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Determinants of Non-Performing Loans and their impact on profitability in South African banks

A research project submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Management in Finance and Investments

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Abstract

The study aimed to examine the determinants (macroeconomic and bank specific) of non-performing loans in South Africa and assess the impact of non-performing loans on banking profitability. It has been demonstrated by the above statistics that South African banks are facing bad loan debt repayments which in turn turns into non-performing loans. Although it can be argued that the level of non-performing loans in South Africa is relatively low, the level of bank credit impairments threatens bank stability in the economy. The study was based on the cointegration and Granger causality method which was applied to panel data drawn from a sample of 8 banks. The granger causality test indicated that no variable Granger causes non-performing loans although non-performing loans granger caused GDP and capital adequacy. Furthermore, the Granger causality test indicated that non-interest income to total income Granger causes return on assets. Therefore, non-interest income to total income is a significant determinant of bank profitability as measured by return on assets.

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Chapter One

Introduction

1.1 Introduction

Traditionally, almost all banks survive on interest income (loan issuing) in the banking industry and this is generally the way banks make money. It was argued by Mac Donald, Scott and Koch (2010) that loans are the backbone asset that contribute about 75% of the total income that banks can generate and constitute banks greater risk exposure. It then follows that if 75% of a bank's assets are loans, a default in payment of these loans would affect a bank's profitability. This study aims to investigate the determinants (macroeconomic and bank specific) of non-performing loans and the impact of non-performing loans on bank profitability in South Africa. The exact determinants of non-performing loans remain unclear in the context of the banking industries as it is highly anchored by different banking regulations and economic conditions across the globe. However, the existence of non-performing loans has been a major public policy issue that has caused a lot of frustration not only in the banking sector but also across economies at large (Negera, 2012).

The past research including Bayar (2019), Etale et al. (2016), Rifat, (2017), Syed and Tripathi (2019), Johnson (2018) and Kingu et al. (2018), had mixed findings in respect to the determinants of non-performing loans across the globe. Bloem and Freemam (2005) postulated that a non-performing loan is any loan in which interest and principal payments are more than 90 days overdue. The Basel Committee (2004) argued that non-performing loans are loans left unpaid for a period of 90 days. The idea behind non-performing loans is that they must be minimised in order to maintain profitability within the banking sector. In order to keep track of this position, a clear understanding of the determinants in South Africa has to be known as it forms the rationale and contribution of this study.

The present research project is based on identifying and analyzing, in a quantitative way, the determinants of non-performing loans, and their impact on profitability in South African

banks. This is done by compiling the information from financial statements hence enter in a data matrix in the establishment of determinants of non-performing loans and their impact on profitability. Chapter one constitutes an introduction to non-performing loans and profitability in which the objectives are set, the investigation is justified and the variables and the population to be analyzed are fully detailed; Chapter two is marked by the theory that encompasses the research, which allows literature review to identify the concepts and theories that support the present work, and finally, in the last three chapters, the development and analysis of the hypothesis proposed as research is defined in which it is possible to determine determinants of non-performing loans and their impact on profitability.

1.2 Background to the study

A criticism that has been made for several years to banks established in South African is that they do not increase the volume of credit they grant to society. This criticism has become more pronounced as a result of the low economic growth achieved by the country from the international financial crisis that began in 2008 (Shaikh et al, 2018). One of the possible explanations for the credit restriction maintained by the banks is that, given the current systems of identification and qualification of credit applications, the delinquency rate of borrowers becomes a variable that negatively and significantly impacts the profitability obtained by banks (Fatoki, 2015). If this is so, banks tend to make the allocation of credit very selective, in order to limit the growth of the delinquency rate as much as possible and thus not see their profitability adversely affected.

An efficient banking system supports the operation and growth of companies, as well as the formation of new businesses and, in a broad sense, can contribute to economic growth and development (Nyasha & Odhiambo, 2015). However, this potential driver of the economy does not always work well, since banks sometimes restrict credit too much or, in other cases, they incur risks that can affect their performance. In particular, credit risk is a fundamental factor in bank profitability, since non-performing loans represents one of the main causes of a bank's economic failure, and, according to Nyasha and

Odhiambo (2015), crises banking tends to start when credit risk problems become widespread. The deterioration in the quality of banks' loan portfolios has been the main cause of difficulties in banking systems and of economic and financial crises in developed economies (Padayachee, 2014). Indeed, the proliferation of mortgage loan defaults in South Africa underlines the links between macroeconomic and financial shocks as well as the relationship between the frictions of the credit market and the risk of financial instability.

Non-performing loans have been widely used as a measure of asset quality by lending institutions and have often been associated with the presence of bankruptcy risk and financial crises, both in developed and developing countries. These are considered to be a statistically significant leading indicator of insolvency (Mutezo, 2013). Most banking institutions often have a significant level of bad debt before the time of distress. Non-performing loans are among the main causes of the problems of economic stagnation (Kuutol, 2017). The presence of these loans these problem loans in a financial industry increases the possibility of having a troubled and unprofitable business. In this case, "irradiating" NPLs is a sine qua non for improving economic conditions. If problem loans are in existence and kept permanently, they have an impact on resources which would be locked in unprofitable areas. Thus, they are likely to hamper economic growth and reduce economic efficiency.

Financial system shocks can stem from macroeconomic imbalances, that is, systemic shocks. In general, research adopted on developed economies has confirmed that macroeconomic conditions affect credit risk (Mutezo, 2013). In the beginning, this research work aims to know the explanatory factors of the quality of the loans granted by the bank, more precisely the non-performing loans order to be able to supervise them. These factors can be macroeconomic or bank-specific variables.

For years, banks in Africa have faced a large number of NPLs without structurally damaging their books. Averaging 11.9% over the past decade, NPL in Africa is three times the global median and is expected to increase significantly in the wake of the Covid-19 pandemic. In Kenya, the seven largest banks restructured loans for $ 1.6 billion in late

April, according to the Central Bank of Kenya (CBK). NPLs are expected to potentially double from 2019 levels at the end of paid holidays, while increased provisioning needs, reduced business generation and pressure on margins could erode growth and profitability of banks (Mpofu & Nikolaidou, 2019). The increasing pressure on African governments caused by the coronavirus pandemic is also weighing on banks, as solvency was "inextricably linked" to the financial strength of the government in the country where the lenders are based.

According to the data for South Africa from 2008 to 2019, the average value for South Africa during that period was 3.97% with a low of 2.84% in 2017 and a high of 5.94% in 2009. The last value of 2019 is 3.89%. For comparison, the global average in 2019 based on 100 countries is 6.01%. The percentage of bad loans in South Africa reflects the health of the banking system. A higher percentage of these loans show that banks have difficulty increasing the interest and principal on their loans. This could lead to lower profits for banks in South Africa and possibly bank closures (Mpofu & Nikolaidou, 2019).

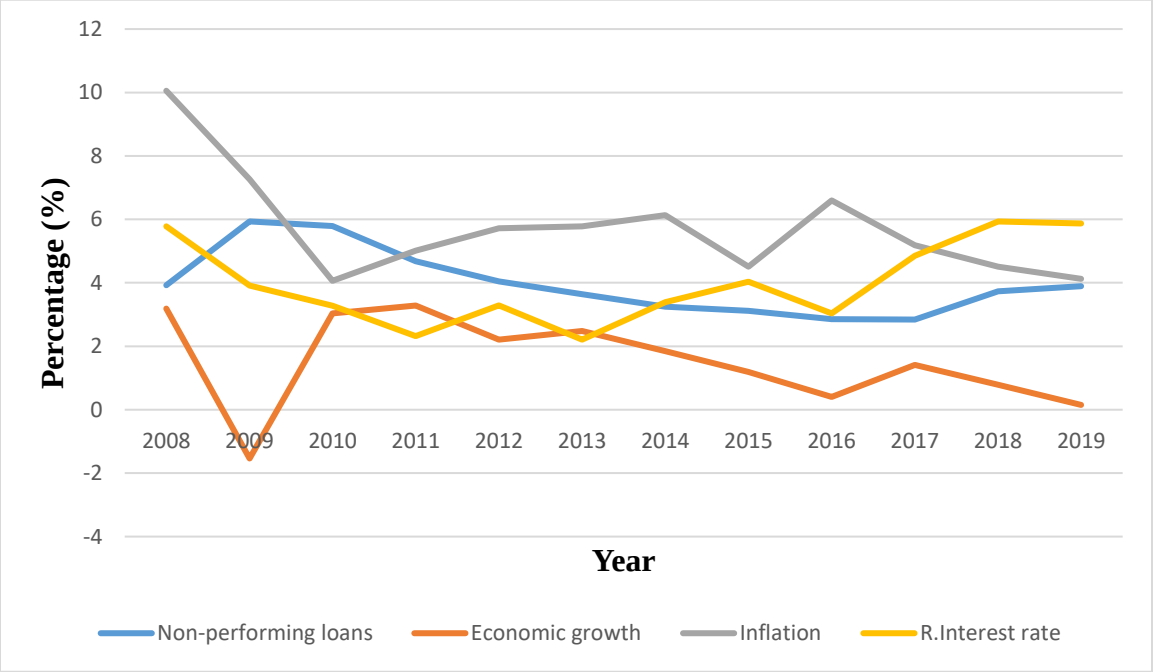


Figure 1: Variable trends (Source: World Bank, 2020).

