

## **Determinants of non-performing loans: evidence from the South African banking system**

Master of Commerce – (50% Research in Finance)

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## **Declaration**

I Puseletso Ntabanyane declare that the work submitted in this paper reflects my own work. The data and information that has been done by others has been given the acknowledgement in the bibliography section.

## **Acknowledgement**

God made it possible. I am truly humbled and grateful. The support from my supervisor Dr Yudhvir Seetharam, words can never be enough to express my gratitude, thank you for being patient with me and always pushing me. I appreciate your time and guidance throughout the journey.

A special thank you to my family for believing in me and always encouraging me to carry on whenever I wanted to give up along the way. Thank you for constantly reminding me that I am capable, and I can conquer everything through prayer and putting my faith in God. Thank you to my mother, my grandmother and my brother, your prayers have gotten me this far. My late father said I would be the hardworking woman that I am today, I am grateful and thankful that he believed in me when I was only 10 days old before he departed forever on the 11<sup>th</sup> day. Thank you to Khulani, I appreciate the support and thank you for constantly believing in me. I would also like to thank a special lady which I met during my journey of pursuing this course, thank you Lerato for holding my hand from the moment I arrived on campus. Thank you for pushing me and believing in me, the journey was tough, but it was truly worth the tears and the sleepless nights. Thank you to my friends for the encouragement and emotional support, I truly appreciate it.

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## **ABSTRACT**

The aim of the study was to investigate the determinants of non-performing loans (NPLs) in South African banks. The determinants of NPLs included macroeconomic, microeconomic (bank specific characteristics) and behavioral finance (influence of customer sentiments). The health of an economy is driven by the health of the financial system in that economy. NPLs can have an impact on the health of an economy as rising NPLs could lead to bank failures. This in turn may lead to fearful public sentiment, bank runs and the ultimate collapse of the financial system.

The study explores the macroeconomic determinants of NPLs, the bank specific determinants of NPLs and the behavioural finance. The study uses a panel data regression model in analysing the data and the data were sourced from the South African Reserve Bank (SARB), Orbis BankFocus, The World Bank and Bureau of Economic Research (BER). The data spans a sample period of between 2006-2020 and the geographic focus is mainly on South African banks (17 in total). The study aims to add to the existing literature. The study aims to do so by adding the behavioral finance aspect, consumer sentiment will be used as a variable that explains the behavioural finance. Behavioural finance as a determinant of NPLs can be used in future research papers.

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## Abbreviations

NPL: Non-performing loans

NPA: Non-performing assets

SARB: South African Reserve Bank

BER: Bureau of Economic Research



# 1. Introduction

## 1.1. Background and overview

Banks play a critical role in an economy, their role of intermediation entails allocating resources such as money from individuals that have excess cash and then lending it on to those individuals that would require it for different purposes such as investments (Geletta, 2012). Banks play a much bigger role than just being intermediaries, their role also includes compensating shareholders on their investments given their performance. This in turn will stimulate more investments and results in economic growth (Sheefeni, 2015).

Globally, the financial system is mainly dominated by the banking sector; therefore, a stable banking sector facilitates economic growth and development (Bayar, 2019). As defined by Mishi & Tsegaye (2012), banks play an important role in an economy and every country has policies which have been established by the government to reduce bank failures in a system. Mishi & Tsegaye (2012) further explains that regulators such as the central bank of a country intervenes when there are problems in the banking system, these problems can cause disruptions in the financial system and cause a bank to fail.

The regulators create policies to ensure banks are determining vulnerabilities in the financial system, and these vulnerabilities can be detected through the use of key financial stability indicators such as the non-performing loan (NPL) ratio (Mpofu & Nikolaidou, 2019). NPLs are loans (particularly the principal and interest amount) which are unpaid and overdue for a period of more than 90 days (IMF, 2021). Nevertheless, NPLs do not have a standardised definition as they differ from country to country, however, it is clear across different jurisdictions that a rising NPL could be an indication of a deteriorating financial system (Petkovski, Jordan and Kiril, 2018). Research has shown that rising NPLs and banking crises are highly correlated (Us, 2017).

Rising NPLs have a negative impact on the bank's asset quality as well as the bank's profitability and liquidity (Mohanty, Binay and Satyendra, 2018). It is important for banks to sustain and maintain their asset quality and profitability as this can determine the future and survival of the entity (Tsumake, 2016). The overall growth of the economy can also be threatened if the banks are not prudent in their approach to extend credit to the borrowers. In the worst of cases, the overall banking sector can collapse, and this could lead to weaker economic activity (Tsumake, 2016). To that end, Atoi\_(2018) views NPLs as an early warning sign for a banking crisis.

The financial crises that occurred between 2007 and 2009 attest to the fact that banks play a huge role in any economy and a deterioration of banks' asset quality leads to economic demise (Tsumake, 2016). For example, the 2007 to 2009 global financial crisis was triggered by a housing bubble where credit was extended to many customers who later defaulted on their loans. The crisis began in the United States of America (USA) and spread to other countries. The vulnerabilities of the USA's financial system highlighted the need to link the macroeconomic environment to the wellbeing of the overall banking sector (Polat, 2018). This signals the importance of policies and frameworks that would govern and regulate the banks as a way of maintaining a stabilised banking sector.

Over the years, some countries have witnessed bank failures because of bad credit decisions. In 1994 a South African bank called Prima Bank failed because of liquidity problems which were caused by high NPLs, and during 2014, African Bank had poor management and liquidity issues mainly caused by excessive lending (Writer, 2021a). It is also important to note that the South African banking sector is dominated by five banks (namely Standard Bank, Nedbank, FirstRand, Absa and Investec) and these banks hold about 89.4% of the market share of total banking sector assets as at March 2020 (Kypreos & Marion, 2021). This high concentration level implies that if the banks fail to properly manage their loans, leading to high NPLs, South Africa's banking and financial sector would become vulnerable and may weaken economic activity (Geletta, 2012). This

warrants an investigation into the factors that determine NPLs in South Africa for managerial and policy advice.

Many factors are highlighted in literature as the key drivers of non-performing loans. The factors are usually grouped under political, economic, environmental, ownership patterns, social or cultural, bank specific, technological, legal, and institutional frameworks based on various studies. However, extant literature has limited studies if there are any on the role of behavioural finance, particularly consumer sentiment. This is a gap which this study seeks to fill.

Consumer sentiment indicates future developments of households' consumption and saving based on their expected financial situation, sentiments about the general economy, unemployment and saving ability (Organisation for Economic Co-operation and Development, 2022). Thus, consumer sentiment has a bearing on economic agents' ability to service loans. Moreover, since the drivers of NPLs vary across jurisdictions this research attempts to establish the determinants of NPLs in South Africa.

## **1.2. Motivation of the study**

NPLs are critical determinants of the healthiness of the banking system and the economy at large. To that end, several studies have been conducted to ascertain the determinants of NPLs. However, extant literature has neglected the effects of behavioral finance on banks' NPLs. This study extends the literature by exploring the effect of consumer sentiment on NPLs. The study is important to policymakers and bank regulators as it helps them to identify the key drivers of NPLs for policy and regulations formulation. Understanding the determinants of NPLs means that banks could be better prepared to identify the signals of the determinants. Once the signals have been identified, the banks would implement the appropriate risk measures. The study will assess the NPLs of the South African banking market during the covid-19 pandemic of 2020 and 2021. The findings of the performance of the South African banking NPLs can help the author combine the literature aspect to the practical aspect that was witnessed during the pandemic and the low economic activity period.

### **1.3. Knowledge gap**

The study seeks to explore additional determinants of NPLs related to behavioural finance such as consumer sentiments which other studies that were identified by the author did not consider consumer sentiment as a determinant for NPLs. This paper identified the gap and added consumer sentiment as a determinant of NPLs. In terms of literature, much of the studies identified macroeconomic and microeconomic determinants of NPLs however, the critical element which is the influence of customer sentiments has not been considered in most studies. This study aims to fill this gap by adding behavioral finance in the form of consumer sentiments. Given the past studies on consumer sentiments, we have identified this as a variable that would be useful for this study. A paper by Duffy, Morley and Watson (2015) highlights that consumer sentiment is used in many model inputs as it is an indicator of economic trends. Consumer sentiment can also be tested with other macroeconomic variables, and this can help in predicting or forecasting future events, in this case NPLs.

### **1.4. Research objective**

Non-performing loans help in signalling the stability of the banking sector; therefore, it is critical for the researcher to investigate the factors which drive NPLs. By understanding the drivers behind the NPLs, it becomes easier for financial institutions to identify when they would most likely experience loan defaults and as such banks can become more prudent in managing credit risk.

Therefore, the aim of this research is to investigate the different factors that often lead to an increase in non-performing loans in South Africa.

To address this aim, the following objectives are raised:

- To examine the relationship between banks' characteristics and non-performing loans.
- To examine the impact of macroeconomic fundamentals on bad loans.
- To investigate the influence of customer sentiments on non-performing loans.

