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Demystifying Macro-Financial Linkages in Zimbabwe: A Panel Analysis of economic shocks and non-performing loans (2009-2017)

BY

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This dissertation is submitted in partial fulfillment of the requirements of the Master of Commerce in Economics Degree in the Department of Economics at MSU.

Gweru: Zimbabwe, November 2017

DECLARATION OF PLAGARISM

I, Katuka Blessing, do hereby declare that this research represents my own work and has never been previously submitted for a degree at this or any other university.

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DEDICATION

I dedicate this thesis to my wife Mrs Kudakwashe Katuka and my kids Deene.M. A and Jnr B.A. Katuka.

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I would like to thank God the Almighty for making it possible to fully complete this thesis. Without God's guidance, this research couldn't have been successful at all.

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May God Bless you all

ABSTRACT

This study investigated the determinants of non-performing loans as well as demystifying macrofinancial linkages in Zimbabwe using a panel of nine banks and semi-annually decomposed data from 2009 to 2017. A combination of panel regressions techniques and panel VAR analysis was employed to meet research objectives. Findings revealed that growth in non-performing loans is driven by both bank-specific and macroeconomic factors in Zimbabwe. Findings confirmed that the main drivers of nonperforming loans in Zimbabwe are loan-to-deposit ratio, equity-to-assets ratio, loans-to-assets ratio and capital inflows and one-period lagged non-performing loans ratio. Findings suggested positive association between the loans to assets ratio and non-performing loans and this supports the moral hazard hypothesis which stipulates that high loans to assets ratio results in the growth of NPLs. The study uncovered the presence of feedback effects from banking sector to the real economy and spill-over effects from real economy to the banking sector. Orthogonalized impulse response function results showed that non-performing respond positively in the short run and negatively in the long run to an innovation in lending rates, real GDP growth rate and capital inflows growth whereas response of non-performing loans to own shock is negative both in the short run and in the long run. Findings indicated that shock in lending rate initially results in a short-lived rise in real GDP growth rate and then a decline in real GDP growth rate in the later stage of the short run period and the decrease continues into the entire long run period. Undoubtedly, the researcher recommends authorities to maintain interest rate capping policy in order to ensure reduction in non-performing loans in the long run. Monitoring of lending rates through capping policy is also of paramount importance since the study uncovered that lending rates adversely affects real GDP growth rate and capital inflows in the long run. Furthermore, policy implications of this study would be that banks must strengthen the loan origination process so that high loan-to-assets do not necessarily translate to high non-performing loans.

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LIST OF ABBREVIATIONS AND ACRONYMS

PVAR	Panel vector autoregressive
BIS	Bank of International Settlement
GMM	Generalized methods of moments
GDP	Gross Domestic Product
ZAMCO	Zimbabwe Asset Management Corporation
LTA	Loan-to-Assets Ratio
LTD	Loan-to-Deposits Ratio
ECCU	Eastern Caribbean Central Union
NPLs	Non-Performing Loans
RBZ	Reserve Bank of Zimbabwe
ROA	Return on Assets
ETA	Equity to Asset Ratio

CHAPTER 1: INTRODUCTION

1.0. Introduction

The global financial crisis instigated the need for regulatory authorities to deepen their understanding of macrofinancial linkages as well as how oscillations in loan portfolio quality can lead to shocks in macroeconomic aggregates.

Loan portfolio quality is a key soundness indicator for the banking industry and the entire financial system. Fluctuations in macroeconomic activity have direct implications on bank balance sheet through credit risk transmission channel leading to a disequilibrium in the banking system. In some instances, banking sector loan portfolio quality is impacted through non-credit risk transmission channel. Disequilibrium in banking sector will in turn have effects on economic activity in the economy, thus resulting in feedback and spillover effects. Against this background the study seeks to demystify the linkage between macro and financial variables with a view to analyses how they relate in the short-run and long-run.