Figure 1 shows the trend of non-performing loans in relation to macroeconomic variables that is real interest rates, inflation and economic growth for the period 2008 to 2019. Figure 1 shows that non-performing loans declined from the period 2009 to 2017 and rose from 2017 to 2019 which was corresponded with the decline in economic growth from

2010 to 2019. From figure, it can be noted that the general trend of inflation was decline whilst real interest rate remained fairly stable from 2008 to 2019.
After the global financial crisis of 2007/08 African economies continued to struggle with non-performing loans (IMF, 2009). Non-performing loans in Africa are three times higher than their median and have averaged at 11.9% over the past decade (Njirani, 2020). Seven banks in Kenya restructured loans amounting to 176 billion Kenyan shillings as of April 2020 (Juma, 2020). Kenyan industry projected non-performing loans to be 14% from 12.5% as the pandemic is causing significant pressure on cash flows of banks.

According to the World Bank (2018), South Africa's level of non-performing loans to gross loans was reported to be 3.728% for the year 2018. PWC (2019a) postulated that South Africa's non-performing loans to gross loans stood at 5.010% as at July 2020. This shows a rise in NPL levels and it is further predicted that aggregated level of NPLs could rise to an all-time high of 10% by the end of 2020 which surpasses the 6% level experienced during the 2008 financial crisis (Rumney, 2020). The continued rise in NPLs affects bank profitability as it means banks are not generating income from issued loans. Therefore, the need to understand what is driving the NPL levels up in South Africa has become imperative.

Further to this, Moody's has downgraded the South African outlook and rankings of top four banks to negative outlook and this was highly anchored by a weakening credit profile of the country's banks (Moody's, 2020). Banks have grown their loan books and have had to write-off more bad debts as there has been a rise in NPLs. NPLs reflect the asset quality of a bank and play a vital role in depicting a bank's credit profile and financial performance (Panta, 2018), hence a rise in NPL quantities translates into a bad credit profile and financial performance. Moody's projected a decline of the South African banking systems on loan ratios over the next 12 to 18 months (Moody's, 2020).

It is argued by PWC (2019a) that the big four banks and the financial sector in South Africa at large were not spared from the bruises of the stagnant economy. Nedbank was the worst performer in respect to earnings and stood at 7% decline for the financial year

f2019 compared to 2018. Standard bank and Absa reported a growth of 1% each in earnings while FirstRand stood above the pack with 5% growth in earnings. The aggregated figure of the four big banks grew by 2.1% of earnings in 2019 compared to 8.7% growth in 2018. Nedbank group's non-performing loans moved to 3.6% from 3.5% during the first half to the second half of 2019 (PWC, 2019b). Nedbank's credit impairment jumped to 66% as at December 2018, while Absa grew by 24%, FirstRand had a 47% credit impairment in personal loans (PWC, 2019b). Standard bank recorded a 23% rise in credit impairment during the same period. This is a clear indication that banks have grown their loan books substantially as bank customers (borrowers) are not coping with their debt repayments and if not properly handled all these might lead to non-performing loans.

It is against this background that this study seeks to establish empirically the determinants of non-performing loans and their impact on profitability in South African banks.

1.3 Problem Statement

It has been demonstrated by the above statistics that South African banks are facing bad loan debt repayments which in turn turns into non-performing loans. Although it can be argued that the level of non-performing loans in South Africa is relatively low, the level of bank credit impairments threatens bank stability in the economy. It is against this background that the study intends to investigate the determinants of non-performing loans in South Africa.

It is also important to note that from a public policy standpoint, the banking and financial sector is one of the key drivers of the South African economy, hence any disturbance that affects this sector negatively no matter how small is worthy to be scrutinized. In the same manner, it must also be proven beyond any reasonable doubt whether determinants of non-performing loans in South Africa are more of macroeconomic or bank specific determinants. The study also exposes the impact of non-performing loans on bank performance. This provides the study a stable ground to investigate the determinants of NPLs and the impact NPLs have on banking profitability in South Africa.

1.4 Objectives

The study considered the following objectives:

- To examine the determinants (macroeconomic and bank specific) of non-performing loans in South Africa.
- To assess the impact of non-performing loans on banking profitability.

1.5 Significance of the study

1.5.1 Banks

This study is of great importance to banks and all financial intermediary players as it sheds more light on the decisions the banks should take to hedge against the risk and loss of non-performing loans. Both local and foreign bank owners would be aware of which steps to follow for them to attain high level of interest income, which in turn should enhance a stable and sound banking environment.

1.5.2 Regulator

The Reserve Bank of South Africa as the bank regulator should be in a clear position to know which area their focus and attention should be directed to as far as bank and financial sector regulation is concerned. From a public policy standpoint this study addresses a relevant and very crucial issue in the banking sector's perspective, and this should help the financial sector in the creation of a stable and level playing ground to ensure banking sector safety and soundness. It is from the results and recommendations of this study that the regulator would be aware of the main determinants and the macroeconomic impact of non-performing loans in the South African rainbow nation.

1.5.3 Academics

Members of the academia would find this thesis very vital as it contributes to the body of literature. It is of best knowledge to the researcher that there is no study in South Africa that has paid attention on investigating both the determinants and macroeconomic impact considering 4 big banks in South Africa. At the same time, there is no study that has also considered the contribution of non-performing loans on economic growth and development in an African context considering a both a time series and panel approach.

1.5.4 General Public

This research is of great importance to the general public as they should know how the banks are making money because people keep their money in those banks, so this paper serves a way for them to better know whether actions taken by banks are sustainable and whether this bank would survive in the long run. It can be unfortunate if a bank fails in the long run with depositor's funds since the general public would suffer the most as thousands of people would loose their monies. This was evident during the global financial crisis of 2007/08. The customer's knowledge of how the bank is making money (interest income) and operating can increase customer's confidence in the banking sector, and this enhances the growth, productivity and development in the economy.

Chapter Two

The section below covers the empirical review that is analysis of previous studies that were conducted on the impact of non-performing loans on profitability. The section aims to also explore the theoretical overview of the study. The theoretical review covers theories relevant to the study, theory related to determinants of NPLs as well as theories related to factors which impact bank profitability.

2.1 Empirical Literature Review

A GMM dynamic panel analysis was employed in Turkey by Bayar (2019) and demonstrated that economic growth, economic freedom, inflation, return on equity and assets, non-interest income to total income and regulatory capital to risk weighted assets had an inverse relationship with non-performing loans. Public debt, unemployment, credit growth, cost to income ratio, lagged value of non-performing loans and financial crisis had a direct association with non-performing loans. Škarica (2013) also arrived at the same conclusion as Bayar, (2019) for his investigation which explored the macroeconomic determinants of NPLs in 7 in the East and Central Europe. He captured quarterly data from periods 2007-2012 and found that unemployment rose the growth of NPLs increased while real GDP had the opposite effect on NPLs.

Syed and Tripathi (2019) considered the BRICS economies in analyzing the impact of macroeconomic determinants of non-performing loans using a Fully Modified Ordinary Least Squares (FMOLS) approach. The paper confirmed that unemployment had a direct relationship with non-performing loans while growth and financial soundness and savings by households posted a negative association. Inflation reflected an inverse relationship with default loans. A study from Fofack (2005) contracted the above findings, Fofack (2005) found a positive relationship between NPL levels and inflation on a study focused of Sub-Saharan African countries. Inekwe, (2010) supplied another result in his study which focused on the effect of inflation on NPLs in the Nigerian banking industry which stated there was no significant relationship between inflation and NPLs during the 15 year focus period using the Person Moment Correlation model. However, (Tsumake, 2016) provides evidence of a significant relationship between inflation and NPLs amongst other

macroeconomic variables in her 2016 study which focused on the Botswana banking industry during the 2005 to 2014 period.

In Bangladesh, Rifat (2017) supports Inekwe's (2010) result with regards to the inflation and NPL relationship, he used a panel data set approach and postulated that firm specific (loan growth, return on assets, loan to asset ratio and relative size of firm) were considered more significant determinants of non-performing loans. Amongst macroeconomic determinants (GDP growth rate, broad money supply and inflation) only money supply was found to have significant impact on non-performing loans.

An Ordinary Least Squares regression technique that incorporated the Fixed and Random Effects was used by Kingu et al. (2018) in Tanzania and forwarded that there was an inverse relationship between non-performing loans and commercial bank profitability. The study results were anchored by information asymmetry theory as well as bad management hypothesis. Similarly, Joel (2018) in Ghana considered a panel of 10 banks and the study concluded that there was a significant inverse association between non-performing loans and return on assets for local banks. In the same manner, there was also a significant positive association between non-performing loans and net interest margin for both local and foreign banks. However, a similar study conducted on the Nigerian banking industry by Adebisi et al. (2015) indicated contracting results to those of Joel (2018) and Kingu et al. (2018). Adebisi et al. (2015) found that there was no significant relationship between ROE and NPLs when using a regression statistical tool during periods 2006 to 2012.

Etale L, Ayunku and Etale E (2016), made use of multiple regression techniques in Nigeria and revealed that bad loans (BAL) and doubtful loans (DOL) had a negative statistical significant impact on return on capital employed (ROCE) while sub-standard loans (SUL) were confirmed to have an insignificant negative influence on return on capital employed. The findings implied that a higher level of non-performing loans in Nigeria would reduce the performance of banks in the long run.