### **1.5. Problem statement**

Banks provide financial services to the public and they also aim to make a profit from the loans and advances that they offer. In as much as loans and advances generate income for the banks, these loans can easily become bad loans - non-performing loans and affect a bank's survival with dire consequences on the whole economy given the central role of banks in an economy. There are numerous internal or external factors which may cause NPLs to rise. This study seeks to investigate the determinants of NPLs in South Africa. The study aims to fill the gap by adding the element of behavioral finance. The determinants of NPLs included macroeconomic, microeconomic (bank specific characteristics) and behavioral finance (influence of consumer sentiments). The question that remains is, can the macroeconomic variables and microeconomic variables assist in predicting future patterns? The author of this study used consumer sentiments as an additional point of study because while the macroeconomic and microeconomic variables have been used in many other studies, they still do not assist in helping banks predict what could happen in the future. The aim is to identify whether behavioral finance has any influence on NPLs and help in predicting future patterns.

### **1.6. Feasibility of the study**

The study is feasible as it seeks to examine the determinants of NPLs. The study will be conducted using data from 2006 to 2020 for the banks in South Africa which are available from the Orbis Bank Focus database (formerly Bankscope). The study uses a panel data regression model to ascertain the determinants of NPLs using the most recent data. The data will consider the 2007 to 2009 global financial crisis as well as the impact of the coronavirus (Covid-19) pandemic period. The results from these periods could give different results compared to all the other periods. The limitations could arise from the banks not disclosing certain financial information and as such this could limit the research if certain financial metrics are omitted from the bank's financial data which are published publicly. The study may also be limited as it examines the top banks within South Africa and does not consider other international banks based in South Africa or the smaller banks within South Africa.

## 1.7. Hypotheses

The different determinants of NPLs are meant to be used in answering some of the hypotheses formulated by the author of this study. From a South African Banking context, the following hypotheses are stated:

### External:

- *Hypothesis 1: **Inflation*** and NPLs have a negative relationship. This is supported by the view that when inflation increases, more often the outstanding debt is not adjusted for inflation and as such, the rising inflation makes it generally easier for those with fixed debt levels to meet their debt obligations (Pettinger, 2021).
- *Hypothesis 2: **GDP*** and NPLs have a negative relationship. The view regarding this hypothesis is on the basis that real GDP will often increase the household's ability to pay their outstanding debt and as such people will be able to meet their debt obligations (Radivojevic & Jovovic, 2017).
- *Hypothesis 3: **Interest rate*** and NPLs have a positive association. When interest rates rise, it becomes extremely difficult for consumers to repay their loans, more particularly for the loans with floating interest rates (Donath, Cerna, & Oprea, 2014).

### Sentiment:

- *Hypothesis 4: **Consumer sentiment*** and NPLs have a negative relationship. This is based on theories which highlight that when consumer sentiment increases the likelihood that consumer spending will increase is high and as such most people could have more appetite to take on debt with the hopes that they will repay their loans (Carroll, Fuhrer and Wilcox. 1994). However, if consumer sentiment goes down, this means that there is less confidence in the market and as such individuals would most likely default on their debt.

**Internal:**

- *Hypothesis 5: Capitalisation* and NPLs have a negative relationship. The measure of capitalisation to NPLs can be a grey area as several studies state that banks with both low and high capitalisation all participate in risky lending activities. Therefore, one cannot easily say whether capitalisation would have an impact on NPLs (Ghosh, 2015). The author also highlighted the “moral hazard” hypothesis which states that a bank with lower capital levels easily amplifies the level of NPLs. Hypothesis 5 therefore supports the hypothesis stated in the study by Ghosh (2015).
- *Hypothesis 6: Profitability* and NPLs have a negative relationship. An increase in NPLs causes profits to run dry and as such this causes profitability levels to decrease. When NPLs are lower there is room for the bank’s profits to grow as the bulk of the bank’s profits comes from interest on the loans, so if there are less bad loans this then increases the bank’s ability to make profit from the loans (Radivojevic & Jovovic, 2017).
- *Hypothesis 7: Size* and NPLs have a negative relationship. This hypothesis is based on the “too big to fail” hypothesis. This hypothesis states that banks that are bigger in size, have less NPLs.

**1.8. Potential benefits of the study**

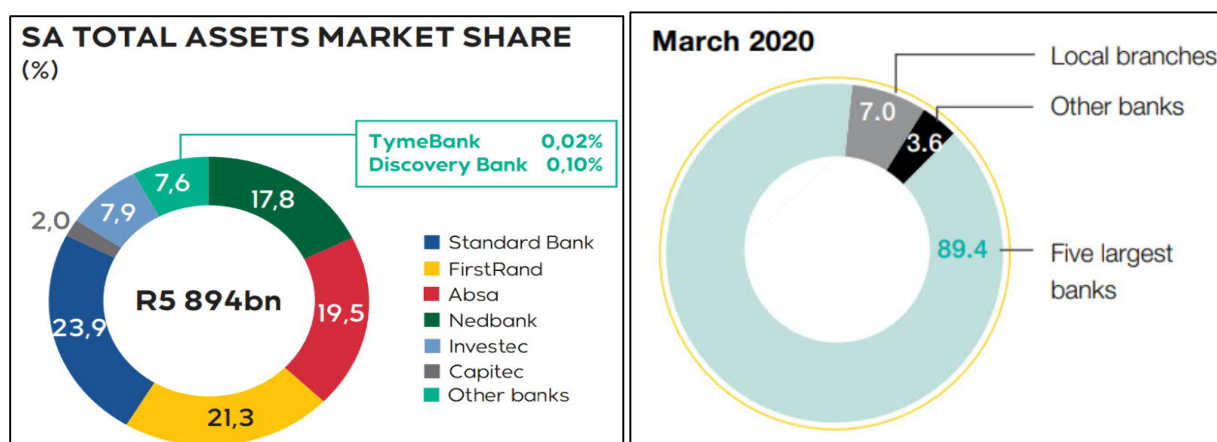
A study into the root of the problem can assist policy makers in drafting plans that would be effective. It is possible that some factors that drive NPLs could be beyond the control of banks, however, the relevant authorities may use the findings and enhance the existing policies and regulations within the banking system. The study aims to add to existing literature and assess how consumer sentiment can be a determinant of NPLs.

## 2. South African Banking Industry

The chapter is about giving an overview of the South African banking industry and analysing the fundamental information that impacts banks. This chapter aims to give context to the study and highlight the importance of the key financial indicators impacting banks within the South African context. The key discussion points in this chapter include asset quality and highlight the performance of some of the top banks in South Africa. As mentioned by Kypreos and Marion (2021), the South African Banking market is dominated by four banks and South Africa has a total of 18 banks and there are additional 13 banks which are foreign banks (Writer, 2021b).

The South African banking sector has changed over the years since 1994, the changes are witnessed in the number of banks in existence compared to back in the 1990s (Hawkins, 2004). The growth of the banks can also be analysed by the growth in products that the banks offer as well as the growth in loans and advances (Hawkins, 2004). While the growth in the numbers is discussed it is also important to note that there is a high concentration to the top five banks in the country. The below figures illustrate the banking sector of South Africa by total asset value.

**Figure 1 & 2: The South African total asset market share**



Source: Writer (2021b)



## **2.1. Types of banks in South Africa**

The banking system can be split into different segments as they all serve a different purpose.

The first segment relates to the corporate, commercial, and retail banks. These banks are regulated as they are registered according to the Banks Act 94 of 1990 (Hamman, 2021). The banks under this segment offer different services and the competition is high particularly amongst the largest banks that dominate in the market. The banks are expected to comply with the regulations and meet minimum standards which are outlined for the banks under the Banks Act (Hamman, 2021). These banks offer loans amongst many other services and functions that they perform.

The second segment relates to the mutual banks. These banks offer loans and credit in the market however, they are limited in terms of the services that they provide (Hamman, 2021). Mutual banks in South Africa are registered under the Mutual Bank Act 124 of 1993.

## **2.2. Credit risk during the Covid-19 pandemic**

Banks provide different services and one of the main services offered by banks is credit, this implies that the banks offer credit to individuals and corporate institutions and the government (Tsumake, 2016). With banks extending loans in the market this leads to increased risks, the bank is at risk of not receiving their money back. If the borrowers are not able to meet their debt obligations this leads to an increase in NPLs (Tsumake, 2016). The Covid-19 pandemic was a threat to the global economy as business activity was limited in many countries due to lockdown measures taken by the different countries, with low business activity this led to companies retrenching staff members during this period. Increased retrenchments and high unemployment levels can lead to individuals defaulting on their existing loans.

The total loans and advances granted by the banks in South Africa proved that the low economic activity resulted in the low demand for new loans (SARB, 2021). The SARB reported a decline in loans during the lockdown period from March 2020, the loans from the banking sector were down from 5.3% to 1.2%, the SARB (2021) mentioned that the loans have always grown over the years and the last decline was in the year 2010. The decline in demand for loans was because of the uncertainty in the economy, the below table is a summary of how confidence in the market improved as economic activity increased from the fourth quarter (Q4) of 2020.

