually reduced the risk of bank failures.

The empirical evidence in the South African case seems to suggest that since the implementation of Basel III, banks have lower default risk as a result of both improved capital adequacy levels and prudent liquidity management (Havemann, 2019). Havemann shows that only two banks have failed in South Africa since the Global Financial Crisis of 2008. From 1990 to 2003 there were 29 bank failures. Makhubela (2006) shows that poor liquidity and credit risk management were the cause of all of those failures. Havemann (2019) shows that of the two bank failures since 2003, one of these was due to fraud and the other was due to poor liquidity risk management.

There have also been numerous global studies that have shown that the Basel framework has resulted in lower default risk for banks. Giordana and Schumacher (2013) performed an empirical analysis and showed that the liquidity regulations reduced the probability of default for banks. Grundke and Kühn (2020) found that liquidity ratios reduced default risk; this was performed using a simulation analysis. They were unable to determine a clear impact on balance sheet growth.

Therefore the liquidity and capital framework adopted by the South African regulators has resulted in a safer banking system. It is important to note that in the analyses by both Havemann and Makhubela unsecured lending has been the asset class associated with the majority of credit and liquidity risk failures since 2000 in South Africa. Therefore it is perhaps worth debating whether the regulations are appropriate for the various asset classes. We will show that the liquidity regulations in particular focus mainly on the deposit and liability quality, with no explicit adjustments for the interplay between credit risk and liquidity risk.

4. MORTGAGES AND WEALTH CREATION

4.1 Bank lending practices to households

In the period since 2008, lending patterns have resulted in a gradual and material change in the nature of household leverage. In 2008, mortgages accounted for 61% of household liabilities, with the rest being made up of the various other forms of lending (mainly vehicle finance, credit cards, overdrafts, and unsecured loans). This has since declined to only account for 47% in 2020 (see Figure 1). The form of lending that saw the largest rise between 2008 and 2021 was unsecured lending.

Regardless of what may have caused this change, we ask the question: is this change in the nature of lending in the best interest of the public, i.e., would a different household balance sheet be more desirable? This is a complex question to address exhaustively. Nevertheless, we address two aspects which may be important: (1) the compounding power of mortgages in creating financial wealth; and (2) the impact of household debt on

savings. We discuss the first aspect below, while the second aspect is discussed towards the end of the paper.

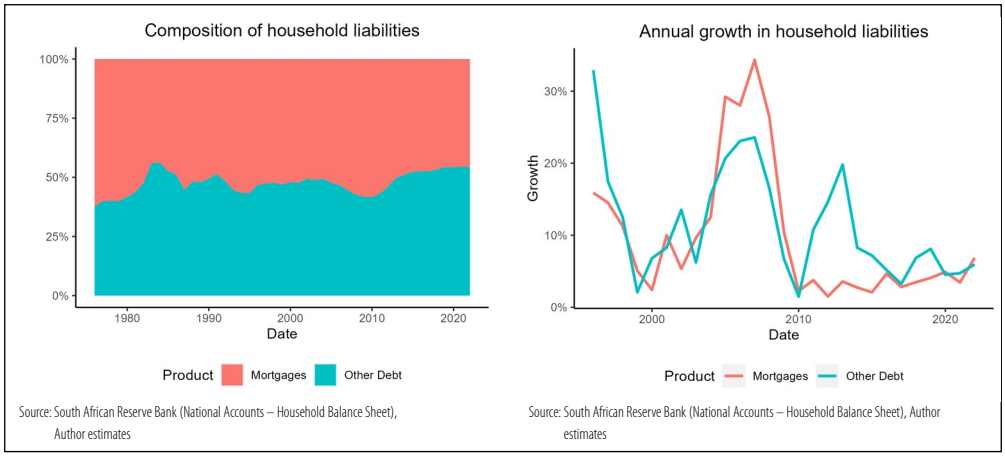

FIGURE 1 Household liabilities – composition and growth over time

Loans have the potential to create wealth when the proceeds are deployed into investments that yield a higher rate of return compared to the cost of the loan. In the South African case house price inflation has been lower than the prime rate of interest. However it is important to note that in the case of a primary home mortgage, the home buyer is receiving a total return based on the growth in the value of the property as well as the rental saved (see Figure 2). The South African Reserve Bank calls this imputed rent and it is important because this is effectively tax-free income. Thus in assessing whether to use mortgages to fund a primary residence, the total return (imputed rent and capital gains on the property) must be considered.

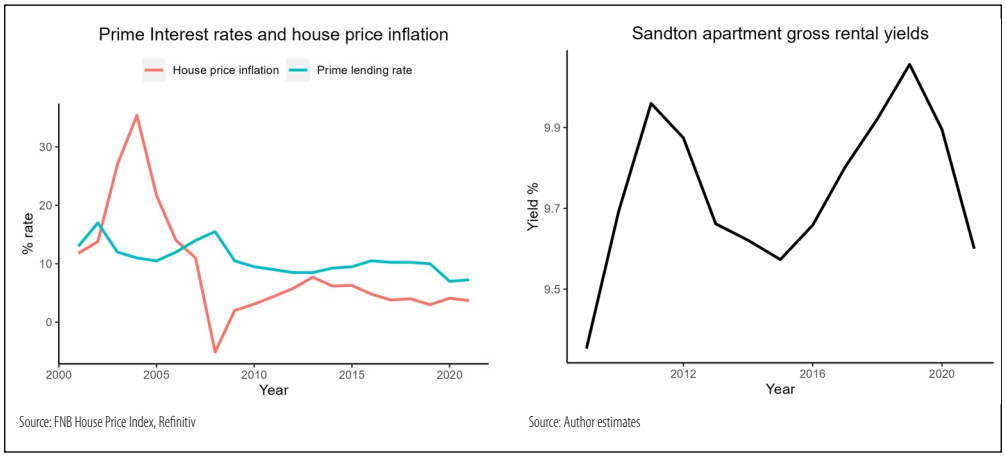

FIGURE 2 House price inflation and prime lending rate over time

Figure 2 shows the rental yields in the Sandton area which we have derived from a proprietary database. This uses apartment prices in a particular area as well as gross market rentals for similar properties. We chose to use a fairly homogeneous area, and also chose apartments due to the relatively standardised nature of the pricing. A gross rental yield of around 10% may seem high, but it is important to note that the municipal rates and taxes are normally borne by the tenant and thus the net rental yield would be around 7%.

The simplest way to understand the ability of mortgage lending to build financial wealth is to consider the internal rate of return on a house funded through a mortgage. There are three inputs into this calculation:

— The mortgage lending rate i
— The rental yield on residential property y
— The capital appreciation on housing investments g

For this purpose, we assume that the borrower buys a house worth $P = 1$, completely financed through a mortgage loan to be repaid in annual instalments over n months. Over this period, the borrower earns occupational rental income (imputed rent) on the house (proportional to its valuation at the time). The property is valued at the end of the period to work out the terminal value of the investment. From this, we can set up the following NPV formula:

$$NPV(i, y, g, n) = y a_n(j) - \frac{a_n(r)}{a_n(i)} + (1+r)^{-n}$$

where:

— $a_n(x)$ is the present value of an annuity certain over n periods, at a rate x,
— r is the internal rate of return, and
— $j = \frac{i+r}{1+g} - 1$.

To run the model, we use the following parameters (derived from Figure 3):

— $n = 240$ months, which is a typical contractual term on a mortgage loan in South Africa
— $i = 0.76\%$ per month, which was the average monthly yield (interest rate) on a South Africa home loan between 2008 and 2019
— $y = 0.58\%$ per month, which assumes a net yield of 7% (gross yields for residential property has averaged around 9.7%, Figure 2), and
— $g = 0.30\%$ per month, which was the compound monthly growth rate in property prices between 2008 and 2019, a period that included a trough in housing prices.

Solving the NPV equation above, we find a rate of return of $r = 0.81\%$ per month, or 10% per annum. For context, the typical assessment of the cost of equity in South Africa is between 13% and 16%. However, we note that the total return on the JSE All Share Index over the same period was around 9% per annum.

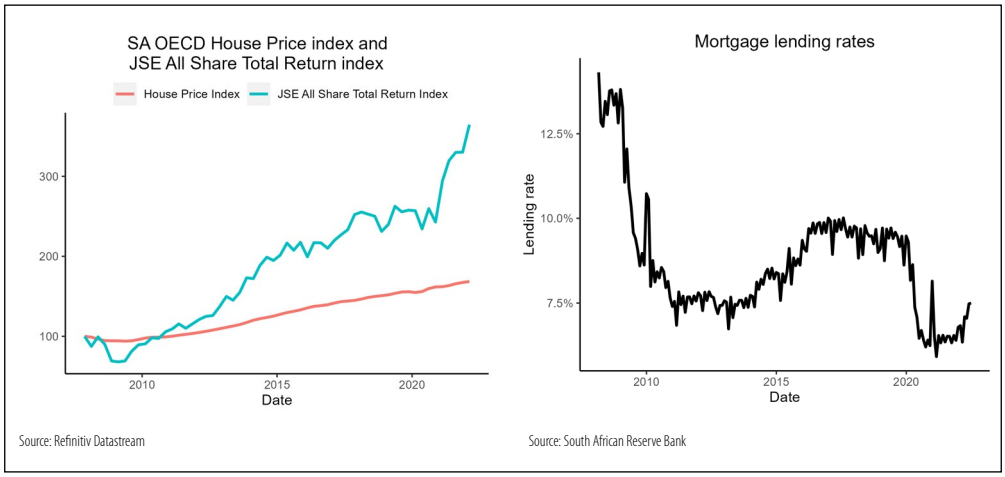

FIGURE 3 Mortgage lending rates (yields), house price appreciation and stock market returns

A weakness in this assessment is that we have held the parameters constant, especially the mortgage rate parameter, which is generally linked to the Prime Overdraft Rate in South Africa. However, we note a full range of monetary policy stances over the period 2008 to 2019. Moreover, we expect that rental yields will generally move in sympathy with interest rates, to compensate property investors. Nevertheless, we provide a sensitivity analysis for r in Figure 4.

4.1 A simpler model for estimating wealth creation

A more simplistic method of thinking about the wealth creation is to approximate the total return spread (TRS) as the total return on the property (rental yield and capital gain) less the borrowing cost:

$$TRS = y + g - i$$

This approximation gives the excess return that would be earned assuming a 100% loan-to-value where TRS is the total return spread during the period observed, and y, g and i are as defined earlier. We have used data from the Sandton area for both house prices and rentals and this is shown in Figure 2. Of course this may vary by type of residence and geographic region. However the experience of listed Real Estate Investment Trusts (REITs) shows that typically the TRS on residential property is positive. It is also found that low yielding properties (i.e. expensive relative to the rental) are generally in areas where capital growth is high. The TRS for Sandton apartments is shown in Figure 5.

Thus, this serves as another way of justifying that mortgage loans generally create wealth, particularly when used for primary housing purposes. This is because the home owner benefits from both rental and capital appreciation which in total has been higher

than the market lending rate for mortgages. Further studies are required across various types of residence, geographic area as well as creditworthiness of the borrower in order to assess whether this is true for all forms of home ownership.

Further we do believe that this is potentially a reason why household savings were higher when mortgage penetration was higher. This is because over time, the wealth created by home ownership eventually crystalises into other forms. For example, it was common in the South African case for home owners to make use of "access bonds". These are facilities through which the mortgage provider allows funds to be loaned from the mortgage once a certain portion of the outstanding capital has been paid off. Therefore, home owners could tap into their equity for various reasons, for example emergencies, investments and even the purchasing of vehicles. Thus this enables households to generate more wealth and support a culture of regular savings.