2.2 Theoretical Review

Several theoretical frameworks on the NPLs acknowledge and concluded that macroeconomic and bank specific determinants do impact NPLs (Sheefeni, 2015). Mpofu (2019) identified the following bank specific determinants namely, Gross Domestic Product (GDP), Return on Equity (ROE), Return on Assets (ROA), total liabilities to total assets ratio, unemployment rate, public debt, inflation, broad money, lending interest rate and domestic credit to private sector by banks. His findings were that NPLs decrease when GDP,ROE, ROA, total liabilities to total assets ratio decrease and that NPLs increase unemployment rate, public debt, inflation, broad money, lending interest rate and domestic credit to private sector by banks increase (Mpofu, 2019).

In general commercial banks are known to be intermediaries in terms of them accepting deposits from customers and using the deposits to provide loans to other customers hence Gezu (2014) contests client deposits are what facilitates bank loans and that this explains the positive correlation that exists between client deposits bank lending. This is what accounts for most risk in a bank as the loans become an important source of income and this carry a high degree of possible default if the borrower does not repay the interest or the loan itself. According to Sheefeni (2015) when an issued loan does not receive the interest due for an extended period of time, it automatically get classified as an NPL.

Further to this, bank failure in the past due to insolvency has been linked with large quantities of NPLs (Fofack, 2005). In addition to this, (Noman et al., 2015) noted that failure to decrease quantities of NPLs may result in bank failure. (Caprio & Klingebiel, 1997) stated that of the 60 banks that failed in the Indonesian financial crisis in 1997, NPLs contributed about 75%. NPLs erode a bank profits since they decrease a bank's interest income and capital (Kingu et al., 2018). It is therefore largely accepted that NPLs are determinants of bank profitability as high levels of these adversely impacts a banks bottom line via bad loans being written off and provisions being made for these bad loans (Baudino & Yun, 2017). An empirical study conducted by (Ombaba, 2013) as well as (Kithinji, 2010) both evidenced a positive correlation between low profitability and high quantities of NPLs in banks.

The theoretical aspects that cultivated this research are the information asymmetry theory, moral hazard, adverse selection and bad management hypothesis.

2.2.1 Information asymmetry

Information asymmetry theory explains a case where it might be hard to tell good borrowers apart from bad ones as a result of inadequate information held by the lender (Sheefeni, 2015). In this instance, the borrower would have complete information about the transactional while the lender does not therefore might make an incorrect decision about issuing the loan of the terms of the loan (Kingu et al., 2018). This leads to moral hazard and adverse selection issue and eventually increased quantities on NPLs since incorrect or inadequate information was used to determine the loan outcome (Ombaba, 2013).

2.2.2 Moral Hazard

The moral hazard stipulates that unless there are serious repercussions to credit defaulting, a borrower would have an urge to default (Weber, 2014). The difficulty lenders face in assessing the borrower's wealth, makes it easier for a borrower to opt to default (Ombaba, 2013). Therefore, in response to this risk, lenders typically increase lending rates and thus making it more expensive for the borrower to repay the loan. This eventually leads to increased quantities of NPLs as high interest rates foster higher loan repayments and if these repayments are not met, NPLs would rise (Chege, 2014).

2.2.3 Adverse Selection

The transparency of a borrower when it comes to giving all their information to banks can reduce adverse selection (Kingu et al., 2018). This helps the bank make informed and optimal credit decisions and could reduce handing over of credit to likely defaulters (Ombaba, 2013). Adverse selection has led to greater levels of NPLs in banks which is a direct result of information asymmetry (Sheefeni, 2015).

2.2.4 Bad Management Hypothesis

The Bad Management Hypothesis states that while banks try to manage the increase in NPL levels caused by adverse selection, management tends to put in more resources/money towards monitoring and managing these (Kingu et al., 2018). This in turn leads to an increase in operating costs over and above the interest income generated, thus the cost to income ratio of a bank would be higher (Trujillo-Ponce, 2011). The rise in the ratio is indicative of bad management decisions with regards to managing and controlling of their loan books (Özguler & Vardar, 2015). We thus presume that a negative relation exists between ROA (bank profitability proxy) and NPLs.

2.3 Determinants of NPLs

2.3.1 Macroeconomic Determinants

2.3.1.1 Interest Rates

An increase in lending interest rates generally increases the value of a loan, making it more expensive to repay. Hence, banks that charge higher lending rates have a greater chance of experiencing a rise in NPL levels as explained by Viswanadham (2015). Numerous studies have evidenced that a positive relationship exist between NPLs and lending interest rates. A Malaysian Islamic banking sector study by Adebola, Yusoff and Dahalan (2011) investigated the determinants of NPLs during the 2007 to 2009 period and found that interest rates and NPLs do indeed share a positive relationship. These are same results found by Waweru & Kalani (2014) in Kenya which evidenced that higher interest rate charges do lead to higher NPL levels. Similarly, Touny (2015) investigated this association in selected Arab countries and found the same relationship of interest rate and NPLs in petroleum and non-petroleum supplying countries. Likewise, Tanaskovi and Jandri (2015) studied rendered similar results however, they additional stated that interest rate increase can lessen a borrower's affordability to repay loans, more so if the loan is variable interest rate contract.

2.3.1.2 GDP and Unemployment

GDP is known to be a measure of value of goods produced and service rendered within a particular country during a specified period (Herdreen, 2019) while unemployment is known as a term describing people who are employable and are actively seeking employment but are not able to find jobs (International Labour Organization, 2013). Based on the definition on unemployment, a positive relationship should exist between unemployment and NPL levels due to the fact that the more unemployed people with loans at banks we have, the greater the chances of default since unemployed people cannot afford to make loan repayments as they have no income. Since the level of economic productivity (GDP) decrease when unemployment rises (Sanchez, 2012) we therefore expect GDP to have an inverse relationship with NPLs. (Viswanadham, 2015) establishes that indeed an inverse relationship between GDP and NPL levels exist and deduces that if GDP levels of a country were to improve/increase, NPL quantities should drop. This is also acknowledged by (Tanaskovic & Jandric, 2015) who found a negative relationship between GDP and the NPL ratio.

2.3.1.3 Inflation Rate

Inflations is regarded as a general change in price levels which is measure using the consumer price index (CPI). There exists a positive relation between NPLs and inflation rates as when prices go down, the bottom line of the bank goes down and return on assets. Fofack, (2005) also evidenced this in his studies which found that inflationary pressures have added to the increased level of loan impairments in numerous Sub-Saharan African countries. Increased inflation thus pushes interest rates upwards and this has a knock-on effect on NPLs.

2.3.2 Bank Specific Determinants

2.3.2.1 Capital Adequacy

Capital adequacy is a tool used to manage risk taking behaviours of banks in terms of it promotes optimal risk sharing between banks and its depositors (Tsumake, 2016). Capital

adequacy ratio calculates the amount of capital a bank stores relative to its risk. Banks with high capital levels are able to withstand credit risk in times of economic downtime therefore a negative relationship between NPLs and capital adequacy should exist (Rehman et al., 2019). According to Munialo (2014) NPLs are inversely influenced more by bank specific determinants, then main one being capital adequacy.

2.3.2.2 Return on Assets

Since ROA is a proxy for bank profitability, it is expected that an increase in NPL quantities would drive profitability down, hence ROA. Return of Assets is measured by taking total asset over net income (Kingu et al., 2018).This negative relationship between the two variables has been evidenced by several studies. Sheefeni's, (2015) being one of those who found they are more reluctant to issuing risky loans. Joel (2018) also reported the same inverse correlation between the two variables which was further supported by Makri, Tsagkanos & and Bellas (2014). Mpofu (2019) also echoed the same and noted that this negative relationship between NPLs is valid, therefore when NPLs increase ROA would decrease and vice versa.

2.3.2.3 Loan to Deposit

The loan to deposit ratio determines the amount of loans issued to deposits received from customers (South Africa Reserve Bank (SARB), 2008). If more loans are issued as compared to deposits received, this poses a financial risk to the company as loans are prone to becoming NPLs. The more loans granted the greater the chance of default there we expect a positive relationship between NPLs and loans to deposits (Makri, Vasiliki ; Tsagkanos, Athanasios ; Bellas, 2014). Therefore, an increase in the ratio increases the quantity of NPLs.

2.4 Factors influencing bank profitability

ROA is used as a proxy of bank profitability are the below table summaries how variables employed in the study should impact ROA.

Table 2.1: Illustration of how ROA (bank profitability) is impacted by macroeconomic and bank specific variables

Symbol	Name	Expected Sign
NPL	Non-performing loans	-
GDP	Gross Domestic Product	+
INT	Interest rates	+
CAP	Capital Adequacy	+
LTD	Loan to Deposit	+
CTI	Cost to Income	-
NIITI	Non-interest income to total income	+

The above table 2.1 illustrates that a negative relationship is expected between NPL levels and bank profitability, this is generally because the more loan defaults the less bank earn income on those loans. Further to this the figure shows a positive relationship is expected between GDP, INT and ROA mainly because banks earning interest of loans if interest rates go up, they earn more interest and because an economic upswing positively enables banks to generate profits. In addition to this the more bank capital a bank keeps in terms of the capital requirements the more immune it becomes to insolvency/risk and hence issues with profitability. The loan to deposit also has a positive relationship with ROA as the more loans a bank issues the more it's prone to generate income on the loans even though the risk of default also rises. Looking at the last two variables there is an inverse correlation between ROA and CTI but a positive relation between bank profitability a NIITI. As banks generate more income from services, advisory services etc. the more they profitability increase whereas if there costs relative to income increase profitability would be negative affected.