**Table 1: Credit to individuals and entities**

	Quarter-on-quarter change (R billions)					Percentage of total loans and advances*
	2020				2021	
	Q1	Q2	Q3	Q4	Q1	
Households .....	24.0	-24.1	25.8	29.9	26.5	50.6
Companies: Total.....	58.8	-43.8	-42.9	15.9	-17.7	49.4
<i>Of which:</i> Financial .....	-12.0	12.3	35.2	27.3	-21.5	11.9
Non-financial.....	70.8	-56.2	-78.1	-11.5	3.8	37.5
<b>Total bank loans and advances ....</b>	<b>82.8</b>	<b>-68.0</b>	<b>-17.2</b>	<b>45.8</b>	<b>8.8</b>	<b>100.0</b>

\* Expressed as a percentage of the total outstanding balance as at March 2021

Source: SARB (2021)

The companies were also cautious with borrowing money from the banks during this period of uncertainty. The SARB (2021) explained that the decline in the demand for loans was experienced in the overdrafts (19% drop in loans and advances), credit cards (a 23.9% drop) and mortgage loans (7.4% drop), these declining figures were reported for the period between May 2020 till April 2021.

When the macroeconomic environment stabilised during 2021 (Q1), many other sectors reported an increase in the demand for loans and credit. The increased confidence in the market was also elevated by the low interest rates. The interest rate cuts by the central bank during the low economic activity resulted in increased demand for credit. The SARB cut interest rates during that time as a mechanism for boosting economic activity in the market (SARB, 2021).

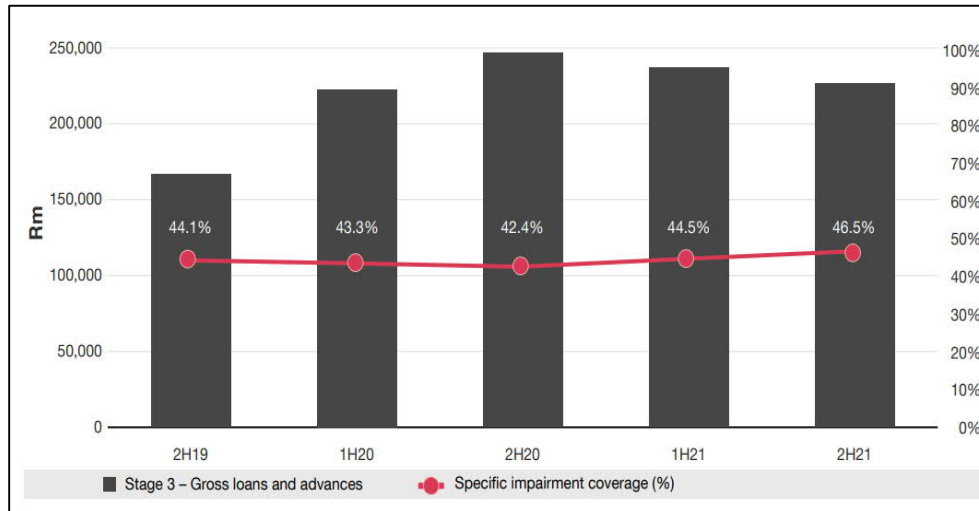
### **2.3. Introduction of loan staging**

Before a loan can be declared as a non-performing loan it goes through different stages which have been declared under the International Financial Reporting Standards (IFRS) 9 accounting standard (Lawton and Leonardelli, 2017). The IFRS 9 standard has guided banks on how to classify the banks' financial assets. Once this has been done the banks can determine whether the different assets are stage 1, stage 2 or stage 3 (Lawton and Leonardelli, 2017). Loans would also form part of this classification of assets. Stage 1 assets relate to all the assets on the banks' balance sheet which are in good standing, these are also known as performing (Lawton and Leonardelli, 2017). Stage 2 assets or loans have increased risk compared to stage 1, in other words the bank has identified a deterioration in the credit quality of the assets (Lawton and Leonardelli, 2017). Stage 3 loans are known as non-performing loans, these indicate that the bank has reported a loss or default on the asset or loan (Lawton and Leonardelli, 2017).

### **2.4. The asset quality of the South African Banks**

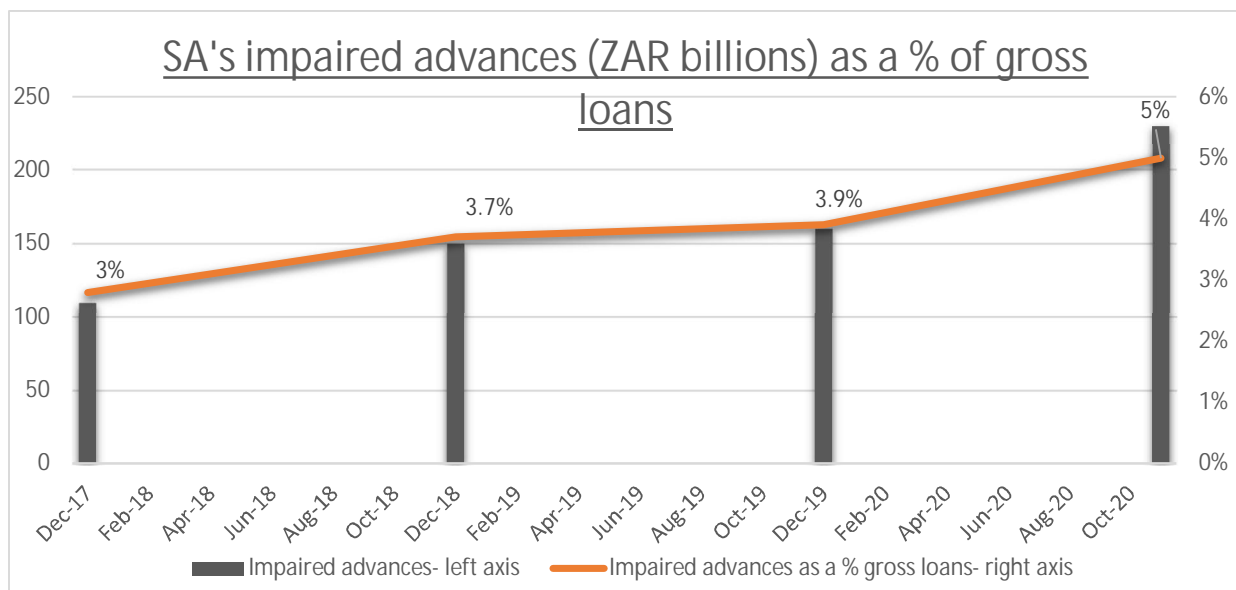
The NPLs are also known as stage 3 loans. The below graph shows the aggregate NPLs by value from the year 2019 (Q2) till 2021 (Q2), the highest NPLs during this period were recorded in the second quarter of 2020. The increased NPLs during that period were because of the lockdown period where there was low business activity, and many individuals and entities were unable to meet their debt obligations. The data used below relates to the top banks in South Africa as explained by Nastas, Prinsloo, and Roopnarain, R. (2021).

**Figure 3: Analysis of stage 3 loans in South Africa**



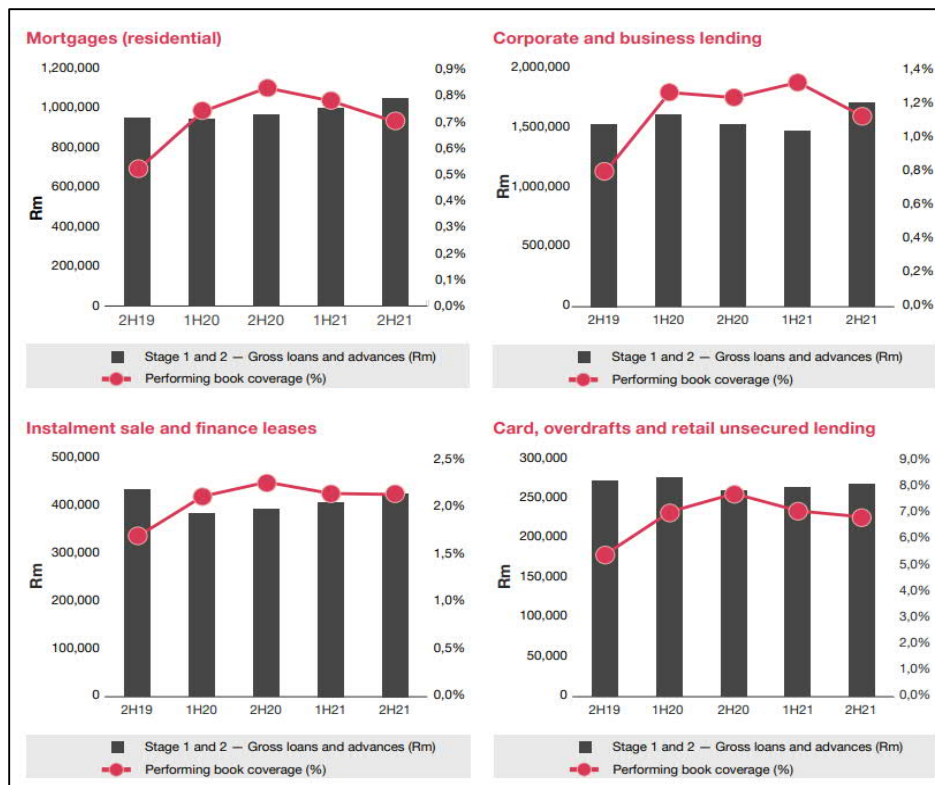
Source: PWC- (Nastas, Prinsloo and Roopnarain, 2021)

**Figure 4: Analysis of stage 3 loans in South Africa**



Source: Compiled by the researcher, information from Moody's Research (Kypreos, Kypreos, Ioannou, and Kabeya., 2022 ).