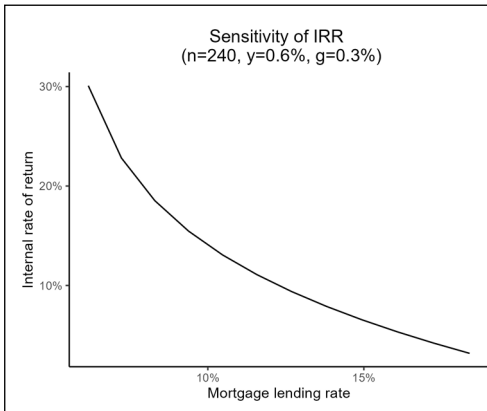

FIGURE 4 Sensitivity analysis of the internal rate of return from housing investment

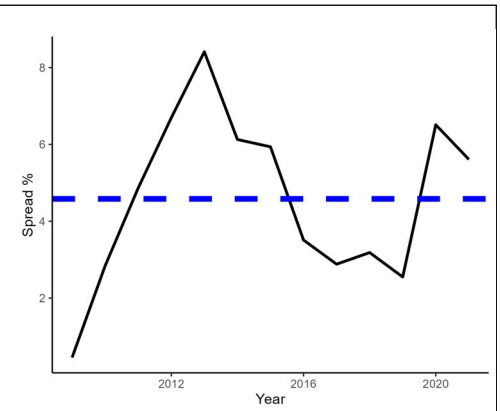

FIGURE 5 Total return spread (TRS) for Sandton apartments

4.2 Broader impact of mortgage wealth creation

It is notable that higher household savings were seen concomitantly during periods of higher mortgage penetration as opposed to a lagged over time (Figure 23). Arku (2006) showed that housing has a material positive impact on economic growth.

A reason for this could be due to the evidence that higher mortgage penetration leads to more transactions and an ability for certain homeowners to crystalise their capital gains and save the proceeds. Another reason could be due to rising residential building activity when mortgage growth accelerates (Figure 6). This could result in higher profits for the entire value chain, for example builders and their employees. The residential building industry is fragmented compared to the large-scale commercial building industry. Therefore it is possible that increased activity in the residential building market results in a high proportion of the value created moving directly to households and small enterprises.

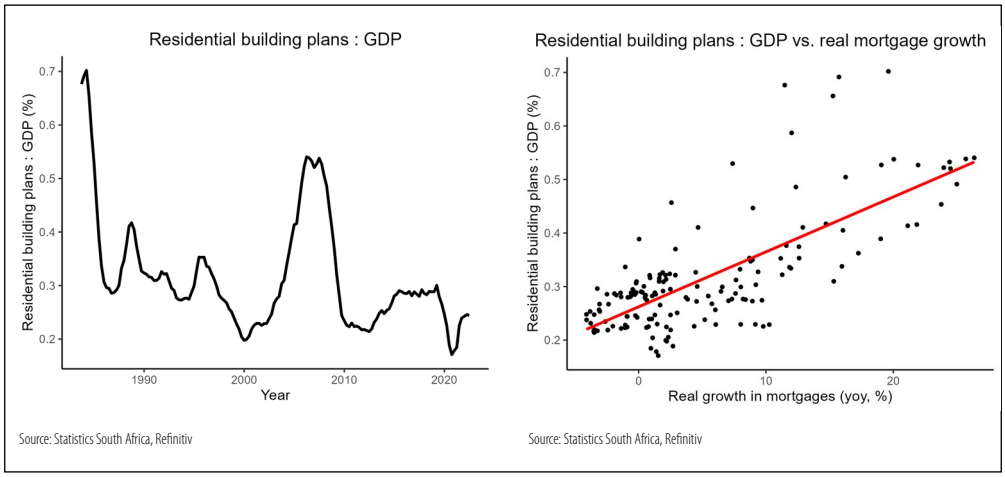

FIGURE 5 Residential building plans relative to GDP (%)

Ovsiannikova et al. (2017) showed that housing investment generates a multiplier effect, triggering the development of other different interrelated sectors.

This must be contrasted against the status quo where around 8 million South Africans have access to unsecured credit which is substantially more expensive, with loans granted over shorter terms compared to mortgages (Differential Capital, 2019). Conversely the CAHF finds that only 1.7 million mortgage accounts exist in South Africa, compared to six million formal title deeds (71point4 & CAHF, 2018).

There is a strong argument that the proceeds of mortgages have a higher benefit for the local economy compared to the case of personal loans and vehicle finance, where a higher part of the value chain benefits external economies.

The evidence seems to favour the hypothesis that mortgages can be vehicles for wealth creation. It could be argued that lending for consumption purposes is not as beneficial for the economy due to the high interest costs and the fact that a large proportion of consumers end up in default and trapped in very expensive debt (Differential Capital, 2019).

5. CAPITAL REGULATION AND LENDING BEHAVIOUR

We now provide an overview of the regulatory regime for banks and how this may impact bank lending behaviour.

5.1 Capital regulation

Basel II+ (Basel II and Basel III) addresses the principal risks faced by banks, being credit risk, operational risk, market risk and liquidity risk. In this paper, we mainly focus on credit and liquidity risk because in the commentary by various management teams, these seem to be the most important drivers behind asset mix strategy (FirstRand Group, 2011). We provide an overview of how these are handled within the Basel II+ framework.

5.1.1 CREDIT RISK CALCULATIONS

The credit risk capital requirements under Basel II+ are based on risk weights. The risk weights are an attempt to estimate how much a given exposure contributes to the 99.9% 1-year value-at-risk (VaR) of a loan portfolio. These weights differ based on the fundamental and systemic risk a particular exposure introduces to the bank. Fundamental risk refers to the factors influencing through-the-cycle expected credit losses on a given loan. These factors are measured using three metrics: probability of default (PD), exposure at default (EAD), and loss given default (LGD) which are multiplied to produce an estimate of expected credit loss:

$$EL = PD \times EAD \times LGD$$

Loans with a higher expected credit loss are generally assigned higher risk weights. Systemic risk refers to the cyclicality of the loss experience arising from each type of loan. Loans that introduce a high level of cyclicality into the portfolio are assigned higher risk weights. The intuition behind this is that loan portfolios that are more cyclical will have more tail risk, and thus a higher VaR. The metric used to measure systemic risk in the framework is the asset correlation coefficient ρ, which is a transformation of the volatility in the portfolio default rate. Specifically, it measures the volatility in the probit-transform for the probability of default, which is referred to as the distance-to-default.

Basel II+ recognises that different banks would operate with differing levels of technical sophistication, so that some banks might not have internal risk models that permit these calculations. The requirements thus allow for three approaches: the Standardised Approach, the Foundation Internal Ratings-Based Approach (FIRB) and the Advanced Internal Ratings-Based Approach (AIRB), the latter being what we described above.

However, even under the AIRB approach, the regulation still prescribes the value for ρ. Of the four parameters of the model Basel II+ credit risk model, ρ is the hardest to estimate, both technically and in terms of the amount of data required.

In the Standardised Approach, the risk weights are stipulated based mainly on asset class. For instance, mortgages attract a risk weight of 35%, while corporate exposures attract risk weights ranging from 20% to 150% depending on credit ratings. The Standardised Approach is much closer to the risk weighting mechanism contained in Basel I, which also relied on asset-class-level risk weights rather than a detailed risk model.

The Basel II+ credit risk framework measures the incremental VaR introduced by a given exposure as follows:

$$VaR = EAD \times LGD \times \Phi\left(\frac{1}{\sqrt{1-\rho}}\Phi^{-1}\left(PD\right) + \frac{\rho}{\sqrt{1-\rho}}\Phi^{-1}\left(0.999\right)\right)$$

where Φ is the Gaussian distribution function. The risk weighted asset K on the exposure is then calculated based on the VaR as follows:

$$K = 12.5 \times \left[VaR - EL \right]$$

$$= 12.5 \times EAD \times LGD \times \left(\Phi\left(\frac{1}{\sqrt{1-\rho}} \Phi^{-1}\left(PD\right) + \frac{\rho}{\sqrt{1-\rho}} \Phi^{-1}\left(0.999\right) - PD \right) \right.$$

Notice that to get the risk-weighted asset we subtract the expected loss[1] from the VaR and multiply by 12.5. The rationale for subtracting the expected loss is that the expected losses on the portfolio ought to have already been subtracted from the book value of the loans on the bank's balance sheet (through loan impairment provisions). The rationale for multiplying by 12.5 is that in the design of the framework, capital requirements were set at 8% of risk-weighted assets.[2]

5.2 Liquidity regulations

Basel II+ introduced a greater focus on liquidity risk. This was partly in response to the Great Recession, which was arguably triggered by a liquidity crisis. The regulation introduces two liquidity metrics, the net stable funding ratio (NSFR) and the liquidity coverage ratio (LCR).

The high level thinking behind the LCR is that a bank should have enough liquidity to survive a 30-day period where withdrawals of deposits are high. The high levels of withdrawals are also known as a "run-on-the-bank" scenario. The outcome is that banks should have enough short-dated or highly liquid assets that can be accessed with minimal impact on market value in order to pay depositors.

The NSFR is a similar concept, but the aim is to survive a longer period of deposit withdrawal. The NSFR requires banks to better match their deposits and liabilities to their assets so that the banks can meet sustained deposit withdrawals over a period of a year.

The impact on profitability of these regulations is that banks are forced to invest more of their assets in liquid short-term assets which could be lower yielding. Banks also have to increase the term of their funding which is likely to be more expensive.

5.2.1 LIQUIDITY RISK CALCULATIONS – LIQUIDITY COVERAGE RATIO

The LCR is a ratio of the stock of high-quality liquid assets (HQLA) to estimated net cash outflows over 30 days in a stressed scenario. This attempts to ensure that banks have enough assets that can be liquidated easily to fund any short-term funding strain that may arise. The requirements provide scenarios to be used to estimate the funding strain (net cash outflows over 30 days) in calculating the LCR. The requirements also stipulate the assets that may be included in calculating HQLA, and the extent to which they may be

1 VaR less expected loss is often referred to as unexpected loss

2 By multiplying by 12.5, we ensure that the capital requirement will end up being equal to the unexpected loss, since 0.08 is the inverse of 12.5.

included. Under these rules, the most liquid assets, including cash, central bank reserves and sovereign debt, are included in the calculation without limit. Other assets such as highly rated corporate bonds may be included to a limited extent, while others are excluded entirely. Basel II+ requires that the LCR always exceed 100%.

The outflows are effectively an estimate of the run-off that can be expected for various classes of liability or deposit funding that a bank may have. The outflows also take into account any liquidity facilities and contingent funding that the bank may have provided to other parties.

The net cash outflows are calculated as follows:

$$TNCO = TCO - min\left(TCI, 0.75 \times TCO\right)$$

where:

— *TNCO* is the total net cash outflow,
— *TCO* is the total expected cash outflow, and
— *TCI* is the total expected cash inflow.

The total expected cash inflows, *TCO* are expected contractual inflows that arise from assets that are fully performing and where the bank has no expectation of default within the 30-day horizon. The *TCO* would be calculated as follows:

$$TCO = \sum_i D_i w_i$$

where:

— D_i are the amounts in each deposit class *i*, and
— w_i are the prescribed weightings (also called run-off factors).

The *TCO* is effectively a weighted expectation of the amount of deposits that could be expected to flow out of the bank over 30 days under a liquidity event.

Typical run-off factors (w_i) are as follows:[3]

Table 1 Summary of run-off rates for various deposit classes

Deposit class	Run-off assumption
Retail and SME stable deposits	3% to 10%
Retail and SME "less stable" deposits	>10%
Unsecured wholesale operational deposits	25%
Unsecured wholesale funding from non-financial corporates, sovereigns and central banks	20%–40%

3 The complete standard on cash inflows and outflows can be found on the Basel Framework website, https://www.bis.org/basel_framework/chapter/LCR/40.htm?tldate=20191231&inforce=20191215&published=20191215.

Deposit class	Run-off assumption
Unsecured wholesale funding	100%
Secured wholesale funding	5% to 100%
Outflows related to derivatives	100%
Outflows related to credit facilities	100%

An example of the application would be that if a bank was completely funded by unsecured wholesale funding, all funding that is contractually payable in 30 days would attract an outflow assumption of 100%.