Chapter Three

This chapter addresses how the research objectives and questions were addressed. The methodology section unpacked the statistical tools, data characteristics, variables involved in the model, diagnostic tests as well as the econometric software package to be applied by the study. This section also provided the general framework in finer details upon which the study followed.

3.1 Research Design

For the research to reach its desired destination, quantitative analysis is the type of the research design that was used by the investigator. Quantitative approach was the better preferred approach as it did not provide room for result subjectivity compared to qualitative approach. To estimate the relationship that exists between model's endogenous variable and its explanatory variables, the study utilized an econometric model. This model catered for the determinants and the impact of non-performing loans on profitability in South African banks.

3.2 Research Population and Sampling

This study made use of a sample of 8 banks that that are listed on the Johannesburg Stock Exchange (JSE) which is made up of the big 6 banks by market capitalization. Purposive sampling under Non-Probability sampling method was utilized in the selection of 8 banks (Standard Bank, Nedbank, ABSA, Capitec, Investec, African Bank, Bidvest and First National Bank) in South Africa to form a panel.

3.3 Data Presentation and Analysis

The study collected secondary data from the World Bank, Bloomberg and Reserve Bank of South Africa websites. Annual bank and macroeconomic data set which covers the period 2008 to 2019. Both descriptive and inferential statistics were employed in data analysis using econometric software packages (E-views 11). Various econometric diagnostic tests were also considered using the collected data.

3.4 Econometric Model

The study used of an econometric model in its investigation on the determinants of non-performing loans and their impact on profitability of South African banks. Econometrics

borrows its rationale from pure economic theory, mathematics and statistical inference in the determination of the market behaviors through finance and economic fundamentals. This approach ascertains the relationship and impact that exists between the models endogenous and its exogenous variables. The idiosyncratic error term of an econometric model captures other factors that explains the endogenous variable but have not been included in the model's explanatory variables (Gujarati, 2004). For this reason, economists and econometricians boost and consider this method of analysis as a robust approach. This research paper utilized the cointegration and Granger causality techniques to ascertain the determinants of non-performing loans and their impact on profitability.

According to Gujarati (2004), the major problem of most data is that it contains unit roots and various estimation techniques are not appropriate. There are two kinds of empirical studies, one that assumes stationarity of data and apply the ordinary least squares method and the other category which acknowledges non-stationarity of data and applies cointegration and granger causality (Magazinno, 2012).The cointegration and Granger causality techniques were used to mitigate against the unit root that may be present in the data.

3.4.1 Cointegration

After the determination of the stationarity properties of the variables, it is important to establish whether a long run relationship between variables exists (Paparas & Stoian, 2016) Cointegration refers to a situation where variables move together in the long run although deviations can be present in the long run (Magazzino, 2012). Coinegration implies that the linear association between variables (residual) is stationary at level although the variables may be integrated of different orders (Nkoro & Uko, 2016).

Cointegration shows the association between variables but it does not show which variable causes the other (Magazzino, 2012). This is supported by the notion by Gujarati (2004) that association or correlation of variables does not imply causality. Therefore, cointegration is a necessary but is not a sufficient condition to show causality. If variables are not cointegrated, the Granger causality is modelled as a Vector Autoregressive Model and in contrast if there is cointegration, Granger Causality is modelled as a Vector Error

Correction Model (Nkoro & Uko, 2016). The model is based on panel data hence the panel cointegration technique was used.

3.4.2 Granger Causality

It is argued by Granger (1969) that if a variable is assisted in its prediction by the past values of another value then they can be a conclusion that granger causality is present. This is a statistical approach that takes place between the model variables from the regress and up to the regressor variables and centers their arguments on the prediction principle. Granger (1969) forwarded that if variable A assists in the prediction of variable B, then this means the past values of variable A should also contain information that can help to predict variable B on ahead of the information contained in the past values of variable B itself. Granger causality has a feedback effect in that variables can have a reverse effect that is granger causing each other. However, some cases may have one-way causation depending with variables.

The study adopted the Granger causality model as specified by Gujarati (2004) as follows:

Model 1

$$NPL_{it} = \phi_2 + \Sigma \boldsymbol{\beta_0} NPL_{it-j} + \Sigma \boldsymbol{\beta_1} GDP_{it-j} + \Sigma \boldsymbol{\beta_2} INF_{it-j} + \Sigma \boldsymbol{\beta_3} UNE_{it-j} + \Sigma \boldsymbol{\beta_4} INT_{it-j} + \Sigma \boldsymbol{\beta_5} CAP_{it-j} + \Sigma \boldsymbol{\beta_6} ROA_{it-j} + \Sigma \boldsymbol{\beta_7} LTD_{it-j} + \mu_{it-j}$$

$$GDP_{it} = \phi_2 + \Sigma \boldsymbol{\beta_0} GDP_{it-j} + \Sigma \boldsymbol{\beta_1} NPL_{it-j} + \Sigma \boldsymbol{\beta_2} INF_{it-j} + \Sigma \boldsymbol{\beta_3} UNE_{it-j} + \Sigma \boldsymbol{\beta_4} INT_{it-j} + \Sigma \boldsymbol{\beta_5} CAP_{it-j} + \Sigma \boldsymbol{\beta_6} ROA_{it-j} + \Sigma \boldsymbol{\beta_7} LTD_{it-j} + \mu_{it-j}$$

$$INF_{it} = \phi_2 + \Sigma \boldsymbol{\beta_0} INF_{it-j} + \Sigma \boldsymbol{\beta_1} NPL_{it-j} + \Sigma \boldsymbol{\beta_2} GDP_{it-j} + \Sigma \boldsymbol{\beta_3} UNE_{it-j} + \Sigma \boldsymbol{\beta_4} INT_{it-j} + \Sigma \boldsymbol{\beta_5} CAP_{it-j} + \Sigma \boldsymbol{\beta_6} ROA_{it-j} + \Sigma \boldsymbol{\beta_7} LTD_{it-j} + \mu_{it-j}$$

$$UNE_{it} = \phi_2 + \Sigma \boldsymbol{\beta_0} UNE_{it-j} + \Sigma \boldsymbol{\beta_1} NPL_{it-j} + \Sigma \boldsymbol{\beta_2} GDP_{it-j} + \Sigma \boldsymbol{\beta_3} INF_{it-j} + \Sigma \boldsymbol{\beta_4} INT_{it-j} + \Sigma \boldsymbol{\beta_5} CAP_{it-j} + \Sigma \boldsymbol{\beta_6} ROA_{it-j} + \Sigma \boldsymbol{\beta_7} LTD_{it-j} + \mu_{it-j}$$

$$INT_{it} = \phi_2 + \Sigma \boldsymbol{\beta_0} INT_{it-j} + \Sigma \boldsymbol{\beta_1} NPL_{it-j} + \Sigma \boldsymbol{\beta_2} GDP_{it-j} + \Sigma \boldsymbol{\beta_3} INF_{it-j} + \Sigma \boldsymbol{\beta_4} UNE_{it-j} + \Sigma \boldsymbol{\beta_5} CAP_{it-j} + \Sigma \boldsymbol{\beta_6} ROA_{it-j} + \Sigma \boldsymbol{\beta_7} LTD_{it-j} + \mu_{it-j}$$

$$CAP_{it} = \phi_2 + \Sigma \boldsymbol{\beta_0} INT_{it-j} + \Sigma \boldsymbol{\beta_1} NPL_{it-j} + \Sigma \boldsymbol{\beta_2} GDP_{it-j} + \Sigma \boldsymbol{\beta_3} INF_{it-j} + \Sigma \boldsymbol{\beta_4} UNE_{it-j} + \Sigma \boldsymbol{\beta_5} INT_{it-j} + \Sigma \boldsymbol{\beta_6} ROA_{it-j} + \Sigma \boldsymbol{\beta_7} LTD_{it-j} + \mu_{it-j}$$

$$ROA_{it} = \phi_2 + \Sigma \boldsymbol{\beta_0} INT_{it-j} + \Sigma \boldsymbol{\beta_1} NPL_{it-j} + \Sigma \boldsymbol{\beta_2} GDP_{it-j} + \Sigma \boldsymbol{\beta_3} INF_{it-j} + \Sigma \boldsymbol{\beta_4} UNE_{it-j} + \Sigma \boldsymbol{\beta_5} INT_{it-j} + \Sigma \boldsymbol{\beta_6} CAP_{it-j} + \Sigma \boldsymbol{\beta_7} LTD_{it-j} + \mu_{it-j}$$

$$LTD_{it} = \phi_2 + \Sigma \boldsymbol{\beta_0} INT_{it-j} + \Sigma \boldsymbol{\beta_1} NPL_{it-j} + \Sigma \boldsymbol{\beta_2} GDP_{it-j} + \Sigma \boldsymbol{\beta_3} INF_{it-j} + \Sigma \boldsymbol{\beta_4} UNE_{it-j} + \Sigma \boldsymbol{\beta_5} INT_{it-j} + \Sigma \boldsymbol{\beta_6} CAP_{it-j} + \Sigma \boldsymbol{\beta_7} ROA_{it-j} + \mu_{it-j}$$