**Figure 5: Analysis of stage 1 and 2 loans in South Africa**



Source: PWC- (Nastas, et al., 2021)

Figure 4 above illustrates the impact of the challenging macroeconomic environment, this ties to the theory discussed in this study which aims to explain how macroeconomic determinants can have an impact on NPLs. During challenging economic periods, the above figure 4 shows that it becomes difficult for households and companies to meet their debt obligations, and therefore these loans have been categorised as stage 3 loans as they are non-performing, and the risk is high as these clients might not be able to pay back the bank.

Figure 5 above shows the performing loans, these are categorised as stage 1 and stage 2 loans. The stage 1 loans are performing loans as clients within this risk profile can service their debt obligations from the time they were granted the loan (Taylor, 2017). The stage 2 loans are the loans where the borrowers have shown signs of elevated risks, in other words there is a level of risk associated with these borrowers (Taylor, 2017).

Overall, the banking sector in South Africa is well positioned when compared to some of its peer countries. Figure 6 and 7 (Annexure A) illustrates how South Africa is positioned in terms of NPLs and profitability of the country when compared to some of the peer countries. The pandemic impacted NPLs in many countries, while some of the data in these figures is forecasted the overall results as of 2020 are accurate in South Africa as seen in figure 4.

### **3. Literature review**

There are a couple of studies covering the literature on determinants of non-performing loans. These studies often look at the bank-specific and macroeconomic aspects, while others name them industry-specific determinants. The main reason for discussing these determinants is for professionals within the banking industry to discuss the possible causes for bank failures and identify possible threats well ahead of time. The impact of these bank failures can have a ripple effect as the failure of one could lead to the failure of many others.

#### **3.1. Theoretical background**

NPL research studies have grown over the years, and they tell us much about the health of the banks. As such, different theories are used to explain the causes of NPLs as this could easily lead to instability within the banking sector (Atoi, 2018). The growing literature can be easily owed to NPLs playing an important role in the many losses experienced within the banking system. The primary theories used in the literature are *information asymmetry*, *adverse selection*, and the theory on *moral hazard*.

The general theory on information asymmetry was introduced by Akerlof (1970). Akerlof (1970) introduced a fundamental concept in markets that certain sellers of used cars have more information about the cars that they are selling than the buyers. This asymmetric information led to adverse selection problems and the theory became a base for understanding asymmetric information in financial markets. In banking, there is uncertainty from the banks' side as the banks can lend to borrowers who may or may not meet their debt obligations due to asymmetric information between the lender and the obligor. Despite all the efforts from the bank to assess the borrower's behaviour there is still much risk associated in the transaction and if banks unknowingly lend to the risky borrowers based on the limited information, they have on the borrower this will result in increased NPLs.

Adverse selection arises before a transaction occurs due to asymmetric information. It occurs when a lending institution lends money to prospective borrowers who are most likely to use the money

for an unintended (adverse) outcome (Mishkin & Eakins, 2006). The adverse selection theory states that the higher the interest rate the more likely it is for borrowers to default and also the increased interest rates often result in the quality of borrowers deteriorating (Atoi, 2018). Banks would most likely lend to poor quality borrowers during this period and this could result to increased NPLs which the bank may need to manage (Atoi, 2018). The management of these NPLs means the bank could deal with increased operating expenses or increased cost to income ratios. This is known as the Bad Management Hypothesis (Kingu, Dr Macha, and Dr Gwahula, 2018). Moral hazard within the financial or banking sector refers to a situation where banks act in a risky manner in order to make more profit as they are under the impression that they are ‘too big to fail’ (Zheng, Bhowmik, and Niluthpaul, 2019). Banks act in a risky manner as they stand to gain profit on the upside, but this could have a negative impact on the depositors and shareholders (Kingu et al., 2018).

When banks want to improve their capital they respond to moral hazard incentives by participating in risky lending activities and charging higher lending rates with the belief that increased interest rates may lead to higher profits and this can balance out their capitalisation (Kingu et al., 2018). However, the increased lending rates could lead to borrowers not meeting their debt obligations which could result in higher NPLs (Kingu et al., 2018). Much of the moral hazard theory relates to the decisions made by the bank and these decisions impact the bank’s balance sheet, therefore the key metrics of the bank such as capitalisation, size, assets and growing loans could have an impact on NPLs (Kingu et al., 2018).

Researchers have also linked the macroeconomic environment to loan quality. The theory suggests that when the economy is booming, there is a lower chance of NPLs rising (Zheng et al., 2019). This implies that during periods of economic growth, borrowers are often able to meet their debt obligations and periods of growth are also a challenge as some banks tend to extend credit to customers who are risky, and as a result when the economy goes through a downturn they may experience higher NPLs (Zheng et al., 2019). The study of Radivojevic and Jovovic (2017) showed that the macroeconomic environment and the performance of banks are the main factors for NPLs.



Sentiment can be defined as a general sense of how people are feeling regarding something, their feelings can be either written or spoken or how they all react to a certain situation (Durukan & Can Ergün, 2017). Investor sentiment can be explained as direct in the sense that it explains the expectations or the investor's mood at a point in time., Sentiment can also be described as indirect, and these can be measured using proxies which would inform the researcher about the investor's sentiment at that point (Solanki & Seetharam, 2018). The existing literature on sentiment is used to explain how sentiment plays an active role in financial markets. This study attends to sentiment in the context of the banking system and how sentiment has an impact on the non-performing loans.

### **3.2. An empirical analysis of the determinants of NPLs**

Most of the studies on NPLs determinants have been on the developed and emerging markets with little on the African context (IMF, 2021). Africa is a continent where NPLs are extremely high and countries in Africa experience extreme macroeconomic challenges. A study by Mpofu and Nikolaidou (2019) on the Sub-Saharan African region highlights the macroeconomic determinants of NPLs and their findings suggest that economic recessions amplifies the credit risk in a specific country.

While noting that the studies on this topic are gaining momentum in Africa, other researchers purely focused on one of the factors. For instance Sheefeni (2015) evaluated the impact of the bank specific determinants of NPLs within the Namibian banking system over the 2001 to 2014 period and their aim was to understand which of the bank specific determinants affect NPLs. Another study taking a different angle was Polat (2018) who examined the macroeconomic determinants of NPLs within Turkey and Saudi Arabia. Their conclusion suggested that NPLs are better explained using macroeconomic variables and the author also suggested that different countries would be faced with different challenges and as such their macroeconomic determinants would be different.

This study examines both macroeconomic and bank specific factors. The sections below will discuss these factors in much detail and determine the factors specific to the South African economy and banking system.

### 3.3. Understanding the determinants of non-performing loans

A study was published by the International Monetary Fund (IMF), which investigates the aftereffects of the Covid-19 pandemic and whether this has resulted in higher NPL levels for Sub-Saharan Africa (IMF, 2021). The theory from the IMF study highlights some of the macroeconomic and bank-specific determinants of NPLs which are highlighted in the below section:

#### i. Macroeconomic determinants of NPLs in Sub-Saharan Africa

The authors used a sample of 41 Sub-Saharan Africa (SSA) countries, and they used a panel regression model for data that is country-level and the sample period was from 2001 to 2018. The authors highlight that at a country level, NPL is driven by various factors. One of them being the *lending behaviour* of banks - if there is too much lending in the market and banks take on more risk, the results suggest that NPLs increase (IMF, 2021). Another macroeconomic factor driving NPLs is the increase in *public debt*. When the country's government increases their debt, this could ultimately result in the state raising too much debt which they are unable to pay and as a result this could lead to an increase in NPLs. Lastly, a country with an already weak macroeconomic environment means that the NPLs will most likely be at their highest. These macroeconomic conditions could have been caused over the years and it takes longer for the SSA countries to recover from such shocks (IMF, 2021).

#### ii. Bank-specific determinants of NPLs in Sub-Saharan Africa

For the bank specific determinants, the authors used data at a bank level and the research was conducted using financial statements from 617 banks. These banks were from SSA countries, and the total number of countries analysed was 43 the sample period was from 1994-2018. The model used in the study was the Generalised Method of Moments (GMM). The authors highlight that at a bank level, NPL is driven by various factors. Firstly, *profitability and efficiency* are some of the factors considered. The study suggests that a bank that is inefficient is often measured by its level of profitability and if the profitability ratios are weak this often suggests that NPLs would also be relatively high (IMF, 2021). Secondly, *bank lending* can impact NPLs. If a bank's lending rates are high this often leads to loan obligations not being met and as a result higher NPLs. Thirdly,

*capitalisation* plays an important role as the results from the study suggest that banks that are often well capitalised have NPLs that are usually much lower (IMF, 2021). Lastly, *governance* is important. The IMF can measure the country's Financial Development Index, and this is positively related to the bank's NPLs. A bank operating in a well-developed environment could experience lower levels of NPLs as opposed to a bank operating in an environment that is not developed.