HQLA are generally assets that can easily and immediately be converted into cash with minimal reduction in value of the asset. Thus, these tend to be assets such as government bonds and highly rated, liquid corporate paper. It is critical that these are easily valued, and thus they tend to be listed. These should also not be correlated with risky assets and thus paper issued by financial institutions such as other banks would generally not be considered HQLA. Banks with a higher proportion of Retail and SME deposits would attract a very low run-off rate and thus require a low amount of HQLA in order to be compliant with the LCR. Similarly, banks with shorter term loans would have a higher cash inflow than banks with long-term loans. The banks with the most proportionate exposure to retail deposits and higher proportion of short-term loans would require the least amount of HQLA.

There is a potentially material weakness in the approach of the regulation in that the risky nature of the asset is not explicitly covered in the inflow calculation. For example LCR40 (BCBS, n.d.) provides the following guidance:

> When considering its available cash inflows, the bank must only include contractual inflows (including interest payments) from outstanding exposures that are fully performing and for which the bank has no reason to expect a default within the 30-day time horizon …

Havemann (2019) and Makhubela (2006) show evidence that even in the case where liquidity issues eventually resulted in bank failure, the assets which caused depositors to panic were higher risk assets like personal unsecured loans. Therefore the current approach which mainly relies on the contractual nature of the loans simply gives shorter term loans an advantage even if the asset is of a low quality. For example, does it make sense that short-term unsecured loans to very high risk individuals require materially less liquidity coverage than low credit risk, low loan-to-value mortgages? It could be argued that in the run-on-the-bank scenario, the short-term unsecured loans could be substantially impaired. Imbierowicz and Rauch (2014) found in the case of US banks that liquidity risk and credit risk did not have a meaningful contemporaneous or time-lagged relationship. However they did find that the influence of their interaction can either aggravate or mitigate default risk.

It is important to note that the run-off factors applied to the various deposit classes are derived from historic experience which may not be applicable in the current environment. For example, in historic times, when a run on the bank occurred, retail clients would struggle to withdraw their loans due to the physical requirement of withdrawing their cash. However, regulators should consider that retail depositors may behave like institutions due to the increased penetration of digital banking channels. For example, it may be very easy for clients who make use of mobile banking applications to withdraw their cash quickly during a high stress scenario for a bank.

5.2.2 LIQUIDITY RISK CALCULATIONS – NET STABLE FUNDING RATIO

The NSFR is a ratio of available stable funding (ASF) to required stable fund (RSF), with a requirement that the ratio exceed 1. ASF and RSF are both calculated based on assigned weights. ASF is calculated by multiplying each category of funding (liabilities) by the assigned weight for the category:

$$ASF = \sum_j L_j u_j$$

where L_j is the value of liabilities in category j and u_j is the available stable funding weight for the category j. Generally, liabilities that are considered most sticky, such as equity, preference shares and term deposits with long maturities, will receive the highest weight of 100%.

Similarly, RSF is calculated by applying weights to each category of assets:

$$RSF = \sum_j A_j v_j$$

where A_j is the value of assets in category j and v_j is the required stable funding weight for the category. Assets encumbered for more than one year receive the highest weighting of 100%, while cash and bank reserves will receive a weighting of 0%. Assets deemed as HQLA in the LCR calculation receive a low weight of 5%, since they are regarded as being highly liquid.

Basel II came into effect in South Africa in 2008, and Basel III was phased in gradually after being published in 2010/11. Transitional measures were put in place for some of the requirements. For instance, threshold for the LCR was initially set at 50% and gradually increased to a 100% to smooth the transition. We now consider the impact Basel II+ may have on the real economy with regard to bank lending behaviour and potential effects on GDP growth.

5.3 Impact of bank regulation on the real economy

The Modigliani and Miller (1958) firm value theorem is often used by both sides of the argument on whether capital requirements have an impact on the real economy, e.g., Cline (n.d.) and Balling (2015).

5.3.1 THE FIRM VALUE THEOREM AND ITS IMPLICATION ON BANK REGULATION

The theorem argues that the value of an unlevered firm should be the same as the value of the equity of the unlevered firm. The theorem relies on the no-arbitrage mechanism – that an investor can replicate the returns on a levered firm by funding a purchase of the unlevered firm's shares through debt. However, this ignores the fact that debt costs are often tax-deductible, as well as transaction costs. Modigliani and Miller (1963) updated the theorem to allow that levered firms ought to have higher enterprise value due to the tax benefit.

The most important aspect of Modigliani and Miller (1958, 1963) for our purposes is the implications on required return. Ignoring tax and transaction costs, the theorem implies that a higher amount of leverage would result in higher required return on equity (since a smaller share of equity is available to absorb losses), but the overall required return on capital should be unaltered. However, after allowing for taxation, the overall cost of capital decreases as leverage rises, as a result of the tax benefit associated with leverage.

This theorem is important in the broader discussion of the impact of leverage on overall bank lending decisions. Proponents of stricter regulations have argued that higher capital requirements may result in higher return on equity, but this would be offset by a reduction in the cost of other forms of funding (required return on capital would be neutral according to the no-tax version of the theorem). However, once tax is introduced, the theorem predicts that higher capital requirements would result in a higher overall required return, even while the cost of equity declines. This may have a real impact on the economy; in order to maintain the same lending margins, banks would need to raise lending rates, which may lead to lower levels of credit extension.

This same argument can be applied to assess the potential impact of relative capital requirements for different asset classes on the mix of bank assets. The typical (South African) bank allocates its assets to a wide range of asset classes, including retail lending, corporate lending, and sovereign lending. Retail lending further segments into mortgage, asset-backed lending, revolving credit, and unsecured lending.

It is typical for these different forms of lending to be carried out by different divisions within the bank. To begin, let us treat each division as a siloed business. In the presence of taxes, through the mechanism above, an increase in the capital requirement for mortgage lending relative to SME credit would result in a relative increase in the required return on capital for the mortgage lending business. This may then result in a relative rise in mortgage lending rate, or else a decline in the overall level of mortgage lending.

In practice, the different divisions within a bank are not entirely siloed. In a modern bank, the cost of capital with which a given division operates is determined by the treasury function, through the funds transfer pricing mechanism. The transfer pricing regime used by treasury generally aims to manage several factors. The main factors are typically the term liquidity premium of the assets being funded by the treasury, the regulatory cost of capital, as well as commercial considerations such as cross-subsidisation. Moss (2018) notes:

> Due to regulation acting as a 'one size fits all' approach, the result is higher costs for products penalized by regulation and lower costs for products overlooked by regulation.

This is exactly in line with what the firm value theorem predicts. Regardless of the many motives that drive internal transfer pricing, under a perfectly functioning transfer pricing regime the cost of capital for divisions with higher capital requirements ought to be adjusted upwards to reflect the impact on the bank's overall capital requirements, since the higher capital requirement would lead to higher levels of taxation.

5.3.2 BANKS AS CAPITAL OPTIMISERS

It is not uncommon for banks to be modelled as capital allocators, e.g., Goel et al. (2017). A key success factor for modern commercial banks is their ability to allocate capital between the wide range of opportunities across the various business units, in the face of uncertainty and regulatory constraints. Under this type of model, a core aim of a bank's management is to solve the optimisation problem:

$$\max_{w_1,\ldots,w_n} \sum r_j w_j,$$

subject to prevailing constraints, including constraints on risk, economic capital and regulatory requirements, where w_j is the amount of capital allocated to business unit or asset class j, and r_j is the return extracted from the allocation.

We have already discussed how, through Modigliani & Miller, capital regulations may have an impact on the required rate of return. Another way of looking at this problem is to consider how return on capital is calculated. The return on capital (ignoring loan fees and operating expenses) for a bank's lending operation can be stated as:

$$r_j = \frac{i_j - CoF_j - \varepsilon_j}{K_j},$$

where i is the lending rate, COF_j is the cost of funding, ε_j is the credit loss rate and K_j is the capital requirement divided by the exposure (equivalent to RWA density). The lending rate is made up of three components, a loading for the cost of funding c_j, a loading for expected loss μ_j and a profit loading π_j:

$$i_j = c_j + \mu_j + \pi_j.$$

Following from formula for determining capital under the AIRB approach under Basel II+, the capital component with probability of default p_j can be written as:

$$K_j = 12.5 \times LGD \times \left[\Phi\left(\frac{1}{\sqrt{1-\rho_j}} \Phi^{-1}\left(p_j\right) + \frac{\rho_j}{\sqrt{1-\rho_j}} \Phi^{-1}\left(0.999\right) \right) - p_j \right]$$

$$= 12.5 \times \left[\frac{1}{PD} \Phi\left(\frac{1}{\sqrt{1-\rho_j}} \Phi^{-1}\left(p_j\right) + \frac{\rho_j}{\sqrt{1-\rho_j}} \Phi^{-1}\left(0.999\right) \right) - 1 \right] \times \mu_j$$

$$= G\left(\rho_j, p_j\right)\mu_j$$

Therefore, we can rewrite the return on capital from lending as:

$$r_j = \frac{\left[c_j - CoF_j\right]_+ + \left[\mu_j - \varepsilon_j\right] + \pi_j}{G\left(\rho_j, p_j\right)\mu_j}$$

By expectation, credit losses should match the credit loading over the life of the contract, so that $\mu_j - \varepsilon_j = 0$. Similarly, the actual cost of funds should match the loading for cost of funds, so that $c_j - CoF_j = 0$. This leads to a more simplified formula:

$$r_j \approx \frac{\pi_j}{\mu_j} \times \frac{1}{G\left(\rho_j, p_j\right)}$$

$$\theta_j \times \frac{1}{G\left(\rho_j, p_j\right)}$$

The first factor of this formula represents the ratio of expected profits relative to the amount of credit risk taken on, while the second factor represents a penalty (in the form of increased capital) for the systemic risk inherent in the portfolio. The size of this penalty is mainly driven by the asset correlation parameter ρ_j. Assuming that the profit loading is commensurate with the level of credit risk taken on across different portfolios (so that all portfolios have the same value for θ_j), relative returns between portfolios will be a function of the asset correlation coefficient:

$$\frac{r_j}{r_k} \approx \frac{G\left(\rho_k, p_k\right)}{G\left(\rho_j, p_j\right)}$$

Consequently, faced with changes in the asset correlation coefficient across different asset classes (or the introduction of a model with such differences), a bank will likely see changes in the relative returns earned across the different asset classes, affecting the outcomes of the bank's optimisation problem.

In a similar way, liquidity requirements can impact relative returns between different asset classes. Consider the NSFR requirements introduced by Basel III. As discussed above, the requirements introduced a set of weights (RSF factors) to determine the amount of

available stable funding required. Generally, the liabilities that constitute available stable funding (those with the highest ASF factors) are a more expensive form of funding for banks. Consequently, the incremental cost of funding a new loan will be a function of the RSF factor on that loan:

$$CoF = c + RSF\delta,$$

where c is the base cost of funding (i.e., the funding cost at the short end of the funding yield curve) and δ is the liquidity premium associated with more stable forms of funding. This means that the lending margins earned on the assets are also a function of the RSF factor:

$$NIM = i - c - RSF\delta,$$

where i is the lending rate. Therefore, in order to preserve the margin, the bank would need to increase the lending rate by δx% for every x% increase in the RSF. However, decisions to increase the lending rate will be subject to market factors. For instance, increasing the lending rate can have negative consequences on affordability, which can in turn impact return on capital through credit losses. NSFR requirements can also impact relative returns between asset classes. To see this, let NIM_j be the lending margin on asset class j. If all asset classes had the same RSF factor, we would have:

$$NIM_j = i_j - c - RSF\delta,$$

where i_j is the lending rate for asset j. In this case, the difference in lending margins between two asset classes j and k would be equal to the difference in lending rates:

$$\Delta_{jk} = i_j - i_k.$$

However, if we introduce differences in RSF, we see how the NSFR requirements impact margins and returns:

$$\Delta_{jk} = i_j - i_k - \delta\left(RSF_j - RSF_k\right).$$

Therefore, faced with changes in the RSF (or the introduction of the RSF requirements), a bank will face relative changes in lending margins (and rates of returns) across products, unless it is able to pass through price increases. To see this in practice, consider the NSFR requirements for three classes of assets under Basel III:

— Unsecured retail loans with a (residual) maturity of less than one year would attract a RSF factor of 50%;
— Retail mortgage loans with a low risk weight (below 35%) and a maturity of more than one year would attract a RSF factor of 65%; and
— Retail mortgage loans without a low risk weight (above 35%) and a maturity of more than one year would attract a RSF factor of 85%.