Model 2

$$ROA_{it} = \phi_2 + \Sigma \boldsymbol{\beta_0} INT_{it-j} + \Sigma \boldsymbol{\beta_1} NPL_{it-j} + \Sigma \boldsymbol{\beta_2} GDP_{it-j} + \Sigma \boldsymbol{\beta_3} NIITI_{it-j} + \Sigma \boldsymbol{\beta_4} CTI_{it-j} + \Sigma \boldsymbol{\beta_5} INT_{it-j} + \Sigma \boldsymbol{\beta_6} CAP_{it-j} + \Sigma \boldsymbol{\beta_7} LTD_{it-j} + \mu_{it-j}$$

$$LTD_{it} = \phi_2 + \Sigma \boldsymbol{\beta_0} INT_{it-j} + \Sigma \boldsymbol{\beta_1} NPL_{it-j} + \Sigma \boldsymbol{\beta_2} GDP_{it-j} + \Sigma \boldsymbol{\beta_3} NIITI_{it-j} + \Sigma \boldsymbol{\beta_4} CTI_{it-j} + \Sigma \boldsymbol{\beta_5} INT_{it-j} + \Sigma \boldsymbol{\beta_6} CAP_{it-j} + \Sigma \boldsymbol{\beta_7} ROA_{it-j} + \mu_{it-j}$$

$$NPL_{it} = \phi_2 + \Sigma \boldsymbol{\beta_0} NPL_{it-j} + \Sigma \boldsymbol{\beta_1} GDP_{it-j} + \Sigma \boldsymbol{\beta_2} NIITI_{it-j} + \Sigma \boldsymbol{\beta_3} CTI_{it-j} + \Sigma \boldsymbol{\beta_4} INT_{it-j} + \Sigma \boldsymbol{\beta_5} CAP_{it-j} + \Sigma \boldsymbol{\beta_6} ROA_{it-j} + \Sigma \boldsymbol{\beta_7} LTD_{it-j} + \mu_{it-j}$$

$$GDP_{it} = \phi_2 + \Sigma \boldsymbol{\beta_0} GDP_{it-j} + \Sigma \boldsymbol{\beta_1} NPL_{it-j} + \Sigma \boldsymbol{\beta_2} NIITI_{it-j} + \Sigma \boldsymbol{\beta_3} CTI_{it-j} + \Sigma \boldsymbol{\beta_4} INT_{it-j} + \Sigma \boldsymbol{\beta_5} CAP_{it-j} + \Sigma \boldsymbol{\beta_6} ROA_{it-j} + \Sigma \boldsymbol{\beta_7} LTD_{it-j} + \mu_{it-j}$$

$$CTI_{it} = \phi_2 + \Sigma \boldsymbol{\beta_0} CTI_{it-j} + \Sigma \boldsymbol{\beta_1} NPL_{it-j} + \Sigma \boldsymbol{\beta_2} GDP_{it-j} + \Sigma \boldsymbol{\beta_3} NIITI_{it-j} + \Sigma \boldsymbol{\beta_4} INT_{it-j} + \Sigma \boldsymbol{\beta_5} CAP_{it-j} + \Sigma \boldsymbol{\beta_6} ROA_{it-j} + \Sigma \boldsymbol{\beta_7} LTD_{it-j} + \mu_{it-j}$$

$$NIITI_{it} = \phi_2 + \Sigma \boldsymbol{\beta_0} NIITI_{it-j} + \Sigma \boldsymbol{\beta_1} NPL_{it-j} + \Sigma \boldsymbol{\beta_2} GDP_{it-j} + \Sigma \boldsymbol{\beta_3} CTI_{it-j} + \Sigma \boldsymbol{\beta_4} INT_{it-j} + \Sigma \boldsymbol{\beta_5} CAP_{it-j} + \Sigma \boldsymbol{\beta_6} ROA_{it-j} + \Sigma \boldsymbol{\beta_7} LTD_{it-j} + \mu_{it-j}$$

$$INT_{it} = \phi_2 + \Sigma \boldsymbol{\beta_0} INT_{it-j} + \Sigma \boldsymbol{\beta_1} NPL_{it-j} + \Sigma \boldsymbol{\beta_2} GDP_{it-j} + \Sigma \boldsymbol{\beta_3} INF_{it-j} + \Sigma \boldsymbol{\beta_4} UNE_{it-j} + \Sigma \boldsymbol{\beta_5} CAP_{it-j} + \Sigma \boldsymbol{\beta_6} ROA_{it-j} + \Sigma \boldsymbol{\beta_7} LTD_{it-j} + \mu_{it-j}$$

$$CAP_{it} = \phi_2 + \Sigma \boldsymbol{\beta_0} INT_{it-j} + \Sigma \boldsymbol{\beta_1} NPL_{it-j} + \Sigma \boldsymbol{\beta_2} GDP_{it-j} + \Sigma \boldsymbol{\beta_3} NIITI_{it-j} + \Sigma \boldsymbol{\beta_4} CTI_{it-j} + \Sigma \boldsymbol{\beta_5} INT_{it-j} + \Sigma \boldsymbol{\beta_6} ROA_{it-j} + \Sigma \boldsymbol{\beta_7} LTD_{it-j} + \mu_{it-j}$$

3.4.3 Justification of Variables

Non-Performing Loans (NPL)

Non-performing loans refer to the loan in which there is default inn payment in principal and the interest by the borrower (). This variable represents the model 1 endogenous indicator as it is mainly used on the body of literature as a soundness indicator and plays a significant role in long run sustainability of banking interest income operations. Limited papers had considered non-performing loans as a dependent indicator (Salas and Saurina, 2002; Sinkey and Greenawalt, 1991). The variable was measured as a ratio of total non-performing loans to disbursed total gross loans in percentages.

The lower the non-performing loans, the quality of assets hence a higher return on assets whilst higher non-performing loans reduce the quality of assets resulting a lower return on asset. There is a negative relationship between non-performing loans and return on assets as a measure of performance (Messai & Jouini, 2013). As the return on assets decrease, banks make risky investments and activities which result in high non-performing loans (Makri et al, 2014).

Gross Domestic Product (GDP)

This is a total monetary value of all goods and services produced within the boundaries of an economy despite nationality. This variable was measured using gross domestic product per capita. An increase in per capita income levels positively influences the standards of living as well as the general wellbeing of citizens. The fact is that this increases the savings level and therefore impacts on the investment levels in the market cannot be ignored.

The higher the gross domestic product levels implies higher income levels which therefore fosters an improved debt serving capacity of loans (Quang and Nhi, 2017; Skarica; 2013). There is a negative relationship between GDP and non-performing loans. Conversely, there is a positive relationship between GDP and return on assets. According to (Makri et al, 2014) an increase in GDP improves the efficiency of assets which results in an increase in the return on assets.

Inflation (INF)

Inflation refers to the general rise in the price level (Piper, 2016). Consumer price index (CPI) was used as a yardstick to measure inflation. This is the general and continuous rise of prices of goods and services with in a market, alternatively it is can also be described as the general fall of currency's purchasing power (Dunn et al, 2018). In respect to the theory of economics and finance it can be generally expected that bank sector can perform better in a stable inflation environment. In a hyper inflationary environment, borrowers face low overall demand of goods and services and fast dissipating of capital base hence they would have an inability to pay back loans. Radivojevic and Jovovic, (2017), and Quang and Nhi (2017) forwarded a positive relationship of inflation against non-performing loans. Empirical studies show that higher levels of inflation results in high informational and functional friction of assets resulting in lower returns for the assets. Therefore, there is a negative relationship between return on assets and friction (Kumar et al, 2018).

Unemployment (UNE)

Unemployment was expressed by the number of unemployed persons in respect to percentage change of the total labor force (International Labour Organization, (2015). Economically active people looking for jobs but cannot find one are considered unemployed (Radivojevic & Jovovic, (2017). The unemployed may acquire loans in order to join the informal sector which in turn leads to moral hazard and adverse selection. Olayinka and Mofoluwaso (2014) postulated that there was a positive significant relationship between unemployment and non-performing loans as people lose the means and resource to service loans.

Interest Rate (INT)

Interest rate is the cost of borrowing capital from the demand side of economics while from the supply side it is regarded as the rate of return on capital invested (Warue, 2013). Higher interest rates level within the banking sector is highly likes to trigger an increase in non-performing loans as the cost of borrowing capital would have increased. Therefore, there is a negative relationship between interest rate and non-performing loans. A fall in interest rates also reduces return of assets and equity of the bank. Collins and Wanjau (2011) and Kanyinji (2014) argued that there was a positive relationship between interest rates and non-performing loans. The interest rate reflect the return on the use of assets and the higher the interest rate, the higher the return on assets as they are allocated to the most productive activities (Kumar et al, 2018).

Capital Adequacy (CAP)

Capital adequacy ratio is a measure of the financial health of a bank. A direct association between capital adequacy and return on assets is expected by the study. As capital adequacy increase, the investor funds and assets are protected and tis yield positive returns on both equity and assets. The ratio of equity in respect to total assets was utilized as a yardstick of measuring of capital adequacy. This variable was also used by Khafid et al. (2020) in Indonesia and postulated that it did not influence non-performing loans. EL-Maude et al. (2017) and Shingjergj (2013) had the same view with Khafid et al. (2020). The higher the capital adequacy ratio the higher the banks abilities to minimize credit risk. Capital adequacy had a significant impact with non-performing loans (Djiogap and Ngomsi, 2012; Dhar and Bakshi, 2015).

Return on Assets (ROA)

This is considered as an endogenous variable in the second model. Return on assets is an indicator that is considered to measure the financial performance of a bank. The variable comprises of two aspects that is effectiveness (profit margin) and efficiency (total asset turn over). This variable was measured by using the ratio of net profit to total assets. This variable was also used by Muasya (2009) in Kenya and confirmed that non-performing loans had an inverse relationship with return on assets.