### **3.4. Macroeconomic determinants of non-performing loans**

Previous studies have identified the following macroeconomic factors as the key determinants of NPLs, namely include Gross domestic product (GDP) growth, unemployment rates, exchange rate, inflation rate, real interest rates and lending interest rates. These factors are investigated to determine whether there is any link between these variables and non-performing loans.

Polat (2018) investigated whether the determinants for NPLs in both countries would be different and the results suggest that they are different as they are country specific. For Saudi Arabia, it was found that the following variables have a positive impact on NPLs: GDP, inflation, debt, market capitalisation and money supply. The variables which had a negative impact include unemployment and transparency while exchange rates and oil prices had no effect (Polat, 2018). While for Turkey only listed companies had an impact as the author assessed the listed and unlisted firms. The variables which were regarded to have a positive impact included inflation and market capitalisation. It is however believed that the explanatory variables for NPLs in Turkey could be delayed or lagged as current macroeconomic variables fail to explain current NPLs.

Based on the study by Saba and Kouser (2012), they explored the US Banking sector over the 1985 to 2010 period using correlation and regression analysis. Their findings suggest that real GDP per capita and interest rates have a positive relationship with NPLs and the authors further suggest that at the point of issuing loans the banks within the US should consider these two variables in their decision making while giving out loans to clients (Saba & Kouser, 2012).

The study by Ombaba (2013) examined the determinants of NPL in Kenya identified macroeconomic factors: inflation and interest rates as the key drivers of NPL. Kjosevski, Petkovski & Naumovska (2019) investigated both macroeconomic and bank specific determinants in the Republic of Macedonia. The study used the banks' panel data for the period of 2005 to 2014. The authors found that during an expansionary period within the economy, NPLs would most likely be at their lowest as many people are able to generate an income and as such people are able to meet their debt obligations. The results from the study that was conducted reveal that macroeconomic variables such as per capita income and inflation have an impact on NPLs for banks within the public sector, for the private banks per capita income have an impact on NPLs (Kjosevski et al., 2019).

Mpofu and Nikolaidou (2019) conducted a study looking into macroeconomic and bank specific determinants in SSA. The study used bank-level data from 2000 to 2017 and panel data models were used for 85 banks in 8 SSA countries. The study was particularly interesting as it was analysing SSA countries that have experienced banking crises before. The results suggest that both macroeconomic and bank specific factors have an impact on NPLs. Focusing on the macroeconomic factors, the authors find that an increase in the lending interest rate, unemployment rate, inflation, money supply all lead to an increase in the NPLs. The author further suggests that policies with a strategic focus of improving the macroeconomic environment should be implemented as this will help in shaping the banking system and reduce NPLs within the banking sector.

### **3.5. Bank-specific determinants of non-performing loans**

A study by Berger and DeYoung (1997) on US commercial banks focused mainly on the bank specific determinants and NPLs and based on their literature they came up with hypotheses on 'bad management', 'bad luck', 'skimping' and the 'moral hazard' and these related to the bank's efficiency and capitalisation. Their view on *bad management* is that low efficiency from the bank leads to increased NPLs. Bad management is linked to banks managing their loan book poorly by extending credit to customers who may not be creditworthy (Berger & DeYoung, 1997). The view on *bad luck* is that increased NPLs often leads to increased operating costs and *skimping* is about banks who appear as more cost-efficient because of their ignorance when it comes to high quality

loans, this will lead to high NPLs over a longer period of time (Berger & DeYoung, 1997). Lastly, their view on the *moral hazard* hypothesis is that increased NPLs are as a result of lower capital levels in a bank, if bank's take on more risk with low capitalisation this leads to an increase in NPLs (Berger & DeYoung, 1997). A study by Fernandez, Pagés, & Saurina (2000) looked into banks in Spain and they explained that credit growth, industry size and capitalisation ratios drive NPLs.

Bayar (2019) examined macroeconomic and bank-specific determinants of NPLs in emerging markets and used the GMM estimator for analysis. On the bank-specific determinants the researchers found that there was a direct relationship between growth in credit and the cost to income ratio. The other variables which had a negative impact included capitalisation, return on asset (ROA), and return on equity (ROE) as well as non-interest income. In their analysis they concluded that the both bank-specific determinants and macroeconomic determinants are essential for a sound and efficient banking system (Bayar, 2019).

The study by Abid, Ouertani, & Zouari-Ghorbel (2014) used the dynamic panel data in finding the determinants of household NPLs within in Tunisia using a sample of 16 banks. The results suggested that the ROE and inefficiency can be derived from operating expenses being divided by operating income as these are bank-specific factors. These factors should be added to the model as they highlight much of the 'bad management' hypothesis the quality of management (Abid et al., 2014). The study contributed to existing literature on the bad management hypothesis.

The research done by Koju, L, Koju and Wang (2018) was on the Nepalese banking system and the authors were investigating the NPLs over the 2003 to 2015 period. The panel data model was used by the authors. The results from the bank-specific determinants suggest that NPLs have a direct relationship with asset size and inefficiency and NPLs have an indirect relationship with capital adequacy (Koju et al., 2018). The authors recommend efficient management in banks in an attempt to build a healthy banking system and a stabilised economy.

One other study by Sheefeni (2015) looked into the bank-specific determinants of NPLs within the Namibian banking system. The period that was analysed was 2001 to 2014 and the results suggest that the loan to total assets ratio and the total assets have a positive relationship with NPLs. The ROE and ROA on the other hand have a negative relationship with NPLs which implies that highly profitable banks do not generate more income and as a result they are not easily attracted to taking on more risk in an attempt to make more income Sheefeni (2015).

### **3.6. Sentiment as a determinant of non-performing loans**

The literature on sentiments particularly investor sentiment may be broader within financial markets but according to the author's knowledge, there are limited papers exploring the impact of sentiment on NPLs. The focus is on consumer sentiment and investor sentiment as both play a role in the banking system and the proxies used to measure sentiment include the Financial and Economic Attitudes revealed by Search (FEARS) index which is known as the investor sentiment index (Solanki & Seetharam, 2018). The consumer sentiment proxy is known as the Michigan Consumer Sentiment Index (MCSI) and the consumer confidence index (CCI) (Liberto, 2021). A study by Daudert (2021) mentions that there are various sources of data relating to financial sentiment analysis, the information can be sourced from company reports, news and others from social networks. Daudert (2021) investigated sentiment of financial texts and their work included modelling different types of data using graphs, their proposed approach leverages off many texts and they used a methodology which used contextual information and incorporated this into a vector representation which represents financial texts. Their representation method gains much from information and it also represents the relationships between the information, this method uses sentiments from different data sources and it helps the author model sentiment contagion in an attempt to increase the standard of sentiment analysis (Daudert, 2021).

A study by Duffy, Morley and Watson (2015) was on the consumer sentiment index, the study assessed the consumer sentiment index by KBC bank, the study was focused on the economy in Ireland the data used was from 1996 to 2015. The authors assessed two additional indices one of them was the Index of Current Expectations. This index assessed the views of the bank customers or consumers on their expectations regarding their financial standing in future, it also further

assessed the consumer's views on what they believe the level of employment in the country would look like in their country, which is Ireland in this case (Duffy, et al., 2015). The other index is known as the Index of Current Conditions, this index assessed the bank consumer's views on their financial situations relative to a year ago, they also assessed their views on their spending habits at that point in time. The consumer sentiment index serves a similar purpose as it measured the changes over a certain period of time in the country (Duffy, et al., 2015). The authors analysed the consumer sentiment index and the results showed that when there is confidence in the economy, the lines representing the three different indices used in their analysis would move towards each other. The lines show no similarities in movement when the economy is experiencing challenging periods (Duffy, et al., 2015). The key takeaway from this study is that the consumer sentiment index can measure how consumers feel about the movements in the economy, if there are economic booms the consumers spend more, and they are generally more positive with their personal financial standing and habits. Once there is a recession the consumer confidence declines and the consumers are not positive about their spending habits and their financial standing (Duffy, et al., 2015). Upon their findings when conducting this research, the authors mentioned that the consumer sentiment index was used as an input in a model to predict economic news on a quarterly basis.

## 4. Research Methodology

This section explores how the data was collected and how the author processed and analysed the data. The variables used and the model will also be discussed in this section. The study will explore the macroeconomic and bank-specific determinants of NPLs, the research also investigates the behavioural finance aspect by examining sentiments and how these impact NPLs. The study uses panel data hence, panel regression analysis will be used for analysis.