1.1. Background to the study

Large body of literature on macrofinancial linkages indicated that there are feedback and spillover effects between banking sector loan portfolio quality and economic performance (Beaton, 2016; Riley, 2014). Based on Table 1.1.1, the world experienced stunted growth in GDP between 2009 and 2017. The world recorded upsurge in economic activity during 2009 and 2010. World output improved by 6.05 percentage points, that is, it improved from -1.74% to 4.31%. In terms of non-performing loans, the world experienced marginal decline of 0.2 percentage points between 2009 and 2010. According to 2009-2010 statistics, the world recorded rise in GDP and marginal decline in non-performing loans and this supports the notion that non-performing loans are likely to decrease with rise in economic performance or that GDP is likely to rise when non-performing loans decreases.

Sub-Saharan Africa region showed significant increase in economic activity between 2009 and 2010. During the same period, Zimbabwe recorded 0.56 and 2.92 percentage points increase in GPD and non-performing loans respectively.

Table 1.1.1 :Economic Activity and NPLs comparative trend (2009-2017)

Economic Activity and NPLs growth (2009-2017)									
Year	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Economic Activity (%)									
SSA	*2.86*	*5.40*	*4.47*	*4.31*	*4.80*	*4.68*	*3.11*	*1.33*	*2.61*
World	*-1.74*	*4.31*	*3.18*	*2.51*	*2.62*	*2.86*	*2.86*	*2.51*	*3.15*
Zimbabwe	*12.02*	*12.58*	*15.45*	*14.78*	*5.53*	*2.13*	*1.69*	*0.62*	*3.45*
Non-performing Loans (%)									
SSA	-	-	-	*5.11*	*6.07*	*6.41*	*6.63*	*9.61*	*10.08*
World	*4.21*	*4.01*	*3.89*	*3.74*	*4.15*	*4.10*	*4.34*	*3.91*	-
Zimbabwe	*1.8*	*4.72*	*7.55*	*13.46*	*15.92*	*15.91*	*10.82*	*7.87*	*7.08*
Benchmark	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*

Source 1: World Bank & RBZ Dataset
**SSA stands for Sub-Saharan Africa*

Table 1.1.1 further indicates that world economic performance regressed between 2010 and 2011 whilst nonperforming loans dropped. World economic activity dropped from 4.31% to 3.18 whereas non-performing loans showed decrease in trend from 4.01% to 3.89%. More interestingly, non-performing loans were oscillating below 5% threshold pegged by Bank of International Settlement (BIS). As shown in Table 1.1.1, Zimbabwe recorded drastic upsurge of 2.87 and 2.83 percentage points in economic growth and non-performing loans respectively. Trends in economic activity and non-performing loans for Zimbabwe during 2010 and 2011 might have stemmed from continued funding of business operations by banks to bad borrowers. Figure1.1.1, indicates upward trend in total loans which supports the idea of rapid credit expansion to bad borrowers leading to burgeon in bad loans. Burgeon in non-performing loans could also have emanated from massive company closures that was experienced during 2010 and 2011.

During 2011 and 2012, the world economic performance deteriorated by 0.67 percentage points whilst non-performing loans slightly dropped by 0.15 percentage point. Zimbabwe on the other hand recorded similar 0.67 percentage points decline in economic performance. During the same period, Zimbabwe recorded 5.91 percentage points increase in non-performing loans and this could have stemmed from continued company closures which had a ripple effect of shrinking economic performance. More importantly was the fact that non-performing loans for Zimbabwe started to oscillate above international benchmark of 5% in 2011.

Change in trend was witnessed between 2012 and 2013 when world economic activity slightly improved from 2.51% to 2.62% whilst world non-performing loans rate worsened from 3.74% to 4.15%. This is depicted in Table 1.1.1. Sub-Saharan Africa as a continent, recorded increase in both economic performance and non-performing loans by 0.49 and 0.96 percentage points respectively during 2012 and 2013. Significant deterioration in Zimbabwean economic activity was shown during 2012-2013 when GDP trend retarded from 14.78% to 5.53% along with rise in non-performing loans from 13.46% to 15.92%. Drastic decline in economic activity might have resulted from a combination of factors which probably include massive company closures and reduction foreign investment. Similarly, drastic rise in non-performing loans could have resulted from adverse combination of decline in economic activity and rise in number of distressed companies. Non-performing loans rate for both Sub-Saharan Africa and Zimbabwe were above 5% during 2012 and 2013.However non-performing loans for Zimbabwe were increasing at a decreasing rate between 2012 and 2013.