This means that the funding cost on retail mortgages is between 0.15δ and 0.35δ more expensive than unsecured retail loans.

The cost of the introduction of the NSFR for each asset class can thus be quantified as $RSF\delta$. We would expect assets with the highest NSFR cost to have seen an increase in lending rates or a decline in share of bank assets. To assess this, we estimated NSFR cost on a new loan for each asset class and compared it to the changes in asset mix that occurred between 2008 and 2022. This analysis (summarised in Figure 7) showed that, in general, asset classes with relatively low NSFR cost tended to see gains in share of banking assets.

In the context of capital allocation, regulatory requirements might not only change relative and absolute returns, they also impose constraints on the capital allocation problem. For instance, the LCR component means that, depending on the mix of funding, a minimum amount of the asset allocation must be towards HQLA.

As mentioned above, literature tends to be divided regarding the exact impact of bank regulation on the real economy. Examples of studies that find evidence for an impact include Fraisse et al. (2020) who estimate that a 1% increase in capital roughly produces a 0.1% increase in the lending rate (this was specifically for one class of commercial real-estate loans). Similarly, De Jonghe et al. (2020) found that capital requirements may have consequences on credit extension, but with some limitations. Conversely, Bahaj and Malherbe (2020) found that, in the presence of bank guarantees, capital requirements may result in higher credit extension. The arguments presented above demonstrate why the link between regulation and the real economy remains an important question to answer.

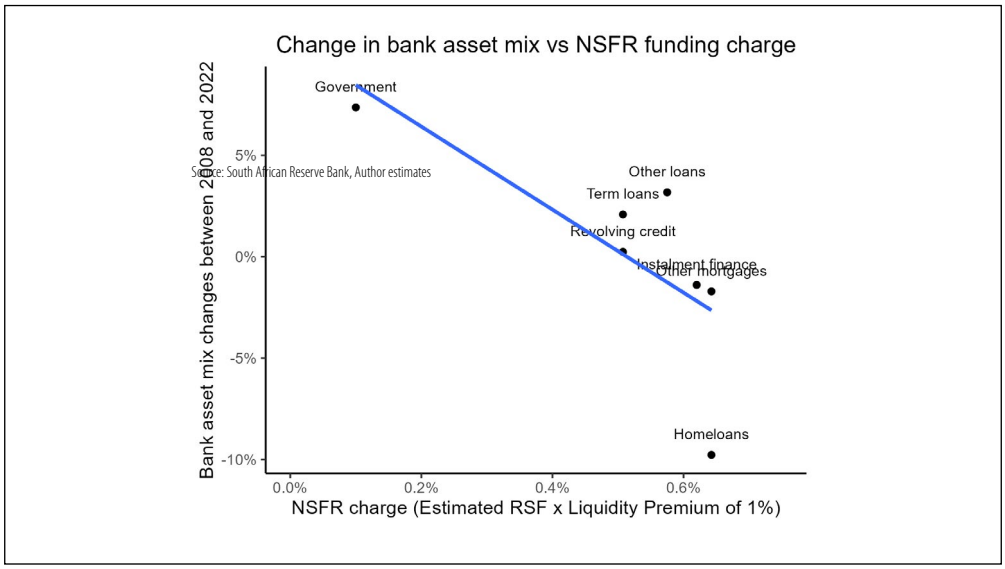

Figure 7 Change in bank asset mix vs NSFR funding charge

6. THE SOUTH AFRICAN CASE

We now consider how these observations about regulation and firm value may affect South African public interest.

6.1 Overview of savings and investments

One of the ways in which changes in bank lending behaviour can affect the real economy is influencing household consumption patterns and overall savings. South Africa currently has a gross savings rate of around 15%. The largest contribution to national savings comes from corporations, accounting for almost all national savings. Households generally contribute 0–5% to the national saving rate, while government is sometimes a dis-saver (Figure 8). The pattern of saving largely reflects the distribution of income between the three sectors, as well as the natural savings rate for each sector. For instance, corporations typically control 15–20% of national disposable income, while households control 60–70% (Figure 8). It is because corporations save virtually all of their disposable income that they end up contributing the most to national saving. Meanwhile government and households have the option to either consume or save their income, with households generally saving less than 5% of their disposable income.

The sectoral distribution of disposable income differs materially from the distribution of gross value added (GVA) between the three sectors (Figure 9). Corporations account for 60–70% of GVA, while households typically account for the smallest portion in the range 15–20%. Using this as a starting point, several factors determine the eventual distribution of income, including the labour share of output (wage levels), taxation rates, and corporate policies around dividend distribution. For instance, a higher corporate tax rate serves to shift more disposable income to government, while higher wages and dividend pay-out ratios shift more disposable income to households.

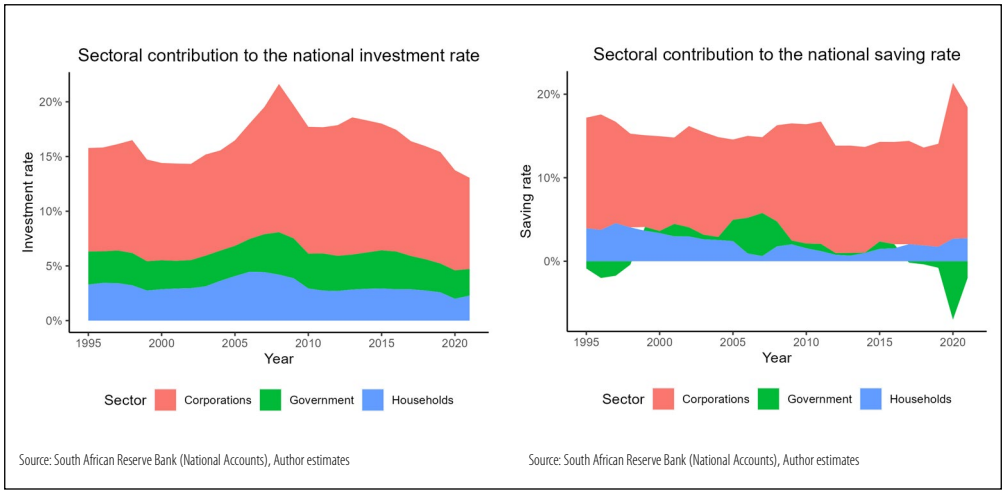

FIGURE 8 Sectoral contribution to investments and savings

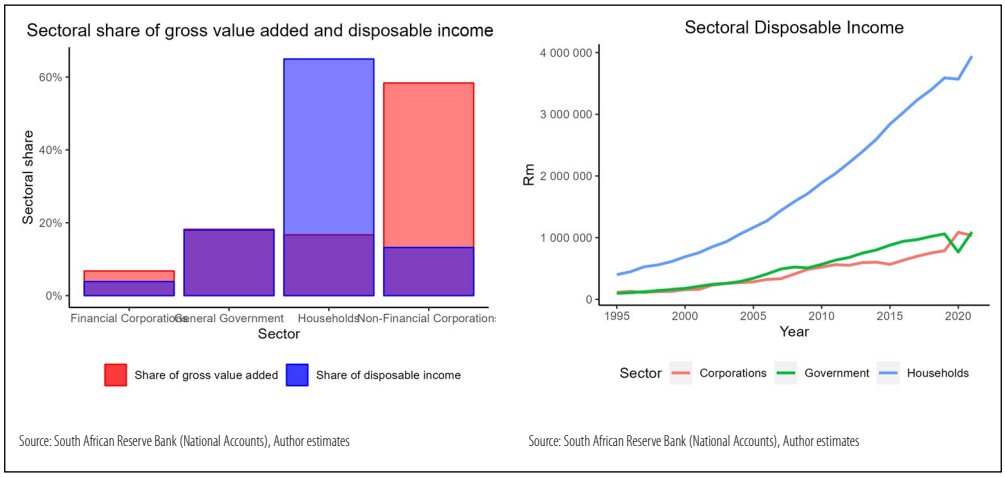

FIGURE 9 Sectoral share of gross value added and disposable income

Banks and the broader financial system have an important role to play in determining overall savings. For instance, the literature on financial repression has contended that the artificially low interest rates that result from certain types of financial regulation may discourage household saving. Banks also have an influence on the consumption patterns within the household sector. For instance, if banks were to cease all consumer lending, this would lead to a reduction in the overall level of consumption. These points are discussed in more detail below.

South Africa's investment rate has historically hovered around the 15% level but has been showing a decline over the past decade, after peaking around 2008/9. That the saving rate and investment rate are generally around the same level is not a surprise, being a function of the much-debated saving-investment nexus (Feldstein & Horioka, 1980). One implication of this nexus is that fostering higher levels of savings may be a way of achieving a higher level of investment. This is an important observation in South Africa's case, since the National Development Plan aims to achieve a 30% national investment rate by 2030 (SA Government, 2012).

Government generally accounts for around 2–4% of the national investment rate, while corporations account for the largest share (Figure 8). The swings in corporate investment are the widest of the three sectors. Corporate contribution to investment peaked at almost 14% in 2008 and has since declined to below 10% in 2021. The corporate contribution appears to be partly driven by sentiment, as shown in Figure 10, a notion that dates back to Keynes (1937). However, we also note that corporate share of disposable income has been in decline over the period when corporate contribution to investment was falling.

Household contribution to the investment rate peaked at 4.5% in 2006 and has since been in steady decline, levelling off close to 2% in 2020/1. It is possible that the household contribution to investment is influenced by the accessibility to housing finance. The typical

South African household, with a mean household income of around R200k per annum and a saving rate of 1–3%, may find it difficult to invest in housing without the aid of mortgage financing. This may explain why the peak in household investment, between 2005 and 2009, was associated with a peak in net borrowing by households (Figure 10), measured as excess investment over saving within the household sector, the majority of which was in the form of mortgages.

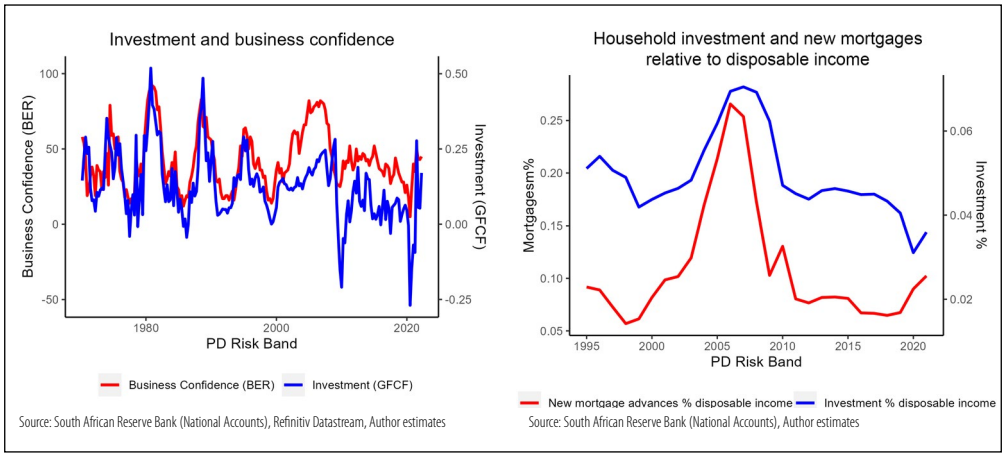

FIGURE 10 Investments, business confidence and mortgage advances compared to disposable income

To the extent that households rely on mortgages to facilitate investment (offered primarily through banks, in South Africa), any changes in the nature of bank lending may result in changes in household investment. This would be concerning if these changes were in response to regulation, rather than market forces. It is possible that banks' decision to shift their asset mix away from mortgages was in response to changes in the nature of demand for credit. However, we observe that bank mortgage lending margin increased (both in absolute and relative to other asset classes) in the period after 2008 (see Figure 11), which is more consistent with a supply shortfall than demand deficit in the mortgage lending market.