Loan to Deposit (LTD)

This is the ratio that displays the comparison between loans issued against funds collected by the banks. The size of loan to deposit of a banking institution is in a position to demonstrate the possibility of credit. The higher the loan to deposit the greater the chance of credit risk occurring. This variable was also used by Adnan et al. (2016) in Indonesia and concluded that loan to deposit had a significant impact on return on assets. Higher loans to deposit ratio shows that the bank is involved in risk activities which decreases the return on assets.

Cost to Income (CTI)

This variable is normally considered as a measure of efficiency by banking institutions. Its proxy of measurement is operating costs to operating income. Bayer et al (2018) realized that cost to income ratio had a negative relationship with return on assets although it was declared statistically significant. In a banking market where there is less competition and costs are normally forwarded to the final customer, hence posting a positive correlation (Francis, 2004). Bayer et al (2018) forwarded a negative association between this variable and return on assets.

Non-Interest Income to Total Income (NIITTI)

The yardstick to measure this variable is the ratio of total non-interest income (fees, commission and other income) to total income. This proxy measures the relative magnitude of banks that are involved in non-interest income of banks. The yardstick of measurement used to measure this variable in this study is the non interest income to total operating income. Singh et al. (2016) and Al Tarawneh et al. (2017) realized a positive association between non-interest income and bank profitability (return on assets).

3.4.4 Diagnostic Tests

The research conducted the following diagnostic techniques.

Panel Stationarity Tests

This is an extension of the traditional Augmented Dickey Fuller test. The test assumes the following process:

$$\Delta \boldsymbol{Y_{ijt-1}} = \boldsymbol{\beta_{ij} Y_{ijt-1}} + \sum_{\boldsymbol{j=1}}^{\boldsymbol{Pi}} \boldsymbol{B_{ijj}} \Delta \boldsymbol{Y_{ijt-k}} + \boldsymbol{\mu_{ijt}}$$

(where *i = 1,2…, N* and *t = 1,2…,T*)

This study adopted the Fisher-type tests using ADF (Maddala and Wu, 1999) and check if the study variables have a unit root or not. The ADF Fisher diagnostic allowed the possibility of varying autoregressive processes across countries. As a basic rule of thumb, a variable is considered stationary if the ADF statistic is greater than the critical value at 5% level of significance.

Multicolinearity Test

This is the existence of a perfect or exact relationship in a regression model among explanatory variables (Gujarati, 2004). The test makes use of the R-squared (a very high R-squared) and very few ratios are considered to be statistically significant in its detection in an econometric model. By default, multicolinearity would be considered present in an econometric model if the R-squared is greater than 0.8 in a correlation matrix. However, if present the “do nothing” approach can be considered as one of the remedies to this econometric problem.

The research methodology provided the model specifications and how the study was carried out in its analysis stage was explained by this section. The chapter also explained variables justification, sampling methods, data characteristics and sources as well as the econometric package and software’s that were used in this study.

Chapter Four

This section presents the results which are interpreted and discussions about the findings made in line with the dynamic panel estimation which was highlighted in Chapter 3. The results presentation and discussions are made so as to achieve the specific objective of the study. The study utilised econometric tools and techniques to analyse the data collected.

4.1 Descriptive statistics

Table 4.1: Descriptive statistics

	NPL	GDP	INF	UNE	INT	CAP	ROA	LTD	CTI	NIITI
Mean	3.939	1.665	6.160	25.005	3.821	18.477	1.886	90.305	56.987	52.819
Median	3.400	1.847	6.155	24.727	3.390	15.900	1.420	90.850	56.600	49.600
Maximum	7.900	3.284	8.832	27.035	5.934	36.600	5.400	109.230	81.050	87.330
Minimum	2.080	-1.538	3.917	22.407	2.209	10.700	0.480	66.310	32.300	38.800
Std. Dev.	1.510	1.382	1.293	1.342	1.201	6.438	1.112	5.879	8.845	11.644
Skewness	1.359	-0.862	0.377	-0.083	0.513	1.603	1.101	-1.076	-0.450	1.535
Kurtosis	3.747	3.187	2.768	2.470	2.164	4.463	3.401	7.166	4.186	4.561
Jarque-Bera	29.130	11.014	2.280	1.132	6.433	45.562	18.376	80.625	8.134	43.510
Probability	0.000*	0.000*	0.320	0.568	0.040*	0.000*	0.000*	0.000*	0.017*	0.000*
Sum	346.607	146.534	542.122	2200.467	336.264	1625.934	165.989	7946.850	5014.820	4648.060
Sum Sq. Dev.	198.378	166.119	145.348	156.585	125.432	3606.152	107.529	3006.553	6806.361	11794.730
Observations	88	88	88	88	88	88	88	88	88	88

Table 4.1 show that the variables non-performing loans, inflation, interest rates, capital adequacy, non-interest income to total income and return on assets are positively skewed. Positive skewness implies that the mean is greater than the median and the distribution has a long tail to the right hence majority of the observations are greater than the mean. GDP, unemployment, cost to income ratio and loans to deposit ratio are

negatively skewed and the mean is less than the median. Negative skewness implies that many observations are less than the mean value.

Furthermore, Table 4.1 show that non-performing loan, GDP, capital adequacy, return on assets, cost to income ratio, loan to deposit ratio and non-interest income to total income are leptokurtic (Kurtoisis statistic > 3). Leptokurtic means that the variables can significantly fluctuate by more than 3 standard deviations from the mean. Table 4.1 and Table 4.2 show that interest rates, inflation and unemployment are platykurtic (Kurtoisis statistic < 3), meaning that the variables do not fluctuate significantly around the mean.

4.2 Diagnostic tests

4.2.1 Unit root test

Table 4.2: ADF- Fisher unit root test results

Variable	ADF Fisher Chi Square	Probability Value	Order of Integration	Intercept	Trend
CAP	42.845	0.000	I(1)	Yes	No
CTI	103.109	0.000	I(1)	No	No
GDP	59.881	0.000	I(0)	Yes	No
INF	38.295	0.001	I(0)	No	No
INT	90.600	0.000	I(1)	No	No
LTD	100.483	0.000	I(1)	No	No
NIITI	86.025	0.000	I(1)	No	No
NPL	29.436	0.021	I(0)	No	No
ROA	37.802	0.002	I(0)	Yes	No
UNE	51.132	0.000	I(1)	No	No

Table 4.2 shows that GDP, inflation, non-performing loans and return on assets are stationary at levels whilst the other variable are stationary after first differencing. Therefore, 1 is the maximum order of integration for both model 1 and model 2. The cointegration properties of the variables are tested as other variables are not stationary at level.

4.2.2 Multicollinearity and correlations

Table 4.3: Correlation matrix

	UNE	ROA	NPL	NIITI	LTD	INT	INF	GDP
UNE	1.000	-0.101	-0.263	0.027	-0.258	0.077	-0.712	-0.247
ROA	-0.101	1.000	0.052	0.655	0.047	-0.061	0.077	0.043
NPL	-0.263	0.052	1.000	-0.085	0.144	-0.017	0.226	0.019
NIITI	0.027	0.655	-0.085	1.000	0.085	-0.035	-0.060	0.041
LTD	-0.258	0.047	0.144	0.085	1.000	-0.200	0.169	0.061
INT	0.077	-0.061	-0.017	-0.035	-0.200	1.000	-0.075	-0.188
INF	-0.712	0.077	0.226	-0.060	0.169	-0.075	1.000	0.071
GDP	-0.247	0.043	0.019	0.041	0.061	-0.188	0.071	1.000
CTI	0.382	0.117	0.258	0.141	0.087	0.125	-0.265	-0.167
CAP	0.098	-0.039	0.098	0.108	0.010	-0.014	-0.087	-0.002

Table 4.3 shows that there is no sever multi collinearity among the variables. According to Gujarati (2004), a model suffers from severe multicollinearity if the correlations between any variables exceed 0.8. Therefore, there is no multicollinearity for both model 1 and model 2.

4.2.2.1 NPL Correlations

Table 4.3 shows that non-performing loans are negatively correlated to unemployment thus as unemployment increases, non-performing loans decline. The negative correlation unemployment and non-performing loans contradict the studies by Bayar (2019) which found a positive significant relationship between unemployment and non-performing loans. Unemployment increases the probability of default hence expected to be positively related to non-performing loans. However, Statistics South Africa (2019) reported that

unemployment is driven by youth unemployment. Banks in South Africa issue out secured loans (Hendricks, 2019) and this may explain the negative relationship between non-performing loans and unemployment such that as unemployment increases it does not have an impact on non-performing loans.

Table 4.3 highlights a negative relationship between interest rates and non-performing loans implying that as interest rates increase, non-performing loans decline. The result contradicts the results of the study by Kanyinji (2014) which concluded that there is a positive relationship between interest rates and non-performing loans. Interest rate reflect the cost of borrowing and as interest rates increase non-performing loans are expected to rise hence the results contradict economic theory.

Moreover, the results indicate a positive correlation between non-performing loans and loans to deposit ratio as well as inflation. Economic literature both theoretical and empirical highlight that the higher the loan to deposit which leads to higher inflation levels the greater the chance of credit risk and loan default occurring (Juwita et al, 2018). Therefore, the results are in line with economic theory where the relationship between non-performing loans and loans to deposit ratio as well as inflation is positive. South Africa is one of the indebted countries and the propensity for consumptive borrowing as people aim at finding means to survive the harsh economic environment (Fatoki, 2015). Thus due to consumptive borrowing, it results in high loans to deposit ratio as banks issue out more loans which increase the probability of non-performing loans.