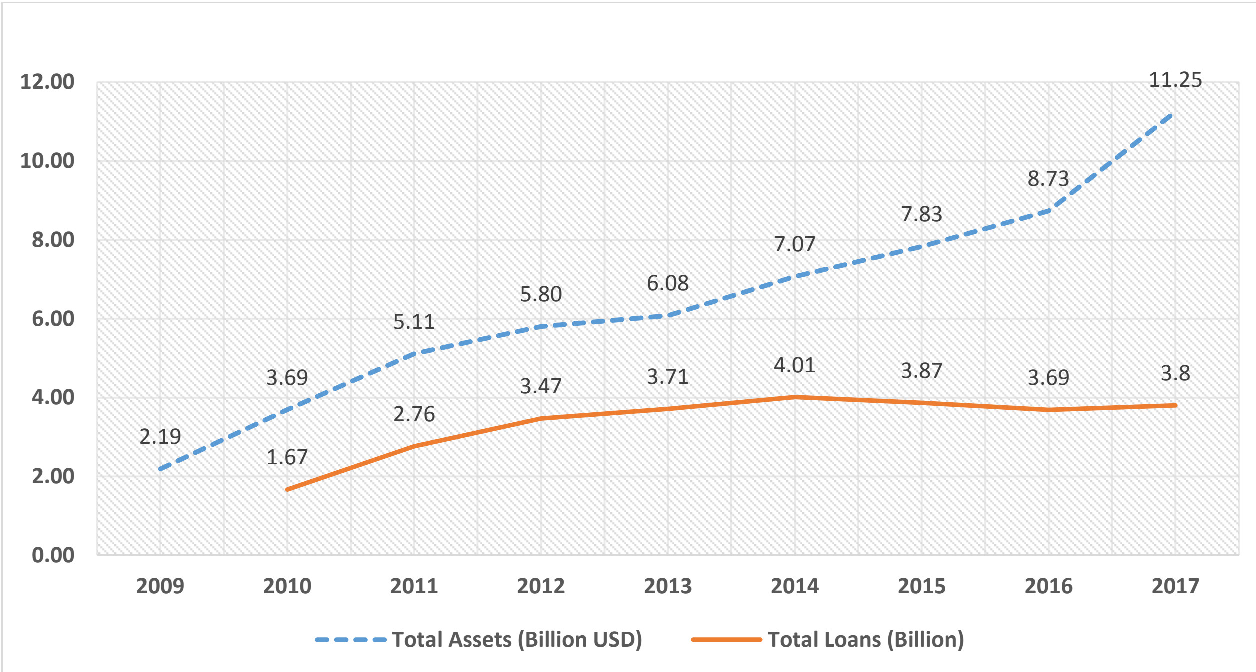
The world experienced decline in economic activity during 2013 and 2014 whilst both Sub-Saharan Africa and Zimbabwe showed regressing trend. World GDP increased from 2.62% to 2.82% whilst non-performing loans down trended by 0.05 percentage points. GDP growth for Sub-Saharan Africa and Zimbabwe dropped by 0.12 and 3.4 percentage points respectively. Sub-Saharan Africa non-performing loans increased by 0.34 percentage points whilst Zimbabwe recorded marginal decline of 0.01 percentage points.

World economic activity remained stagnant whilst non-performing loans increased during 2014 and 2015. On the other hand, Sub-Saharan Africa showed decrease in economic activity and increase in NPLs. The region experienced decline in economic activity level by 1.57 percentage points coupled with a 0.22 percentage points increase in non-performing loans. At country-level, Zimbabwe experienced further plunge in economic activity from 2.13% to 1.69% during 2014 and 2015. Favorable decline in non-performing loans trend extended into 2014 and 2015 were the trend significantly dropped by 5.09 percentage points. Improvement in non-performing loans is accredited to the establishment of ZAMCO during 2014.

During 2015 and 2016 economic performance for the world, Sub-Saharan Africa and Zimbabwe retarded by 0.35, 1.78 and 1.07 percentage points correspondingly. World non-performing loans ration dropped from 4.34% to 3.91% whilst Sub-Saharan Africa posted increased from 6.63% to 9.61%. The non-performing loans ratio for Zimbabwe improved from 10.82% to 7.87% between 2015 and 2016. Zimbabwe posted positive improvement in economic performance and non-performing loans ratio during 2017. The economy grew from 0.62% to 3.45% whilst non-performing loans ration further dropped from 7.87% to 7.08%. Although Zimbabwean banking industry recorded continuous decline in non-performing loans ratio since 2013 to 2017, the current ratio is still above the 5% international benchmark.