Moreover, a report published by the National Credit Regulator found that 23% of unsecured consumer loans are being used for building and renovations, which adds to the view that the reduction in mortgage lending has not been due to a lower demand for housing investment (NCR, 2012). The report noted that "credit providers are not, in the current industry conditions and regulatory framework, incentivised to offer mortgages to clients to the extent that they were in the past."

6.2 Household shortfall

In a system where banks are seeking to optimise risk-adjusted returns, we would expect the size of the various channels for bank funding to be affected by the capital requirements

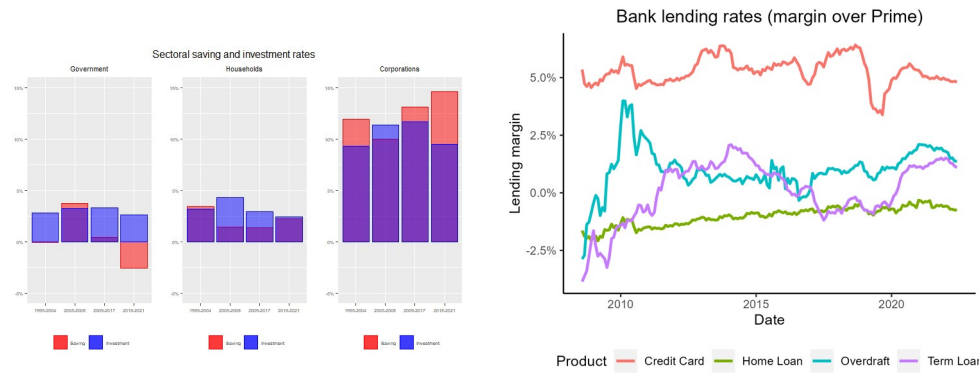

FIGURE 11 Sectoral savings and bank lending margins

associated with each type of channel. For instance, if the capital requirements for lending to SMEs increase relative to the requirements for lending to corporates, we would expect upward pressure on relative lending margins for SMEs with a potential decline in overall lending volumes. This expectation is consistent with Modigliani and Miller (1958, 1963), as discussed above.

6.2.1 APPLICATION OF BLACK-LITTERMAN TO DETERMINE EXPECTED RETURNS OF VARIOUS BANKING ASSETS

In order to gain a sense of how lending patterns may have changed in response to bank perceptions of risk-reward patterns, we employ the reverse portfolio optimisation approach proposed by Black and Litterman (1992). This allows us to estimate investor expected returns for different asset classes based on their relative market capitalisations. In Figure 12 we show how the gross retail debtors' book has evolved for the different retail asset classes. This is analogous to the market capitalisation of each retail credit asset class. Notice that since 2008 there has been a gradual shift away from mortgage lending towards unsecured lending.

In order to estimate expected return, we use the reverse optimisation formula (Black & Litterman, 1992):

$$R = \lambda \Sigma w,$$

where R is a vector of expected returns, w is the vector of market capitalisation weights, and Σ is the covariance matrix for asset returns. In the absence of a detailed returns history for each asset class, we estimate the covariance matrix using the quarterly change in NPL ratios for each asset class, on the basis that credit loss rates are a key driver of changes in credit portfolio returns (see Table 2).

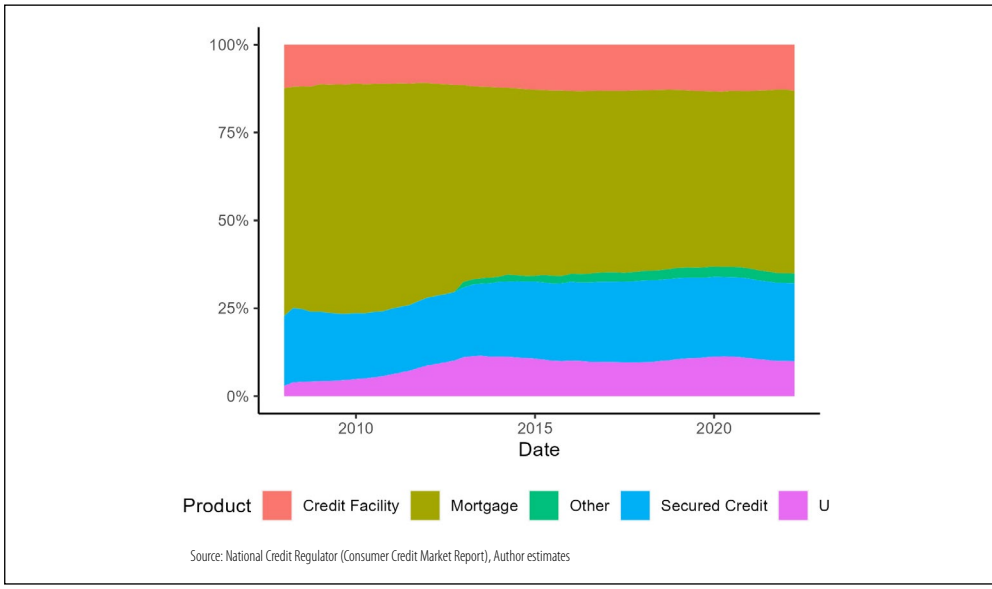

FIGURE 12 Composition of household debt

The results of the reverse optimisation are given in Figure 13. The results suggest some significant changes in returns expectations among lenders. The largest change is seen in unsecured lending, where expectations increased steadily from 2008, reaching a peak in 2013. Over this period, returns expectations on mortgage products were in decline. Credit facilities also show an increase in expectations over this period, while secured credit remained stable.

TABLE 2 Covariance of NPL ratios

Product	Mortgages	Secured credit	Credit facilities	Unsecured credit	Short-term credit
Mortgages	0.00005	0.00002	0.00002	0.00001	0.00002
Secured credit	0.00002	0.00003	0.00001	0.00001	0.00004
Credit facilities	0.00002	0.00001	0.00015	0.00002	0.00025
Unsecured credit	0.00001	0.00001	0.00002	0.00017	–0.00011
Short-term credit	0.00002	0.00004	0.00025	–0.00011	0.00353

The BCBS published a survey in 2010, which was a comprehensive analysis of the impact of Basel III on capital ratios (BCBS, 2010). There were substantial declines in core equity tier 1 (CET1) capital ratios – for example, larger banks saw the average CET1 ratio drop from 10.5% to 6.3% under Basel III. One of the main drivers cited was the increased risk-weighted assets due to stricter treatment of securitisation. Therefore it is possible that Basel III materially impacted securitisation in South Africa and perhaps also contributed

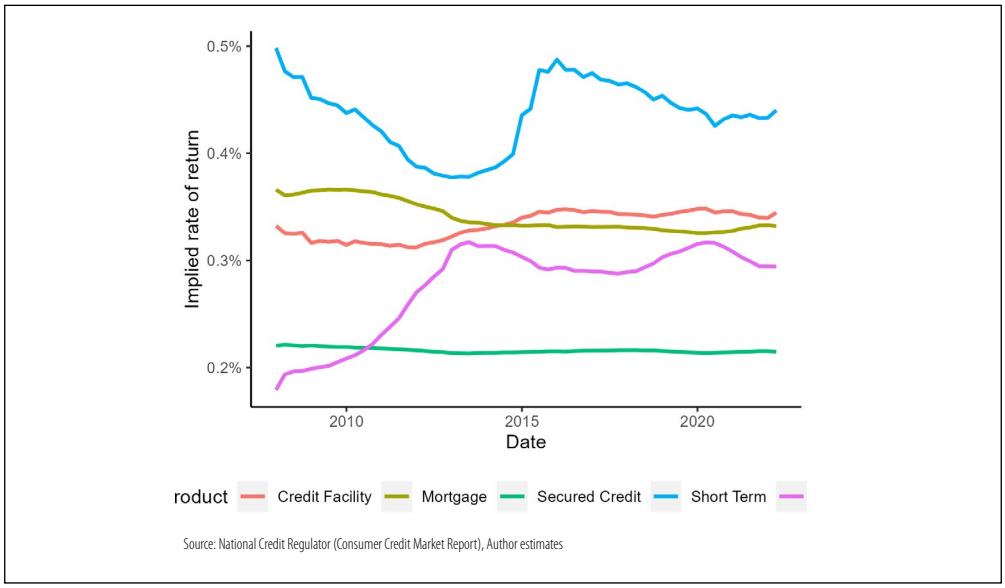

FIGURE 13 Implied rate of return per asset class

to the reduction in bank appetite to lend mortgages. This is because securitisation was an important means to raise funding for longer term assets such as mortgages. According to the Banking Association of South Africa, securitisation balances on mortgages have dropped from around R30 billion in 2008 to around R4 billion in June 2022 (Banking Association of South Africa, n.d.).

6.2.2 UNDERSTANDING THE RETURNS EXPECTATIONS

The capital that banks are required to hold is a function of their risk-weighted assets. As discussed above, these risk weights for credit risk are a function of the fundamental risk characteristics of the assets (as measured by PD, EAD and LGD) and the systemic risk of the asset class. Figure 14 depicts the risk-weighted assets (RWA) density (RWA divided by exposure) for two different retail asset classes – mortgages and other retail (which includes secured and unsecured term loans). This assessment is given for different default risk groups. Generally, we see that the other retail asset class has a higher density than mortgages. This is primarily because other retail loans tend to have a much higher loss rate in the event of default (LGD), warranting a higher capital requirement. To control for differences in loss rates, we divide the RWA density in each risk group by the expected credit loss in each risk group, in Figure 14. This shows that after controlling for loss rate, mortgages generally have a higher capital cost than other retail. In other words, given a home loan and an unsecured loan with the same expected credit loss, a bank would end up holding less capital on the unsecured loan.

In the RWA formula, the parameter that is responsible for this higher capital cost is

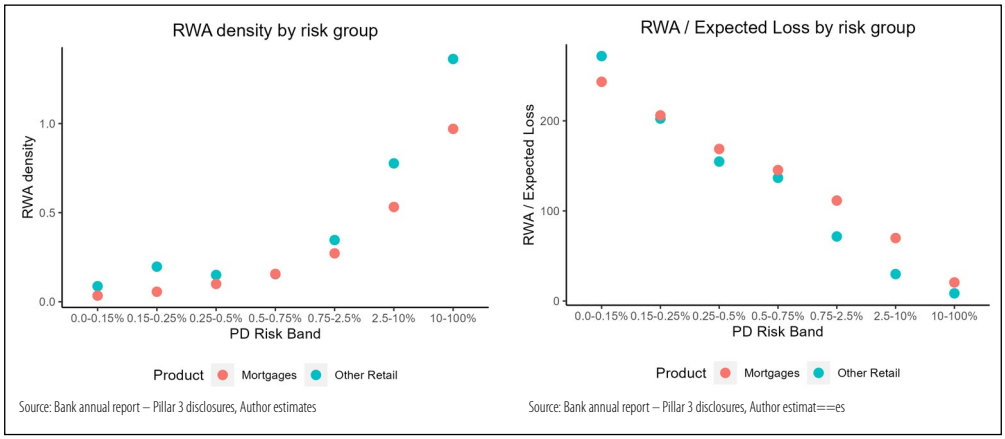

FIGURE 14 Risk weights and expected credit loss

the asset correlation coefficient. To illustrate this, we show the difference between the prescribed correlation coefficient for mortgages and other retail, for each risk group. This is given in Figure 15, where we see that in risk groups where this difference is highest, we also see the largest disparity in per unit RWA density between mortgages and other retail.