### 4.1. Research paradigm

The author identified positivism as the framework for this research study. Many studies that follow a positivism approach are quantitative in nature and they are based on a probabilistic model which was used by researchers in the past. In summary the positivists suggest a hypothesis which can be tested, it can either be proved correct or incorrect. Positivism can also be used to determine whether a relationship exists between variables and not necessarily the theory behind it (Stephen, Antwi and Kasim, 2015). The positivism paradigm suggests that scientific methods can help in revealing information or knowledge. Positivism emphasises the need for experiments, measurements and valid information to be used in the research. Positivists also suggest that the information derived from scientific research can be verified and it is accurate information which can address the hypotheses raised or the underlying research question (Nel, 2016). The author seeks to use positivism by testing the relationship between the different variables and testing the hypotheses stated earlier by using statistical methods.

### 4.2. Data

Based on the literature review, NPLs are experienced globally, and different countries would have different outcomes in terms of determinants. The study will analyse the effect of these determinants on the South African banking system. The South African banking system comprises 17 locally controlled banks (including 4 mutual banks), and 50 subsidiaries and branches of foreign banks. This study will be considering the 17 locally controlled banks as the top five banks in South Africa owns 89.4% of the market share and the other local branches own 7%. This in total equates to 96.4% of the South African banking market share (Writer, 2021b).



The data for bank specific variables will be annual data from 2006 to 2020, the macroeconomic determinants will be annual data from 1960 to 2020. The sentiment variable was quarterly data from the year 1982 and the author converted the quarterly data to annual data and the data was collected from the Bureau of Economic Research (BER). The bank-specific data was collected from Orbis Bank Focus, the macroeconomic variables were all sourced from the World Bank Economic Indicators. For data on sentiments the information was collected from various sources and an index will be used to represent sentiments.

The data was cleaned as follows: outliers were removed, missing values were replaced by mean, banks with missing data for three or more years were excluded in the study. The research approach followed is the deductive approach as this seeks to determine the hypothesis which is backed by the information that already exists (Beyer, 2002).

### Panel Data

Panel data refers to a dataset that can be about different cross sections over a period of time. The data has characteristics of cross sectional and time-series combined. The most common types of panel data analysis include fixed effects model, random effects model and pooled effects model. The benefit of panel data is that it assists in controlling variables which are unobservable across the variables in the data set

*Fixed effects model*, this relates to the characteristics in the data which are constant across the individuals or entities, depending on the underlying variables used in the study (Beyer, 2002). An example would be the gender, this is a variable that is fixed over time. *Random effects model*, these variables cannot be predicted as they are random in nature (Beyer, 2002). With random effects, if the variables used are individuals or entities, the differences are random. *Pooled effects model*, this model is used once a test has been done whether the model is fixed or random, the pooled effect is a combination of the fixed effects and random effects.

### 4.3. Empirical model

The study formulates and estimates the following panel regression model:

$$NPL_{it} = \alpha + \beta_1 ROAA_{it} + \beta_2 CAR_{it} + \beta_3 Bank\ Size_{it} + \beta_4 CTI_{it} + \beta_5 INF_{it} + \beta_6 GDP_{it} + \beta_7 RealIR_{it} + \beta_8 CCI_t + \varepsilon \text{-----}(1)$$

Where: NPL is Non-performing loans, ROAA is Return on Average Assets, CTI is Cost to Income Ratio, CAR is the Capital Adequacy Ratio, Bank Size is the Bank Size, INFL is Inflation rate, GDP is the Gross Domestic Product, Real IR is the Real Interest rate while CCI is the Consumer Confidence Index.  $\alpha$  and  $\beta$  are coefficients to be estimated.

### 4.4. Variables

The table below is a list of variables that will be used in the analysis of this research.

**Table 2: Research Variables**

Variable	Measurement	Data Source	Priori expectations
<b>Dependent Variable</b>			
Non-performing loans (NPL)	NPL=Impaired loans/Gross loans	Orbis Bank Focus	-
<b>Bank-specific factors</b>			
Return on Average Assets (ROAA)	ROAA= Net Income/ Average total assets	Orbis Bank Focus	Not significant as a determinant of NPLs
Cost to Income Ratio (CTI)	CTI= Operating expenses/ Operating income	Orbis Bank Focus	Not significant
Capital Adequacy Ratio (CAR)	CAR= (Tier 1 capital + Tier 2 Capital)/ Risk Weighted Assets	Orbis Bank Focus	Significant

Bank Size (Bank Size)	Measured by total asset value	Orbis Bank Focus	Significant
<b>Macroeconomic factors</b>			
Inflation rate (INFL)	-	World Bank	Significant
Gross Domestic Product (GDP)	-	World Bank	Not significant
Real Interest rate (Real IR)	-	World Bank	Significant
<b>Behavioural Finance</b>			
Consumer Confidence Index (CCI)	-	Bureau of Economic Research	Significant

Source: Own construction

#### 4.5. Pre-estimation tests

##### 4.5.1. Stationarity test

The study tests for unit roots to ensure that efficient estimates are generated. The Fisher type augmented Dicker-Fuller test that is appropriate for unbalanced data was employed for unit root tests. The stationarity test helps in determining whether the statistical characteristics of the mean, autocorrelation and variance and are all constant. The unit root then tests the magnitude of the stationarity in the time series model (Ozbun, 2021).

##### 4.5.2. Multicollinearity

To avoid spurious regression the study checks for multicollinearity using a correlation matrix. When there is a high correlation between the independent variables (either two or higher number of variable), this is known as multicollinearity (Bhandari, 2020).

#### **4.5.3. Breusch Pagan (1980) LM test for random effects**

The Breusch Pagan test is used when the author wants to determine the existence of heteroskedasticity in the model (Zach, 2020). The study tests for heteroskedasticity.

#### **4.5.4. Hausman (1978) specification test**

The Hausman test is used when determining whether to use the fixed effects or the random effects (Torres, 2007). The Hausman is tested in the study.

#### **4.5.5. Cross sectional dependence**

The test estimates the correlation between the variables in the same cross section (Henningsen, 2019). The Cross-sectional dependence is tested in the study

### **4.6. Post-estimation tests**

#### **4.6.1. F-statistic**

The F-statistic determines whether there is a relationship between the independent variables and the dependent variable (Choueiry, 2021).

#### **4.6.2. R-squared**

The R-squared is test used to measure how strong the relationship is between the independent variables as a collective and the dependent variable. This helps in determining whether the model is a perfect fit for the underlying data or variables used.

### **4.7. Estimation Procedure**

Equation 1 formulated above can be estimated through the random effect or fixed effect. The Hausman test was employed to choose between these two estimation techniques, and it favoured the fixed effect model. The *vce* robust option in STATA was used to control heteroskedasticity.

#### 4.8. Limitations

The above tests may not capture the proxies on sentiments. The other limitation is that there could be bank data that may not be reported publicly by some of these banks.

## 5. Results and Findings

This aim of this chapter is to analyse and discuss the findings and results of the study. A fixed effect panel data regression model was used in this study and STATA was the statistical tool that was used to run the tests.

### 5.1. Descriptive statistics

The table below shows the descriptive statistics. The table shows the different descriptive statistics - mean, std.dev, skewness, kurtosis, min and max. The data set included variables such as the NPL (the dependent variable) and the other variables which represented the broader macroeconomic variables, bank- specific variables and the consumer sentiment.

**Table 3: Descriptive Statistics**

Variable	Mean	Std.Dev	Skewness	Kurtosis	Min	Max	Obs
NPL	3.58	4.37	2.05	6.45	0.32	24.93	133
ROAA	1.72	1.83	1.72	5.73	-2.1	8.27	133
CTI	58.80	10.16	0.24	3.73	32.67	84.51	133
CAR	17.76	6.65	2.15	6.89	11.1	42.5	133
Bank Size	25.30	2.39	-0.49	1.66	20.58	28.14	133
INFL	5.30	1.53	1.08	5.02	2.06	10.06	133
GDP	1.10	2.89	-1.49	5.57	-6.96	5.60	133
Real IR	3.91	1.28	0.32	1.84	2.21	5.93	133

CCI	-6.41	43.63	0.42	2.66	-77	84	133
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Source: STATA output

The data have shown that the NPL ratio (*dependent variable*) averaged 3.58% amongst the sampled banks with a minimum and maximum of 0.32% and 24.93% respectively. The high NPL ratio is concerning as it implies that there was a period of high default on bank loans during the period of the study. The standard deviation value of 4.37 indicates low variation of the NPL ratio among the banks used in the study.

The macroeconomic variables used included inflation, GDP, and real interest rates. When analysing the GDP results, the standard deviation value of 2.89 indicates the low variability in the data set. The skewness is still within the -2 and 2 range which implies that GDP is also normally distributed.

The bank specific variables used included ROAA, CTI, CAR and the bank size. The ROAA had the lowest minimum of -2 and the CTI ratio has the highest maximum at 84.51. CTI has the highest standard deviation compared to other bank specific variables and this indicates that there is high variation of the CTI ratios amongst the banks. A lower CTI shows the bank’s ability to contain its costs while increasing their profits, the low CTI ratio results in the bank being more profitable (Galal, 2020).