There is positive correlation between non-performing loans and GDP. A study by Quang and Nhi (2017) found a negative relationship between GDP and non-performing loans because economic prosperity leads to improved debt servicing capacity of loans. The correlation results contradict the results by Quang and Nhi (2017). The results contradict the economic conditions in South Africa. According to (Henricks, 2019) the South Africa economy is becoming tighter for the poor as inflation, unemployment and inequality increase whilst the exchange rate is declining, Harsh economic environment compels people to hold money for precautionary and buffer reason and forgo loan repayments hence a negative the results contradict economic rationale.

Furthermore, the results indicate a positive correlation between non-performing loans and capital adequacy. Banks are able to minimize the risk of defaults through the capital

adequacy thus a positive relationship is expected between non-performing loans and capital adequacy (Fofack, 2005). The positive correlation between the variables is explained by poor application of corporate governance practices in banks where Omarjee (2018) reported that although VBS bank is the most notable case of poor corporate governance but it is wide spread in other banks. Banks with high capital adequacy may not practice effective corporate governance practices results in the issuance of loans as there is guarantee through capital adequacy that the banks are covered from failure resulting in a positive relationship between the variables.

4.2.2.2 ROA Correlations

Table 4.3 show that there is a positive correlation between non-interest income to total income and return on asset. The performance of a bank as reflected by return on assets is determined by the diversification of income and the greater the non-interest income of a bank, the better performance of the bank (Baele et al, 2007). The correlation results are therefore in line with the study by Baele et al (2007). PwC (2019) noted that non-interest income has aided in the profitability of banks which allows them to venture into other activities. The diversification of activities as determined by non-interest income allows the banks to divert the asset to more productive activities resulting in a positive correlation between the variables.

In addition, Table 4.3 show positive correlations between return on assets and GDP. High economic growth and development is associated with high efficiency which results in the high returns on assets. Compared to Sub Saharan countries South African banks are more efficient and these has been attributed to the economic development the country recorded over the years especially during the 2010 FIFA world cup (PwC, 2019).
There is a positive relationship between ROA and loans to deposit ratio. During economic booms, there is high demand for loans and this increases the loans to deposit ratio where bank earn interest from differentials in interest offered to borrowers and depositors and having a positive impact on profitability (Fofack, 2005). Although annual economic growth has been increasing at a decreasing rate, there is high demand for loans to finance

entrepreneurship which has been growing the country and this can be attributed to the positive relationship between the variables.

Moreover, there is positive correlation between returns on assets and inflation as well as cost to income ratio. Cost to income ratio shows company efficiency and an inverse relationship between cost to income ratio and performance is a default correlation (Omoregie and Kelikume, 2016). The positive relationship between cost to income and return on asset can be attributed to competition and bank density in South Africa. As competition intensifies, the banks open new branches in other areas so as to attract new customers and retain older one which increase both return on assets and profitability hence a positive association (Hendricks, 2019). As cost to income ratio increases, it shows that efficiency of the bank has declined hence the study results refute economic theory.

Capital adequacy and return on assets are negatively correlated as shown in Table 4.3. Banks with high capital adequacy have a large safety net and the advantage is translated into higher profitability by the bank (Aebi et al, 2012). The negative correlation between capital adequacy and return on assets contradicts the findings by Aebi et al (2012) and indicate that capital adequacy has a negative impact on profitability. ROA shows how efficient a bank allocates and uses its resources and the negative relationship maybe due to inefficient banking practices. (Hendricks, 2019) reported that banks now poor customer service and the waiting times are no longer indicating inefficiencies. Although the macro prudential capital adequacy is in place, inefficient allocation of resources may lead to a negative association between capital adequacy and return on assets.

Interest rates and returns on assets are negatively correlated as shown in Table 4.3. As interest rates increase, the profitability of the bank decreases. Interest rate are a cost of borrowing and an increase results in decrease in loans issued to customers and a decline in interest income which has an impact on profitability (Lartey et al, 2013). Therefore, a negative correlation between interest rates and return on assets is established through the loan and credit creation mechanism.

4.3 Panel Cointegration Test

The tables below show the panel cointegration results for model 1 and model 2 which highlights whether there variables move together in the long run although deviations may be recorded in the short run.

Table 4.4: Model 1 Kao residual cointegration

t-Statistic	Probability Value
-4.644	0.000

Table 4.5: Model 2 Kao residual cointegration test

t-Statistic	Probability Value
-4.785	0.000

Table 4.4 and Table 4.5 show that based on the Kao residual test, there is cointegration among the variables in the 2 models. However, Gujarati (2004) indicated that, the existence of a relationship between variables does not prove causality or the direction of causality. Cointegration plays a preliminary role in ascertaining the direction of causality between variables hence it is a necessary but not a sufficient condition for ascertaining the causal relationship. Therefore, the Granger causality test ascertains the causal relationship between the variables in the 2 models hence it Vector Error Correction Model Granger causality test was adopted.

4.4 Impulse response function

Tables 4.6 and 4.7 shows the results of the impulse response function that is how non-performing loans and return on asset respond to changes in any variable.

Table 4.6: NPL Impulse response function

Period	UNE	ROA	LTD	INT	INF	GDP	CAP
1	-9.15E-06	-0.17417	0.0000	0.0000	0.0000	0.0000	0.0000
2	1.21E-05	-0.13445	-0.01824	-2.29E-05	0.000136	1.78E-05	-0.03762
3	6.53E-06	-0.01721	0.025429	4.23E-05	4.81E-05	1.50E-05	0.012014
4	-1.45E-06	0.044846	0.056551	8.96E-05	0.000129	3.62E-05	0.020347
5	-6.22E-06	0.075131	0.064128	0.000104	6.23E-05	2.80E-05	0.04041
6	-6.75E-06	0.085821	0.05105	9.77E-05	-5.55E-05	7.96E-06	0.059813
7	-5.23E-06	0.084501	0.029972	8.01E-05	-0.0002	-1.75E-05	0.077797
8	-2.75E-06	0.080375	0.005982	5.93E-05	-0.00033	-4.33E-05	0.093904
9	-1.80E-07	0.075381	-0.01721	3.87E-05	-0.00045	-6.63E-05	0.106789
10	2.18E-06	0.070927	-0.03797	1.97E-05	-0.00055	-8.57E-05	0.116551

Table 4.6 shows that in model 1, the response of non-performing loans to changes in unemployment, return on assets and capital adequacy increase over time. Conversely, Table 4.6 that the responses of non-performing loans to changes in loan to deposit ratio, interest rate, inflation and GDP decrease over time. The responses of non-performing loans to external variables (UNE, GDP, INT and INF) is less than the responses from the bank specific factors (CAP, ROA and LTD). Non-performing loans respond more to firm characteristics than broader economic factors (Levine, 2002). Therefore, the results support the assertion by Levine (2002) hence firm specific factors have a significant influence on non-performing loans.

Table 4.7: ROA impulse response function

Period	NPL	NIITI	LTD	INT	GDP	CAP	CTI
1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.00242	0.03121	0.01557	-0.017	-0.00266	-0.1707	0.05042
3	0.02238	0.11738	0.10324	-0.0242	0.02442	-0.0763	-0.0155
4	0.05257	0.14013	0.12223	-0.0259	0.04103	-0.0827	-0.0134
5	0.06188	0.16028	0.17022	0.03044	0.06796	-0.0832	-0.0243
6	0.06558	0.17107	0.19569	0.05873	0.06055	-0.075	-0.0125
7	0.06015	0.16948	0.20974	0.07754	0.04429	-0.0754	0.00588
8	0.04936	0.16007	0.2192	0.07654	0.0268	-0.0698	0.02464
9	0.03653	0.14289	0.22409	0.06587	0.0162	-0.0648	0.04223
10	0.02458	0.12266	0.22724	0.06031	0.01562	-0.0593	0.05529

Table 4.7 shows that the response of return on assets decreases only to changes in capital adequacy over time, whilst the variable`s response to other factors increases over time. The responses of return on assets to external variables (GDP and INT) is less than the responses from the bank specific factors (LTD and NIITTI). Bank profitability is a complex concept where environmental factors and bank characteristics determine the profitability of the bank (Levine, 2002). Therefore, the results highlighted in Table 4.7 shows that profitability as measured by the return on assets respond more to bank specific factors than it does to economic or external factors.

4.5 Variance decomposition

Table 4.8 and 4.9 show the variance decomposition which highlights the variation of a variable due to changes in others**.**

Table 4.8: NPL variance decomposition

Period	S.E.	UNE	ROA	LTD	INT	INF	GDP	CAP
1	0.73479	3.50E-06	8.68446	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.95729	3.61E-06	9.7557	0.00034	5.47E-09	2.51E-10	2.48E-05	1.23595
3	1.05793	3.70E-06	9.47964	0.13877	6.04E-09	2.77E-10	2.74E-05	1.36471
4	1.11165	3.73E-06	9.01202	0.3406	6.01E-09	2.75E-10	2.73E-05	1.35886
5	1.14264	3.77E-06	8.6872	0.67415	5.84E-09	2.68E-10	2.66E-05	1.32065
6	1.16112	3.79E-06	8.45259	1.12555	5.66E-09	2.60E-10	2.57E-05	1.28014
7	1.17298	3.81E-06	8.29288	1.66442	5.58E-09	2.56E-10	2.54E-05	1.26156
8	1.18132	3.81E-06	8.17925	2.2613	5.66E-09	2.59E-10	2.57E-05	1.27992
9	1.18778	3.82E-06	8.09256	2.87298	5.95E-09	2.73E-10	2.70E-05	1.34486
10	1.19324	3.81E-06	8.02231	3.46057	6.47E-09	2.96E-10	2.94E-05	1.46212

Table 4.8 shows that the major variances in non-performing loans among the variables emanated from return on assets, with largest variation of approximately 9.76% realised in period 2. Interest rates had the lowest variance in non-performing loans among the variables. In addition, the results indicate that the variations in non-performing loan emanating from bank specific characteristics (return on assets, loan to deposit ratio and capital adequacy ratio) were greater than the variations which emanated from economic variables. The study results are in line with the study by Inekwe's (2010) which concluded that firm specific characteristics were significant determinants of non-performing loans.