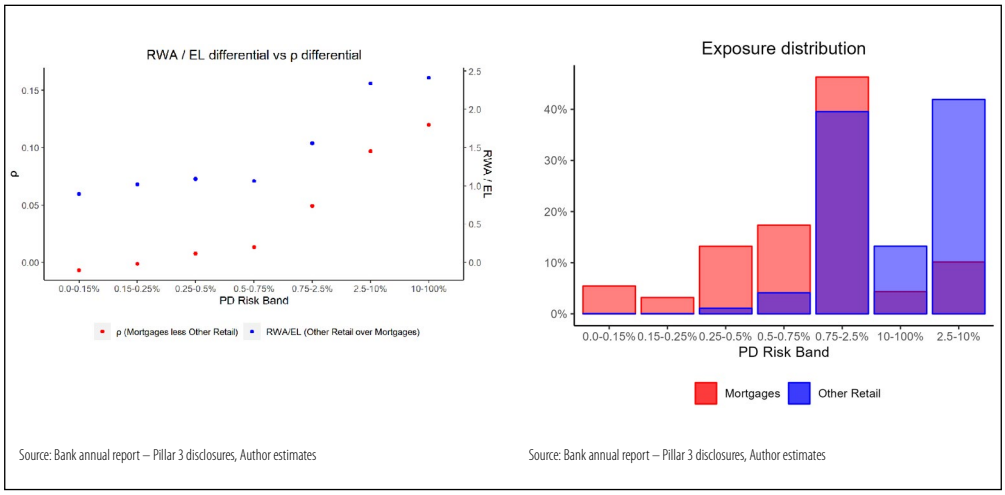

FIGURE 15 Risk weighted assets and the asset correlation coefficient (ρ)

6.2.3 ESTIMATING THE ASSET CORRELATION COEFFICIENTS

The asset correlation coefficient is a function of several factors, but ultimately measures the cyclicality in the loss experience for a particular portfolio of loans. Therefore, assets that have a more cyclical loss experience are expected to have a higher asset correlation coefficient, all else being equal. In Figure 16, we show the cyclicality in NPL between different retail loans. At first glance we observe that secured loans tend to have the lowest

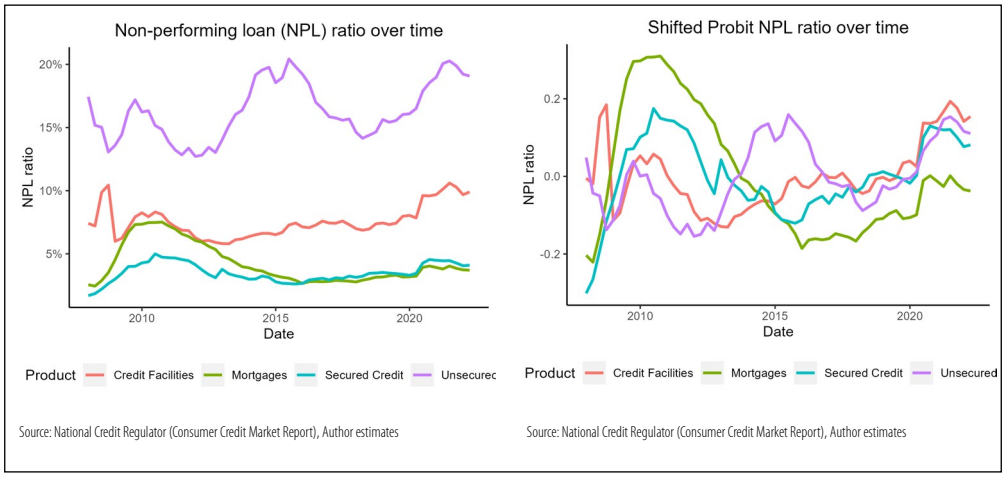

FIGURE 16 Cyclicality of loss rates over time

volatility, while unsecured loans have the highest. However, this does not mean that mortgages ought to have a lower asset correlation coefficient than unsecured loans.

The asset correlation coefficient measures volatility in the distance-to-default, (which is a probit transform of the probability of default, as discussed above) rather than the probability of default. Therefore, rather than measuring the volatility in NPL ratios we ought to measure the volatility in the probit-transform of the NPL ratios (to the extent that we may treat NPL ratios as proxies for the probability of default). On this basis, we see that mortgages have the highest level of volatility through the cycle.

This exercise highlights an important fact about the model being used to assess credit risk under Basel II+. Holding the variance in the probability of default constant, the asset correlation coefficient will tend to decrease as the probability of default increases. This fact is, to an extent, captured in the Basel II+ model. For instance, the asset correlation coefficient for other retail exposures is designed to decrease with the level of default risk. However, for mortgages (as well as revolving retail exposures) the prescribed asset correlation coefficient is constant, independent of the level of default risk. This explains why the RWA density per unit loss becomes relatively punitive for mortgages as the risk scale increases, as shown in Figure 15.

There is only a limited amount of literature dedicated to the estimation of the asset correlation coefficient in retail portfolios. Within this literature, the conclusions regarding the appropriateness of the asset correlation coefficient differ considerably – with some finding that the prescribed asset correlation coefficients are too punitive and others finding agreement with the prescribed coefficients. A potential source of the disagreement in findings might be due to differences in methodology. For instance, Stoffberg and Van Vuuren (2016) and Mwamba et al. (2019) employ distribution-based estimates and find agreement with the prescribed coefficients. Meanwhile, Rösch and Scheule (2004) and

Crook and Bellotti (2012) use regression-based techniques and find asset correlation coefficients significantly lower than the prescribed coefficients.

As discussed above, Modigliani and Miller (1958, 1963) imply that these differences in asset correlation coefficients may be what drives the returns expectations seen in Figure 13. This prediction is irrespective of whether the prescribed asset correlation coefficients are appropriate. Given the potential importance of the asset correlation coefficient (and the inconclusive state of literature), more work to understand its applicability, specifically in the South African context, should be encouraged.

6.3 Impact of market forces relative to regulatory forces

Regulation is not the only factor influencing banks' lending practices. It is intuitive that market forces play an important role in strategic asset allocation by banking executives. For example, in the South African case the shift towards unsecured personal loans could be seen as a bank's drive to increase financial inclusion.

The growth in public sector employment and increased financial inclusion by lower income households would have meant a higher demand for credit. As recently as 2020, the Centre for Affordable Housing in Africa published a study (Nkhonjera, 2020), which showed that there are only 6.6 million formally registered properties, despite estimates that South Africa has over 18 million households (Statistics South Africa, n.d.). It is not possible to obtain a mortgage without a formal title deed and therefore as financial inclusion has grown in South Africa, it is understandable that the relative demand would have shifted towards unsecured lending.

The reason that regulation affects executive management's decision can be explained by understanding the market valuation of banking stocks. Listed banks with higher returns on equity generally trade at higher price-to-book ratios than banks with low returns on equity.

For stable, mature banks, the dividend discount model can be used to value the equity:

$$P_0 = \frac{D_1}{COE - g}, \tag{A}$$

where:

— P_0 is the value of the equity per share at time = 0
— D_1 is the expected dividend per share at the end of the first year (time = 1)
— COE is the cost of equity, and
— g is the dividend growth assumption in perpetuity

Return on equity, *ROE*, can be written as:

$$ROE = EPS_1 / BV_0 \tag{B}$$

EPS_1 is the earnings per share in the first year, BV_0 is the tangible book value per share at time = 0. We can assume that BV_0 is equivalent to the CET1 capital of the bank. Assuming that in a mature bank the dividend payout ratio, *PR* can be assumed constant and that EPS_1 can be related to D_1 as:

$$D_1 = EPS_1 \times PR \tag{C}$$

Assuming that the growth rate *g* applies to dividend and earnings per share alike, it can be shown that $g = (1 - PR) \times ROE$, thus we can substitute (C) and (B) into (A) and yield the relationship:

$$\frac{P_0}{BV_0} = \frac{ROE - g}{COE - g}.$$

This is an important result because the tangible net asset value is effectively the CET1 capital under the Basel capital regulations. Further, recall that equity is also part of the NSFR calculation. This means there is a direct relationship between a bank's growth, asset mix, funding mix and the capital required. Finally, from the result above there is a link to the market valuation of the equity. It should be clear that while market forces of demand may determine how banking executives shape the balance sheet, there is a direct influence of regulation on the share price. Many of the South African banking executives' remuneration is also based on ROE targets, and therefore their remuneration is directly a function of regulatory influence on capital and liquidity.

The relationship between return on equity and the market valuation is shown in Figure 17. This shows that higher ROE commands a higher market valuation (price-to-book ratio). One of the most important drivers would be the required capital which is driven by regulation. Therefore it should be clear that management teams will try to derive

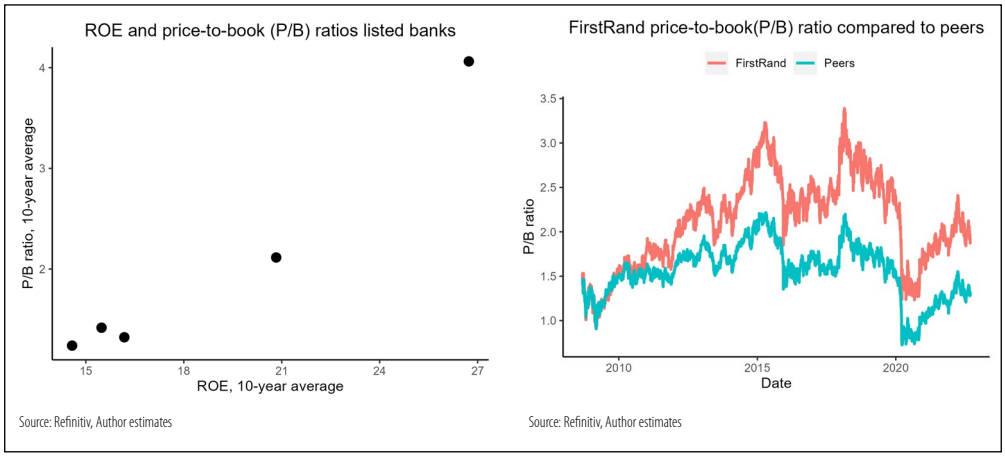

FIGURE 17 Price-to-book ratio of FirstRand compared to peer average over time

the maximum returns within the confines of the regulation. Arguably, in the South African case, where a few banks dominate the market, regulation and the consequent management response may be a more important factor than market demand.

A clear example of the direct impact can be seen in the FirstRand Group's annual results presentation (FirstRand Group, 2011). The executives highlighted the need to lengthen the funding profile, increase the deposit franchise and change the origination strategy. These are a direct impact of the Basel III changes. FirstRand followed through on the executive strategy communicated in 2011 and the exposure to mortgages was reduced from roughly a third of the book down to around 22%. The exposure to unsecured loans was increased to around 11% of the book (see Figure 18). The subsequent improvement in ROE compared to peers resulted in substantial share price outperformance and a high market valuation compared to peers (see Figure 17).