The Consumer Confidence Index (CCI) was used as the sentiment variable. Compared to the macroeconomic and bank specific variables the CCI had the lowest minimum value of -77 and the maximum value was 84. The standard deviation for the CCI is higher than all the other variables and this indicates the high variability in the dataset.

## 5.2. Unit root test

The below table shows the results for the unit root test or stationarity.

**Table 4: Unit root test results**

Variable	Order of Integration	Chi-square	Level of significance
NPL	I(0)	34.02**	1%
ROAA	I(0)	53.21***	1%
CTI Ratio	I(0)	54.78***	1%
CAR	I(0)	61.49***	1%
Bank Size	I(0)	66.68***	1%
INFL	I(0)	76.23***	1%
GDP	I(1)	105.52***	1%
Real IR	I(0)	77.56***	1%
CCI	I(1)	132.39***	1%

Source: STATA output. \*\*\*, \*\*, \* indicates statistical significance at 1%, 5% and 10% levels

The results suggest that the variables are stationary and as such this implies that the variables have a fixed mean and variance over a period of time. All the variables except GDP and CCI are stationary at 1% level. GDP and CCI are stationary in first differencing.

### 5.3. Breusch Pagan (1980) LM test for random effects

**Figure 6: Breusch Pagan test**

```
Breusch and Pagan Lagrangian multiplier test for random effects

npl[bank,t] = Xb + u[bank] + e[bank,t]

Estimated results:

```

	Var	SD = sqrt(Var)
npl	16.35923	4.044655
e	1.380422	1.174914
u	3.633022	1.906049

```

Test: Var(u) = 0
      chibar2(01) = 39.84
      Prob > chibar2 = 0.0000

```

Source: STATA output.

Chibar2(01) = 39.84; Prob > Chibar2 = 0.0000

The p-value is less than 5% hence we do not accept (i.e., reject) the null hypothesis that the Pooled OLS model is appropriate.

### 5.4. Hausman test

**Figure 7: Hausman test**

```
Test of H0: Difference in coefficients not systematic

      chi2(18) = (b-B)'[(V_b-V_B)^(-1)](b-B)
              = 124.51
      Prob > chi2 = 0.0000
      (V_b-V_B is not positive definite)

```

Source: STATA output.

Chi2(18) = 124.51; Prob > chi2 = 0.0000.



The p-value is less than 5% hence the study uses the fixed-effect model for estimation.

### 5.5. Heteroskedasticity test

Given that the vce robust option in STATA was used to control heteroskedasticity, the heteroskedasticity test was not done.

### 5.6. Cross-sectional dependence

Pesaran’s test of cross-sectional independence= 1.443, Prob= 0.1489

The p-value is above 5% which indicates cross-sectional independence among the variables.

### 5.7. Multicollinearity

Multicollinearity was tested using the correlation matrix and the results are presented below. The results in table 4 below shows that the correlation coefficients are all below 0.7 which indicates the absence of multicollinearity.

**Table 5: Correlation Matrix**

Variable	NPL	ROAA	CTI Ratio	CAR	Bank Size	Inflation	GDP	Real IR	CCI
NPL	1.00								
ROAA	0.30*	1.00							
CTI Ratio	0.03	-0.47*	1.00						
CAR	0.67*	0.69*	-0.30*	1.00					
Bank Size	-0.27*	-0.24*	-0.39*	-0.28*	1.00				
INFL	-0.08	0.14	-0.22*	0.01	0.02	1.00			

<b>GDP</b>	-0.21*	0.14	-0.14	-0.12	0.08	0.30*	1.00		
<b>Real IR</b>	-0.03	0.05	0.04	-0.02	0.04	0.05	0.21*	1.00	
<b>CCI</b>	-0.10*	0.12	-0.09	-0.02	0.08	0.25*	0.49*	0.51	1.00

Source: STATA output

### 5.8. Empirical Results

The Hausman test results showed that the fixed effect model is the appropriate estimation technique in this study. The results from the fixed effect estimation are presented in table 6 below.

**Table 6: Empirical results**

Variables	Coefficient	Robust Standard error	T-statistics
Bank specific variables (Internal)			
ROAA	0.5070*	0.2285	2.22
CTI Ratio	-0.0149	0.0195	-0.76
CAR	-0.2722**	0.08333	-3.27
Bank Size	1.6065**	0.5407	0.014
Macroeconomic variables (External)			
Inflation Rate	-0.1233**	0.0457	0.022
GDP	-0.1877**	0.0445	0.002
Real IR	-0.173*	0.0819	0.061
Sentiment			
CCI	0.0045**	0.0018	0.029
Diagnostic statistics			
F (8,10)		33.87***	

R-squared	0.4925
-----------	--------

Source: STATA output

\*\*\*, \*\*, \* indicates statistical significance at 1%, 5% and 10% levels

When examining the coefficients in table 5 for **bank-specific variables**, the ROAA and the Bank size have a positive relationship and impact on the NPL as indicated in the positive coefficients of 0.507 and 1.6065 respectively. The other remaining bank-specific variables negatively impact the NPL. The results also indicate that all the bank-specific variables except the CTI have a coefficient of less than 0.05 which indicates that these variables are statistically significant. This implies that if there is a 0.5070 unit change (whether an increase or decrease) in the ROAA coefficient, the NPL will also change by 0.5070 in the same order. Several research papers that were quoted in the literature review of this study analysed the Return on Asset (ROA) as one of the bank-specific variables while this paper used the Return on Average Assets (ROAA). The results from table 5 contradicts the earlier findings by Bayar (2019) who identified a negative effect of ROAA on NPL. The study suggests that ROA had a negative impact on the NPL. The views of Bayar (2019) support the hypothesis on profitability. Given that ROA is seen as a profitability metric the results are aligned to the hypothesis and the author of this study accepts the hypothesis.

The other bank specific variables (CTI ratio and CAR) have a negative impact on NPL. CTI is not a significant variable as a determinant of NPL and the CAR ratio is significant. The CAR results support the earlier literature by Berger and DeYoung (1997) on the moral hazard theory. This implies that the increased NPLs are because of lower capital levels in a bank, if banks take on more risk with low capitalisation this leads to an increase in NPLs as explained by the negative impact output from table 5.

When examining **macroeconomic variables**, these variables all have a negative coefficient which indicates the negative impact on NPLs. Inflation rate and GDP are statistically significant, while Real IR is not significant given the higher p-value. The negative impact of Inflation contradicts the earlier literature by Polat (2018) which suggests that inflation has a positive impact on NPLs. This implies that when inflation increases, NPLs will most likely increase. The findings however

support the author's hypothesis on inflation (*hypothesis 1*) as it suggests that Inflation and NPL have a negative relationship. The results of GDP having a negative impact on NPLs is also in contradiction to a study by Saba and Kouser (2012), who concluded that GDP has a positive impact on NPL. The author's hypothesis on GDP (*hypothesis 2*) was supported by the results in Table 4.4. The hypothesis on GDP suggested that GDP and NPLs have an inverse relationship. The view regarding this hypothesis is on the basis that real GDP will often increase the household's ability to pay their outstanding debt and as such people will be able to meet their debt obligations. The results on the interest rates also contradict the adverse selection theory as stated by Atoi (2018) in the earlier literature. The researcher also suggests a similar theory to the adverse selection theory, therefore the results do not support the literature that increased interest rates could lead to higher NPLs, there is a positive relationship with interest rates and NPLs. The results could suggest a different outcome because the variable is insignificant as a determinant of NPLs.

The above bank-specific and macroeconomic variables are determinants of NPLs except for CTI and IR.

The results suggest that sentiment is statistically significant, and it has a positive impact on NPLs. The results are not in line with the hypothesis on consumer sentiment (*hypothesis 4*). The theories and studies on sentiment and NPL as a combined topic are limited and this paper aimed to contribute to the studies by analysing how consumer confidence drives NPLs. The CCI impacts NPLs as the consumers get impacted if there is low activity and macroeconomic challenges are high in the market. An example would be during Covid, if there is no confidence in the market this implies that there is high uncertainty in the market which then impacts the CCI. When there is low confidence in the market this could be because of various factors in the economy. The study by Duffy, et al. (2015) stated that periods of recession can result in the consumer confidence being low in the economy. The CCI proves to be significant as a determinant of NPL because when consumer confidence is low this may be due to increased interest rates and high unemployment rates. The increased interest rates and high unemployment rates could result in the consumer sentiments being negative and consumers could default on their loan obligations given the challenges in the economy. Some of these challenges could affect the consumers personal finances therefore making it difficult for consumers to meet their debt obligations.

### F-statistic

The estimated F-statistic p-value is significant at 5% level. This indicates that the model is statistically significant. This suggests that there is a relationship between the independent variables and the dependent variable

### R-squared

The R-squared value is 0.4925, this value is not too high and it is not too low. These results suggest that the model is a good fit.

## **6. Conclusion and recommendations**

This study examined the determinants of NPLs within the South African context. NPLs impact the balance sheet of the bank in various ways, and this has an overall impact on the country's economy and the overall consumer sentiment may change towards banks. The NPL ratio has been identified as a critical proxy for assessing how healthy a certain financial system is. In assessing the stability of a financial system, it is also important to understand the different key drivers of the NPL. The primary goal of the research was to investigate these key drivers and determinants of NPLs.