Table 4.9: ROA variance decomposition

Period	S.E.	NPL	NIITI	LTD	INT	GDP	CAP	CTI
1	0.703	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	0.798	0.001	0.153	0.038	0.045	0.001	4.580	0.400
3	0.857	0.069	2.008	1.484	0.119	0.082	4.758	0.379
4	0.908	0.396	4.167	3.131	0.187	0.277	5.064	0.359
5	0.956	0.777	6.573	5.998	0.270	0.756	5.329	0.388
6	1.004	1.132	8.868	9.242	0.587	1.049	5.394	0.368
7	1.049	1.365	10.734	12.465	1.085	1.140	5.457	0.340
8	1.090	1.469	12.091	15.580	1.497	1.115	5.461	0.366
9	1.127	1.478	12.912	18.519	1.741	1.063	5.437	0.483
10	1.162	1.437	13.279	21.274	1.910	1.020	5.382	0.681

The results from table 4.9 show that the largest variation in return on assets emanated from loans to deposit ratio. This implies that, the loan to deposit ratio had a significant impact on the performance of the firms as it represents the source of funds to finance loans issued to customers. In addition, non-interest income had a significant influence on the variations in return on assets. Non-interest income represent diversification against risks which has a positive impact on bank performance (Chiorazzo et al, 2008).

4.6 Granger causality

Tables 4.10 show the results of the Granger causality test which highlights the direction of causality between variables.

Table 4.10: Model 1 Granger causality

Variable	Direction of causality	Lag length	F-Statistic	Probability Value.
UNE	NPL to UNE	2	0.988	0.378
	UNE to NPL	2	0.015	0.984
ROA	NPL to ROA	2	0.011	0.990
	ROA to NPL	2	0.191	0.827
LTD	LTD to NPL	2	0.198	0.821
	NPL to LTD	2	0.801	0.453
INT	INT to NPL	2	0.419	0.660
	NPL to INT	2y	1.353	0.265
INF	INF to NPL	2	0.053	0.948
	NPL to INF	2	0.531	0.590
GDP	GDP to NPL	2	0.429	0.653
	NPL to GDP	2	3.768	0.028
CAP	CAP to NPL	2	1.168	0.317
	NPL to CAP	2	3.839	0.026

The results from table 4.10 show that there is no causal relationship between non-performing loans and other variables except capital adequacy and GDP. The results indicate a uni-directional relationship running from non-performance loans to GDP, thus, non-performance loans granger cause GDP. Moreover, the results show a uni-directional relationship running from non-performing loans to capital adequacy, thus, non-performing loans granger cause capital adequacy. The results show that both internal and external factors do not determine non-performing loans in South Africa.

The results contradict the findings by Inekwe (2010) among others which concluded that external factors determine non-performing loans. Economic theory states that, mismanagement economic factors lead to bank failures and bank runs especially inflation (Baele et al, 2007). Therefore, the results indicate that other factors such as information asymmetry may determine non-performing loans. Information asymmetry exists when on party has more information than the other, where the information is critical to the contractual relationship (Dahl et al, 2011).

The information asymmetry theory posits that borrowers have more information than lenders leading to moral hazard and adverse selection which leads to non-performing loans (Batra, 2003). Information asymmetry highlight the need for effective credit assessment which involves collateral from borrowers to hedge against default repayments.

Table 4.11: Model 2 Granger causality

Variable	Direction of causality	Lag length	F-Statistic	Probability Value.
NPL	NPL to ROA	1	0.331	0.566
	ROA to NPL	1	0.011	0.917
LTD	LTD to ROA	1	0.862	0.356
	ROA to LTD	1	0.219	0.641
INT	INT to ROA	1	0.033	0.855
	ROA to INT	1	0.113	0.738
GDP	GDP to ROA	1	0.026	0.872
	ROA to GDP	1	0.051	0.821
CAP	CAP to ROA	1	0.020	0.888
	ROA to CAP	1	0.077	0.782
NIITTI	NIITI to ROA	1	8.997	0.004
	ROA to NIITI	1	2.156	0.146
CTI	CTI to ROA	1	0.732	0.395
	ROA to CTI	1	0.632	0.429

Results from table 4.11 show that there is no causal relationship between return on assets and other variables except non-interest income to total income. Table 4.11 shows a uni-directional relationship that runs from non-interest income to total income to return on assets, thus, non-interest income to total income granger causes return on assets. Therefore, non-interest income to total income determines bank profitability.

Non-interest income to total income reflects the level of diversification by the bank and enables banks to minimise risk leading to improved profitability (Chiorazzo et al, 2008). Non-interest income to total income augments returns and has a positive impact on

profitability (Gürbüz, 2013). Therefore, non-interest income to total income is an important factor which determines bank profitability as asserted by Chiorazzo et al (2008) and Gürbüz (2013).

The study results showed that non-performing loans was negatively correlated to unemployment and interest rates but positively correlated to GDP, inflation, capital adequacy and loans to deposit ratio. Furthermore, the results showed that return on assets was positively correlated to non-performing loans, non-interest income to total income, loan to deposit ratio, GDP and cost to income ratio whilst negatively correlated interest rates and capital adequacy. The results also showed that non-performing loans and return on assets responses and variations were significantly emanated from internal factors than from external factors. The granger causality test indicated that no variable Granger causes non-performing loans although non-performing loans granger caused GDP and capital adequacy. Therefore, it implies that non-performing loans are caused by other factors which are not contained in the model. Furthermore, the Granger causality test indicated that non-interest income to total income Granger causes return on assets. Therefore, non-interest income to total income is a significant determinant of bank profitability as measured by return on assets.

Chapter Five

This chapter is primarily guided by the results presented and interpreted in Chapter 4. Based on the study results of the econometric approach, a summary of the findings and policy recommendations are proffered in this chapter. Non-performing loans should be minimized as the level of bank credit impairments threatens bank stability in the economy and bank profitability.

5.1 Summary of findings

In order to achieve its aims, the research set specific study objectives. Based on the specific study objectives, the summary of findings is summed up as:

To examine the determinants (macroeconomic and bank specific) of non-performing loans in South Africa

The granger causality test indicated that no variable Granger causes non-performing loans although non-performing loans granger caused GDP and capital adequacy. Non-performing loans are negatively correlated to unemployment and interest rates but positively correlated to GDP, inflation, capital adequacy and loans to deposit ratio.

To assess the impact of non-performing loans on banking profitability

The correlation results showed that return on assets is positively correlated to non-performing loans, however the Granger causality test indicated that non-performing loans do not Granger cause return on assets. Only non-interest income to total income is a significant determinant of bank profitability as measured by return on assets.

5.2 Recommendations

Notwithstanding the implications of the results, recommendations which aim at providing ethical, practical and uncomplicated guidelines intended to minimize non-performing loans are still valid. The study proffers the following recommendations:

Credit Analysis

Credit analysis is the first step in the process in the minimisation of non-performing loans. Credit assessment highlights the borrower's ability and capacity to meet the obligations of the loans granted and minimises the probability of the non-performing loans.

Diversification of activities

Banks which primarily depend on interest income earned through the spread between interest on deposit and interest on loans are at risk of incurring non-performing loans. Therefore, banks should diversify activities according to the strategic options such that non-interest income becomes a significant source of income and bank profitability.

Enforcement of prudential measures

Banks should impose prudential measures which are tailored for borrowers such that limits are imposed on the amount of loans extended based on the value and collateral of the borrower. This also entails the banks following the macro prudential frameworks as laid by the Central Bank and Basel Committee.

Transparent and efficient information sharing

The information in creditor data base should be shared efficiently and transparently so as to highlight potential defaulters before loans are extended. Information sharing therefore is a critical factor that minimizes non-performing loans.

5.3 Conclusion

The banking industry is important to the economy as all economic agents are influenced by its activities. Stability of the banking sector is critical due to the vast linkages which banks have on other institutions and economic players. The study sought to examine the determinants (macroeconomic and bank specific) of non-performing loans in South Africa. The objective was satisfactorily achieved as results indicated that no factors in the model Granger cause non-performing loans although there were correlations between non-performing loans and other variables. Furthermore, the study aimed at assessing the impact of non-performing loans on banking profitability. The objective was achieved as

Granger causality indicated that non-performing loans do not granger cause return on assets although the variables were positively correlated.

5.4 Suggestions for future studies

Although the study was though, it did not exhaust all the areas and concepts around the determinants of non-performing loans and bank profitability. The study suggests the following studies to be undertaken in the future:

- A comparative approach where banks from countries are analysed and included in the study to broaden the knowledge on the study area.
- A panel approach to be conducted for developing countries which have a high risk of non-performing loans.

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