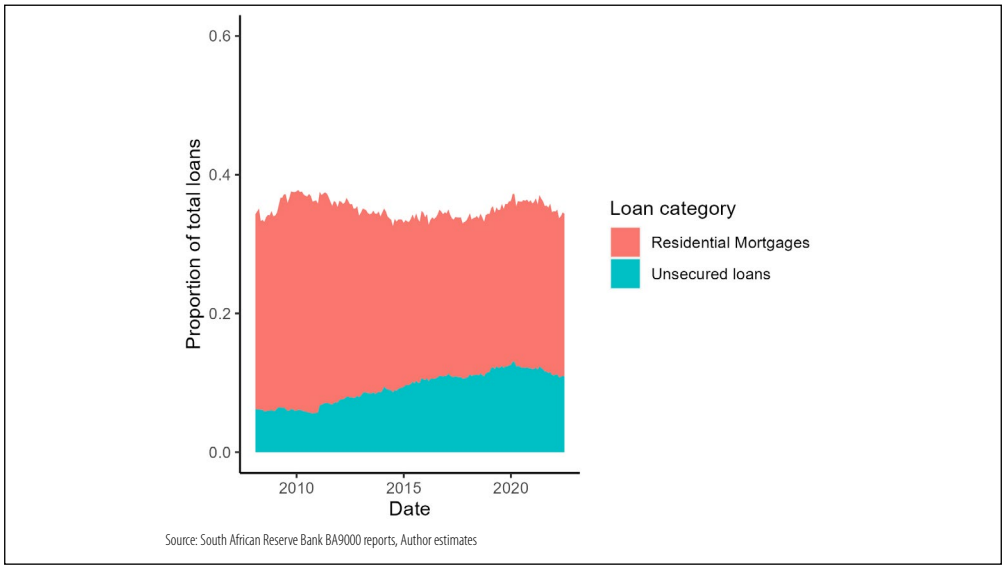

FIGURE 18 FirstRand exposure to mortgages and personal loans (proportion of total loans)

Managing our business for the 'new normal'

- Maintain conservative capital ratios
- Keep appropriate liquidity buffers
- Lengthen funding profile
- Increase deposit franchise
- Ensure appropriate risk/reward pricing and origination strategies

Source: FirstRand annual results presentation, 2011

FIGURE 19 FirstRand Group strategy presentation in 2011 regarding regulatory changes

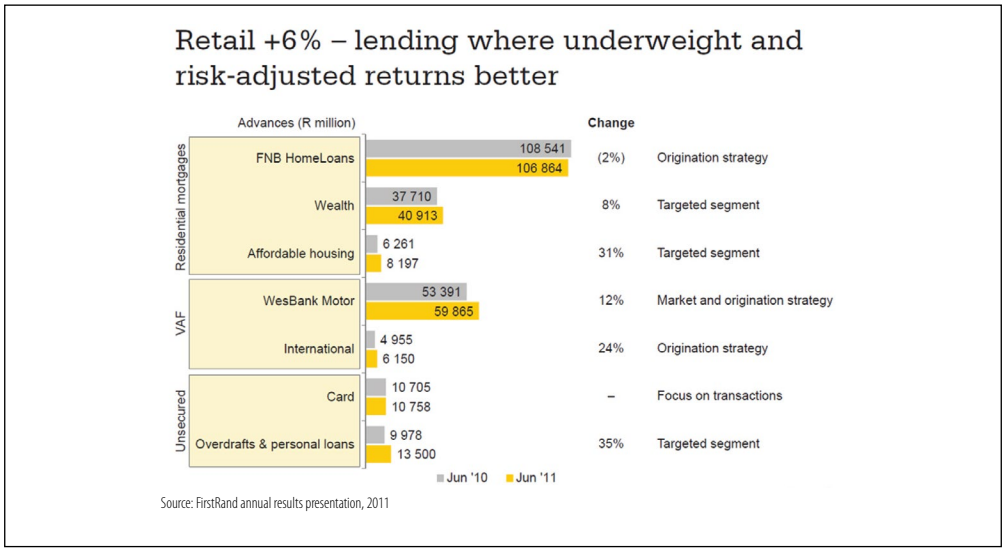

FIGURE 20 FirstRand strategic asset mix change during 2011

It is important to note that the Basel III regulations adopted by the South African Reserve Bank meant that banks knew fairly early that the funding profiles would need to be lengthened. This was negative for longer term loans which needed to be funded by longer term, more expensive funding. The higher cost is due to the fact that bank yield curves are generally upward sloping and hence the higher costs are incurred for longer term funding.

The evidence seems to strongly support the hypothesis that South African banks have reduced appetites for mortgages *mainly due to regulatory changes as opposed to consumer behaviour*. These can be summarised as follows:

— Evidence from bank executive strategy describing mortgages as low return and low capital efficiency compared to short-term unsecured loans.
— Banking executives highlighting that the funding terms had to be lengthened. Due to liquidity regulations the long terms of mortgages would require longer, more expensive funding compared to unsecured loans which have short terms.
— The strong link between the market valuation and the ROE provides incentive for banking executives to create shareholder value by achieving the highest ROE possible.
— The most important driver of the required amount of capital is the regulatory regime.
— The length of the funding profile (liability profile) which directly impacts the margins of the bank is a function of the liquidity regulations.
— The fact that mortgage rates to consumers have risen relative to prime rates (Figure 11 suggests that this was not driven by lack of consumer demand.)

6.4 Liquidity regulations and impacts on the balance sheet structure

The Basel Committee on Banking Supervision, using data provided by the South African Reserve Bank published an assessment of the South African banking system's compliance with the LCR in 2015 (BCBS, 2015). The assessment found that a sample of nine banks achieved an LCR of 76% as at December 2014. The sample of nine most likely constituted the largest banks because the Level 1 HQLA in the sample exceeded R430 billion, which was around 10% of total assets in the banking system. The LCR for individual banks ranged from 62% to 1300%. Therefore, it is reasonable to assume that from as early as 2014 the South African banking sector would have had a clear indication that the balance sheets would have to be meaningfully reshaped in order to comply with the LCR requirement. Thus, it should also be fairly obvious that the banks had two critical levers under their control to achieve the LCR:

— Increasing the amount of HQLA on the balance sheet. This would involve a higher amount of SA government bonds on the balance sheet as an example.
— Reducing exposure to asset classes where the net inflows on a contractual basis would be minimal. Mortgages would therefore be an example of an asset class that is not favourable. Short-term, unsecured loans would be helpful in achieving a higher level of inflows.

It is shown in Figure 21 that mortgage exposure reduced from a peak at 25% to around 16% of total advances. Government bonds have increased from around 3% to almost 15% of advances. Unsecured retail loans also increased from 6% to 10% of advances. This is in line with our assertions that banks would increase exposure to government bonds and reduce mortgage exposure in favour of short-term loans.

Another lever that would have assisted banks in achieving LCR compliance would be to reduce reliance on wholesale funding. This is considered the least sticky form of deposit and the deposit class that is most likely to "run on the bank" during a stress scenario. However, this feat is possibly the most difficult to achieve because this would require winning more primary banking clients. These are retail depositors who deposit their salaries and other income with the bank. This is difficult to achieve because this requires superior service, competitive pricing and ultimately brand power. This is informally also difficult to achieve when a bank is trying to reduce exposure to mortgages, because consumers tend to bank primarily with the bank that provides their mortgage.

Therefore, we are comfortable with the conclusion that the introduction of the LCR was an important factor in reducing the banks' willingness and capacity to engage in mortgage lending. Recall from Figure 11 that mortgage rates increased by about 1% (relative to prime lending rates) from 2010 to 2020. Therefore it is likely that improved pricing and margins mean that there was still good demand from consumers and that it was actually reduced supply that allowed banks to improve margins.

In the case of the NSFR, the RSF factor for loans maturing in less than one year is 50%.

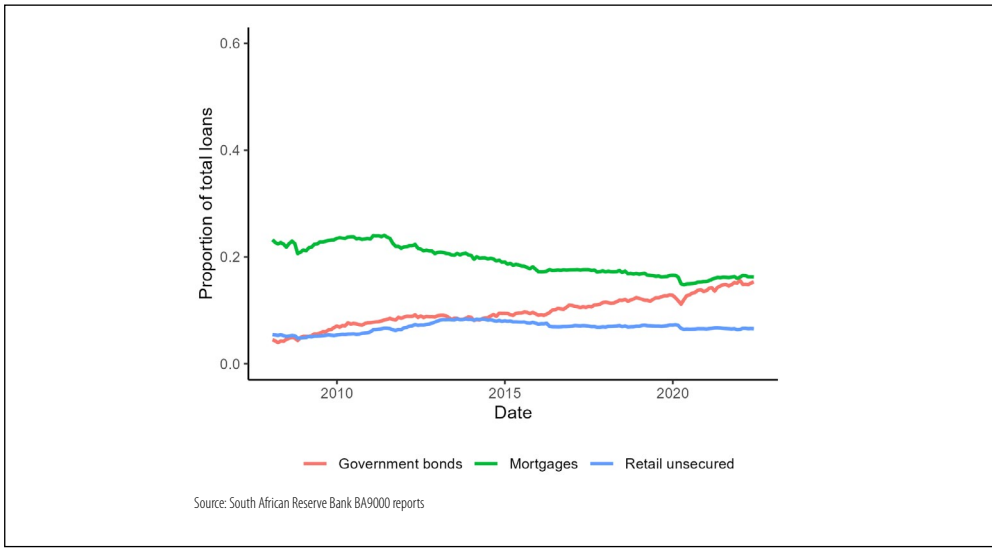

FIGURE 21 Total banking system exposure to various asset classes[4]

Residential mortgages which have a risk weight of 35% or less under the Standardised Approach receive a RSF factor of 65%. Performing loans with risk weights greater than 35% maturing after one year receive an 85% RSF factor. Therefore, it is reasonable to conclude that banks would generally steer clear of residential mortgages that are fairly risky. This is largely also a function of the loan-to-value of the mortgage. Thus, we are not surprised that 100% loan-to-value loans to first-time buyers has likely reduced. This is possibly also another reason that has driven consumers away from mortgages towards consumption-focused lending. The three largest South African banks have exposure to this category of mortgages ranging from 0% to 7% of the book. Perhaps it is also unsurprising that two of the banks have no exposure to the higher risk mortgage books. Perversely it makes more sense to lend to risky borrowers using unsecured personal loans. For example, it is possible that instead of approving 100% loan-to-value mortgages, banks are approving 80% loan-to-value, together with a personal loan for the balance. This view is corroborated by the National Credit Regulators report which showed that a significant portion of unsecured lending is being channelled towards building and renovations, as mentioned above.

In summary the liquidity regulations have clearly favoured an increased exposure to government bonds and short-term, unsecured loans. Furthermore the NSFR is quite punitive where mortgages have a risk-weight greater than 35% on the standardised approach.

4 Government bonds including treasury bills

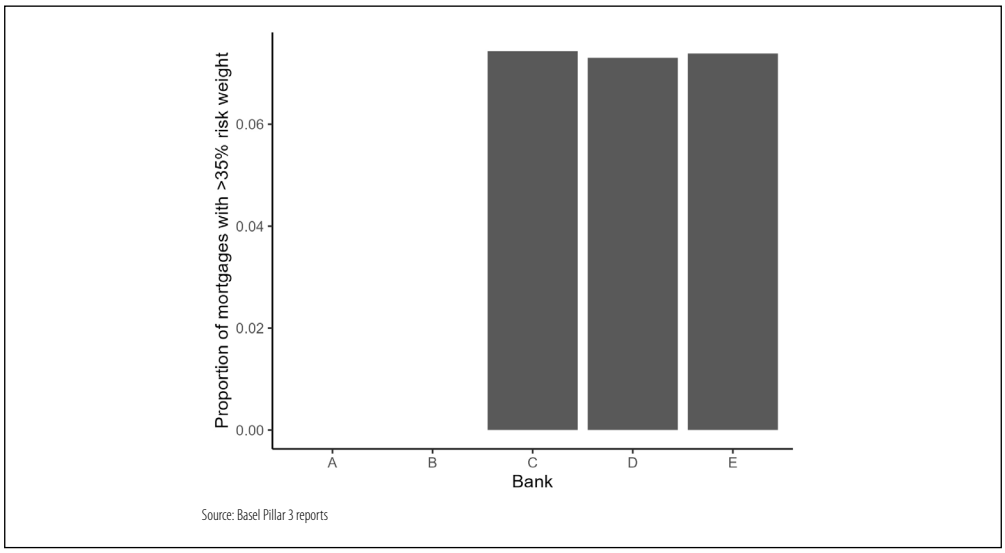

FIGURE 22 Exposure to 35% risk-weighted mortgages

6.5 Impact of lending on gross and net savings rates

The nature of lending to households also has an impact on household spending patterns, and ultimately on the saving rate. Between 2008 and 2019, households accumulated R1.9 tn in financial assets, which included R1.0 tn pension fund assets and R0.9 tn in deposits of various forms. Over the same period, households borrowed R0.6 tn in various forms of consumer loans and trade credit, and another R0.4 tn in mortgages. The difference between the two forms of borrowing is that the former is generally channelled toward consumption, thereby depressing the savings rate, while the latter is generally channelled towards investment, leaving the saving rate unaffected. In other words, over the period 2008 to 2019, households had the ability to self-fund almost all their borrowing, but this borrowing was channelled towards consumption within the household sector, leading to a depressed saving rate.