This study investigated the macroeconomic and bank-specific determinants of NPLs in South Africa. In addition, the study investigated whether consumer sentiment can be used as a determinant of NPLs. The study analysed the period from 1960 to 2020 using a panel data regression model. The bank-specific variables included the Return on average asset (ROAA), Cost to income ratio (CTI), Capital adequacy ratio (CAR) and Bank size. The macroeconomic variables included Inflation rate (INFL), Gross domestic product (GDP), Real interest rate (Real IR) and lastly the sentiment variable was the Consumer confidence index (CCI). The results confirmed that all other variables have a significant impact on NPLs except for CTI and real IR.

The results of the study revealed that with the bank-specific variables, CAR had a negative impact on NPL which could imply that if a bank has low capitalisation levels this could amplify the level of NPLs. The positive impact of bank size and return on asset could imply that as the total assets of the bank grow this will lead to lower NPLs. This is evidence of the assumption of "too big to fail" which could be detrimental to the bank as they could lend more given their big size and low NPLs.

The results of the macroeconomic variables reveal the negative impact of INFL and GDP on the NPLs. The negative impact of GDP implies that if GDP increases it becomes easier for debt payers to meet their obligations and as such this then leads to a decrease in NPLs. Lastly CCI had a positive impact on NPL which implies that if CCI is high, consumers will most likely take on more

debt and over time the NPLs will increase as a result. The challenge with the CCI is that it may be applicable to certain variables given its power in explaining the confidence relative to a specific variable, such as house related variables and goods consumed. However, this study assessed CCI as this variable can highlight the significance of NPLs as the overall consumer confidence in the market can explain the behaviour of whether customers meet their debt obligations during different economic cycles. CCI has shown that it is influenced by the economic environment, and it can therefore have an impact on NPLs.

Given the results of this study and others, it is evident that these variables may be different for each country. Several variables would be determinants of NPLs and others not as this could also depend on the time frame analysed. For future research, it would be interesting to understand whether higher loan loss provisions could eliminate the risk of higher NPLs. An analysis on the loan types with high NPLs would be an interesting point to investigate as this could help in determining whether additional measures need to be taken by banks in reducing these NPLs. During the 2020 Covid-19 period banks in South Africa took extra precautionary measures during a challenging economic period and as a result, banks were able to weather the storm and keep NPLs low. The NPL data may be lagged given that the reported information is only annual; hence, future research papers can also assess early warning triggers which can be standardised across different countries and economies. This early warning trigger can be a proxy that credit analysts or managers can use in detecting NPLs and this could be a helpful proxy to many other banks, so they are able to detect which banks are at risk of reporting higher NPLs by the end of their financial reporting period.

The study used data from different time frames, the macroeconomic variables had data from the year 1960 and the bank-specific variables had data from the year 2006 for some variables, some banks only had data for the past three years only as some of these banks are new entrants in the market. The data for the bank specific and macroeconomic variables was annual however the data for the sentiment (the CCI) was quarterly. The data for sentiment had to be converted into annual data as this would solve the limitation of working with different data sets. The bank specific

variables only have annual data because banks do not publish their financial results quarterly and some do not publish semi-annual data. These were some of the limitations in the study, Further research papers can investigate the predictability of NPLs using consumer sentiment data and other variables which can help banks in predicting NPLs ahead of time.



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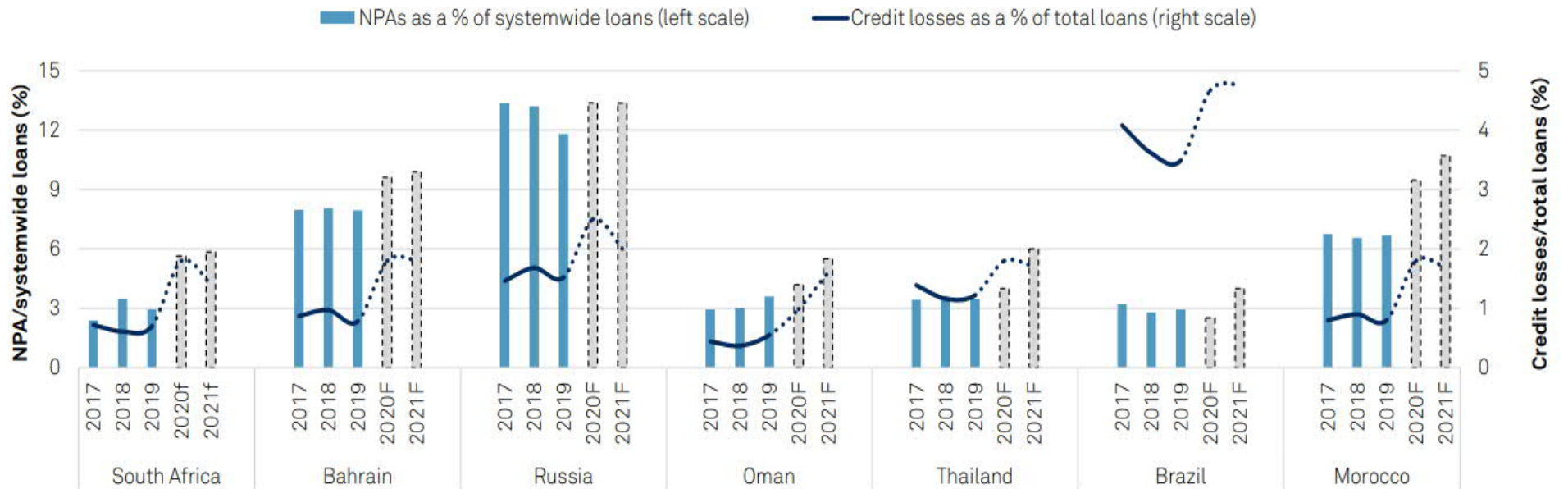
<https://doi.org/10.3390/su12010325>.



## ANNEXURE A

**Figure 8: South African Banks’ asset quality compared with peers**

### South African Banks’ Asset Quality Is Adequate, Compared With Peers



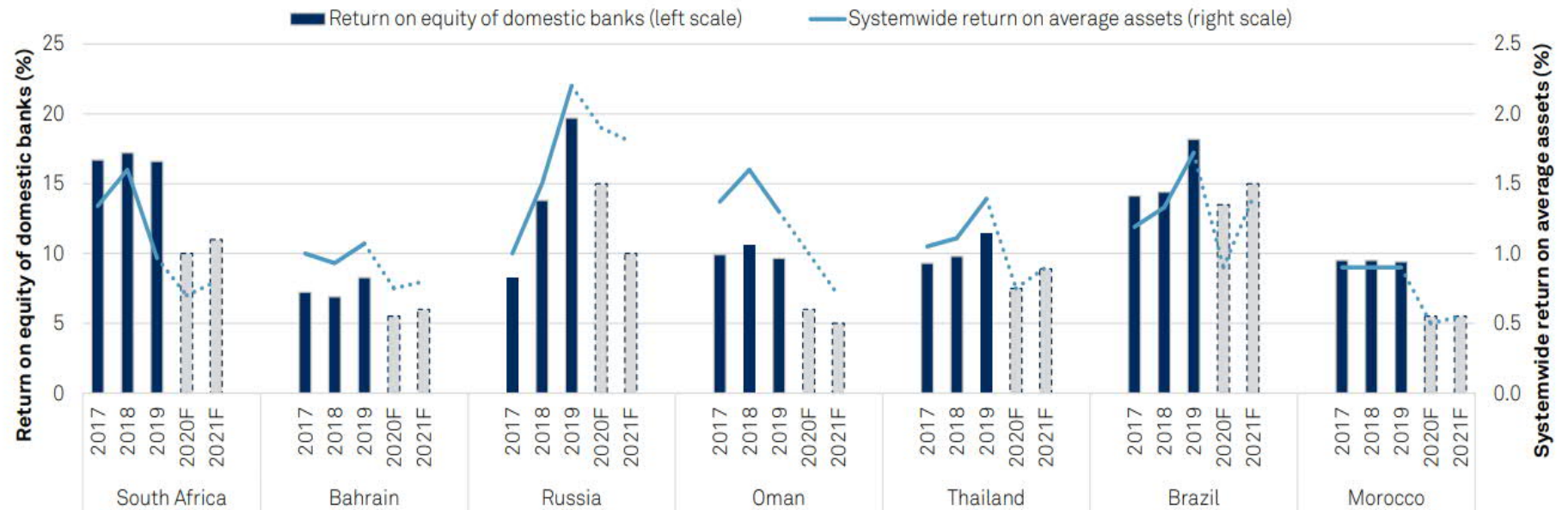
NPA: Non-performing assets, F= Forecast'

Source: S&P Global Ratings- (Mensah, et al., 2021)



**Figure 9: South African Banks' profitability compared with peers**

**South African Banks' Profitability Shows A Similar Pattern To Peer Banking Systems**



F= Forecast

Source: S&P Global Ratings- (Mensah, Barsdorf, Tribhowan and Young (2021))