This illustrates an important point in how the national accounts display the savings rate. Indeed, South African households have a low saving rate, generally in the range 1–3%. However, this is a net number: it represents the total savings made by households that are net savers, less the borrowings or households that are net borrowers (particularly those borrowing for consumption rather than investing). Therefore, the willingness of banks to lend to households, especially for consumption purposes, has a material impact on savings.

6.6 A broader look at the impact of household debt

The idea that a well-developed financial system has a positive effect on economic development is well-subscribed. However, not all of the services offered by the financial system are equally conducive to long-term growth. For instance, Černohorský (2017) set out to understand which of the loans offered by banks in the Czech Republic have

a positive impact on development. Of the categories of lending considered (including mortgages and loans to businesses), only consumer loans were found to have no positive influence on development. Mian et al. (2017) studied data from 30 countries and found that an increase in household debt is associated with a short-term consumption boom, but a severe reversal in subsequent years. Mian et al. (2021) propose that high levels of household debt may place the economy in a debt trap, where the common debt-inducing fiscal policies no longer work. More generally, Studwell (2013) studies the developmental history of several Asian economies, contrasting the north-east Asian miracle economies to the less successful south-east Asian economies:

> … financial policy [in north-east Asia] frequently accepted low near-term returns on industrial investments in order to build industries capable of producing higher returns in the future. The alternative would have been for financial institutions to encourage more consumer lending, which tends to produce higher profits and is the focus of financial systems in rich countries. However, herein lies a far from attractive equilibrium for an emerging economy in which banks become very profitable and industry remains technologically backward. This is the situation in most of south-east Asia and Latin America today. The best banking returns in the east Asian region are produced in the region's most backward countries – the Philippines, Indonesia and Thailand.

The observations we draw from these are as follows. Firstly, within the many loans offered by banks, consumer loans might be the least useful in supporting economic development (Černohorský, 2017). Secondly, loans to households in general might lead to short-term economic acceleration followed later by a severe slump (Mian et al., 2017)). In extremes, loans to households may even place the economy in a debt trap, rendering traditional monetary policy ineffective (Mian et al., 2021). Lastly, consumer lending may generate high banking profits in the near-term but retard the developmental prospects of a country in the longer-term (Studwell, 2013).

Returning to the South African case, in the period prior to 2008, not only was household investment higher, but there was also a tighter correlation between household borrowing and household investment (see Figure 23). This suggests that the primary reason for debt was to facilitate investment, a notion that is confirmed by the nature of household lending during this period. The correlation between household borrowing and investment deteriorated post 2008, suggesting a shift towards borrowing for consumption purposes (see Figure 23).

6.7 Increased lending to government

One of the asset classes that have benefited the most from bank lending decisions since 2008 has been government. During this period, South African government debt has risen

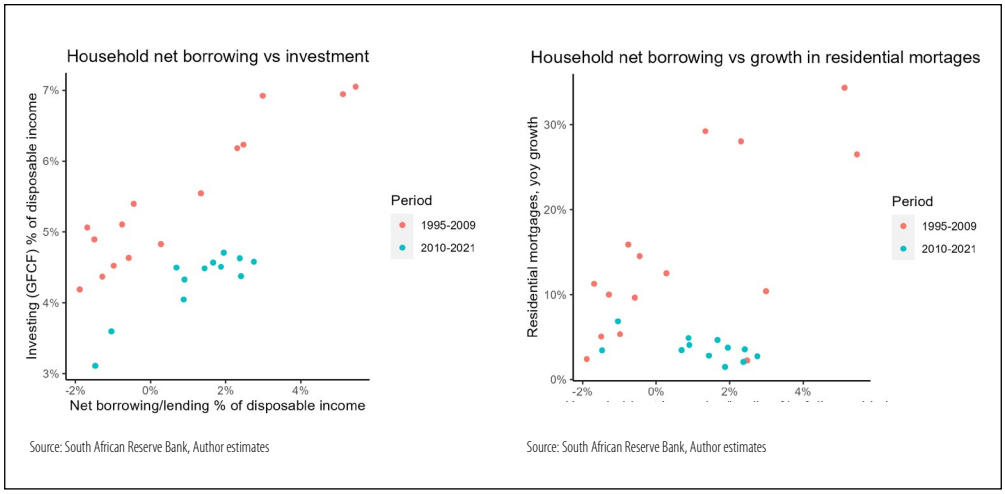

FIGURE 23 (*Left*) Household borrowing and mortgage growth, and (*right*) household borrowing and investing before and after the GFC

from around 5% of bank assets to close to 10% in 2021 (see Figure 24). It is possible that this asset class has benefited the most from the Basel II+ capital regulations. On the credit risk side, domestic sovereign debt receives a nil risk weight, making it the cheapest form of credit from a regulatory capital perspective. In terms of liquidity risk, domestic sovereign debt is included without limit in the calculation of HQLA, which is used in both the LCR and NSFR calculations.

These requirements make sovereign debt especially attractive for banks, resulting in the sovereign-bank nexus – a phenomenon that has received considerable attention in recent years (Feyen & Huertas, 2019). The nexus is most important for Eurozone banks, where sovereign debt cannot be regarded risk-free (since there is no currency sovereignty). In the South African case, where the government has more flexibility when it comes to servicing Rand-denominated debt, the concern is lessened. However, the rising concentration of government debt on bank balance sheets may still be a cause for concern. To the extent that the increased lending to government by banks is due to regulation rather than market forces, there is a question as to whether this constitutes a form of financial repression (Reinhart et al., n.d.).

The way in which financial repression may be in action is that the increased willingness for banks to fund government borrowing may serve to artificially depress yields on government debt. Since government bond yields often serve as a benchmark rate, depressed yields may result in lower rates across the entire domestic credit market. This has its benefit, since it might result in higher levels of investment, due to the cheaper funding rates. We have not seen evidence of this in South Africa. Instead, the rise in government debt occurred alongside a decline in corporate investment, as discussed above. On the other hand, the lower rates may disincentivise saving in favour of consumption. Moreover,

they may have a negative impact on savers, since rates of returns on saving (providing funding) would also be depressed (Allianz Global Investors, 2014).

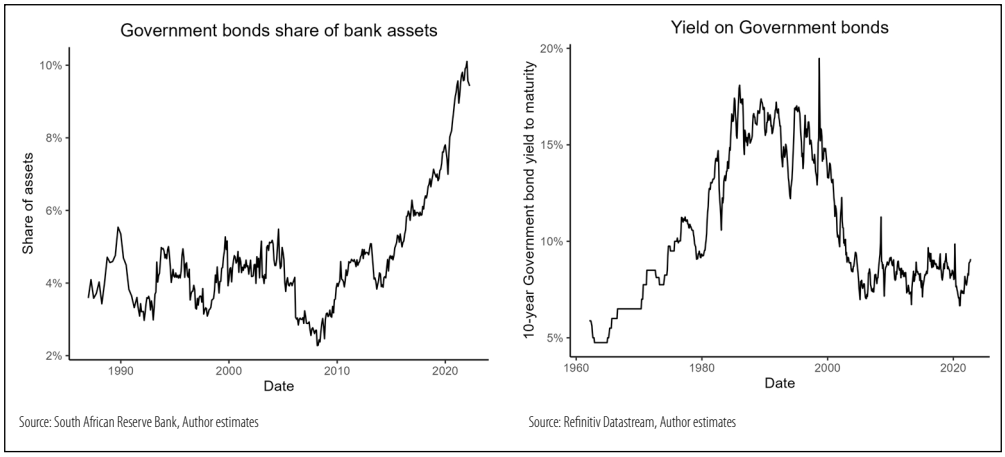

FIGURE 24 Government bonds[5] as proportion of total banking sector assets and yields

7 CONCLUSION

The role of prudential regulation in the financial sector is to manage the various forms of risk that pervade the space. For the banks, this includes the credit risk, operational risk, market risk and liquidity risk that are being addressed by Basel II +. Similarly, the Solvency Assessment and Management regulations are designed to manage the risk of insolvency for insurers.

It is often the case that regulation tends to come with side effects and loopholes. For instance, it is often argued that too much regulation in the commercial space can stifle innovation and competition amongst firms. Similarly, some have argued that bank regulation may impact overall lending by banks, as discussed above. In cases where there is a risk that regulation may bring about unintended consequences, it is important that these consequences are understood, even if not directly addressed or remedied.

The main purpose of this paper was to highlight some of the side effects that capital regulation may have on bank lending, which may ultimately influence wealth creation and the financial health of consumers. These can be summarised as follows:

— A shift in lending away from mortgages towards higher cost loans. The regulations make it very difficult to lend mortgages to poorer individuals who may have higher credit risk.
— The reduction in mortgage penetration has potentially had negative impacts on household wealth and savings and this has likely resulted in lower GDP growth for South Africa.

5 Note this excludes treasury bills

— A substantial increase in bank lending to government. This is perhaps inefficient because consumer deposits are simply being channelled to a component of the economy that has the lowest ability to invest or save (see Figure 8). There are cheaper ways for the consumer to lend to government, such as through passive bond funds.

We leave the reader with an open question: to what extent should regulation (including prudential regulation) pay attention to issues of public interest?

The way in which this question is answered has implications for how prudential policy is designed. For instance, the paper discussed the need to ensure that the parameters being used are appropriate for the South African context. However, what this question asks is for us to look beyond: even if the parameters were appropriate, is there still scope to change the regulatory requirements in the public interest (e.g., to encourage better lending behaviour)?

7.1 Possible considerations for policymakers and regulators

It can be seen that the shift towards shorter term, higher interest products has simply meant that consumers are paying higher interest rates and using loans that are not productive (consumption loans). The evidence seems to suggest that the changes in lending patters are more a function of the regulatory changes which have a direct impact on capital requirements and banking sector profitability. In the South African context, with substantial income inequality this was perhaps not the intended outcome of the regulation

Furthermore the NSFR and LCR have an impact requiring either higher amounts of capital (the longest term funding) or higher reserves held in government bonds. Further we have demonstrated that in the case of mortgages, a lower mortgage penetration can result in lower household wealth creation and thus lower household investment. Ultimately this is negative for economic development. The lower structural growth in South Africa arguably results in a higher reliance on imports and an economy that is less competitive over time. This is likely to exacerbate inflation risks which would be against the Reserve Bank's mandate of inflation control and currency stability.

In the case of the LCR we believe that regulators should investigate whether the credit risk of the assets should be incorporated in how the inflow calculations are computed. It seems perverse that high risk, short-term loans are quite favourable compared to longer term loans purely on the basis of the contractual terms of the loans. However, we note that most liquidity crises have actually coincided with credit risk events. In simple terms, the very assets that have had the most influence on liquidity crises are treated quite favourably under the current regulations. It is also worth revisiting some of the historic assumptions regarding the sticky nature of retail deposits given the increased penetration of digital banking channels. For example, while retail deposits have been sticky in historic crises, the advent of mobile applications could allow rapid withdrawals and this could undermine the assumptions underlying the LCR calculations.

The decline in mortgage lending appears to coincide with structurally lower household savings and thus a negative impact on GDP growth for the country. Therefore policymakers should consider whether the capital and liquidity regulations could be adjusted in order to promote lending in asset classes that are positive for the economy and wealth creation. Policymakers could also consider promoting secondary markets for mortgages, which would increase the liquidity of the asset class.

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