Figure 1.1.1 indicates exponential growth in the Zimbabwean banking industry as denoted by total assets curve.

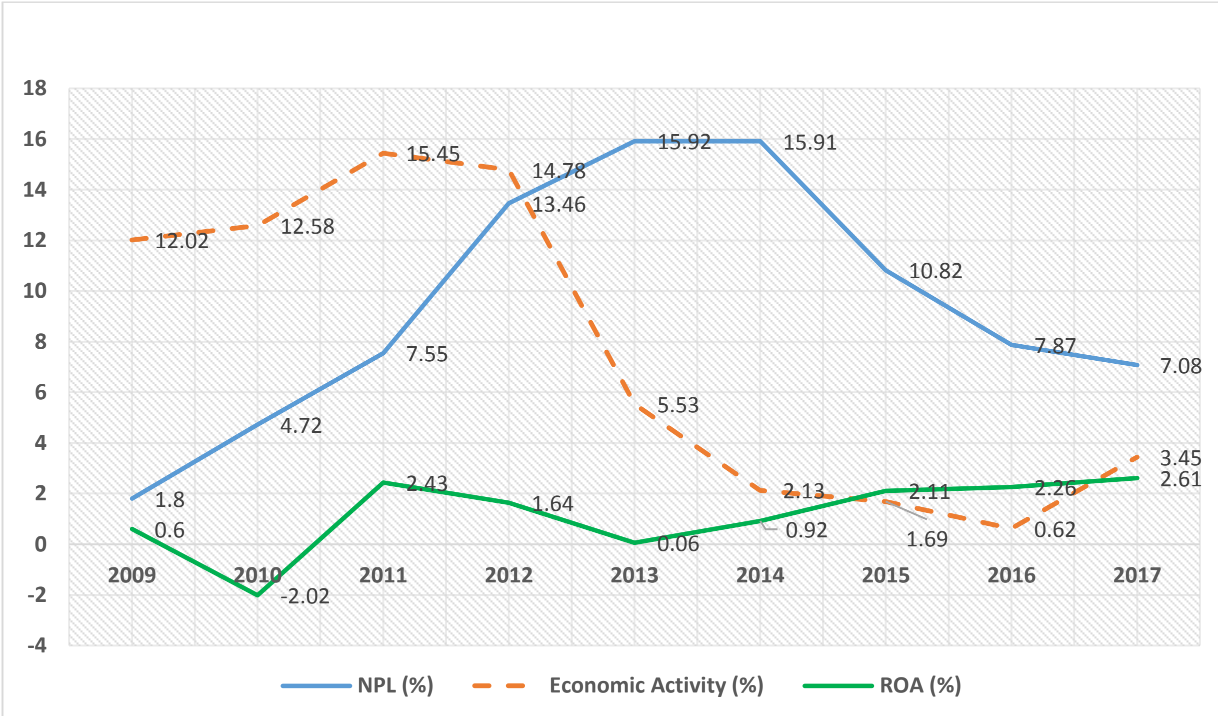
Figure 1.1.1: Banking Sector Total loans & assets growth (2009-2017)



Source 2: RBZ (2018)

Based on Figure 1.1.1 both total loans and total assets for Zimbabwean banking industry significantly improved between 2009 and 2014. These trends maybe related to aggressive lending culture adopted by banks when the economy was dollarized in 2009. Although there was continuous growth in total assets from 2009-2017, total loans began to decline in 2015 extending to 2016. However total loan curve regained momentum in 2017 were gross loans increased from USD 3.69 billion to USD 3.8 billion. Linking the trend in total loans between 2015 and 2016 and non-performing loans statistics presented in Table 1.1.1 and Figure 1.1.2, it can be discerned that banks became less aggressive in lending thus resulting in reduction in non-performing loans during the same reporting period.

Figure 1.1.2: NPLs and GDP Trends



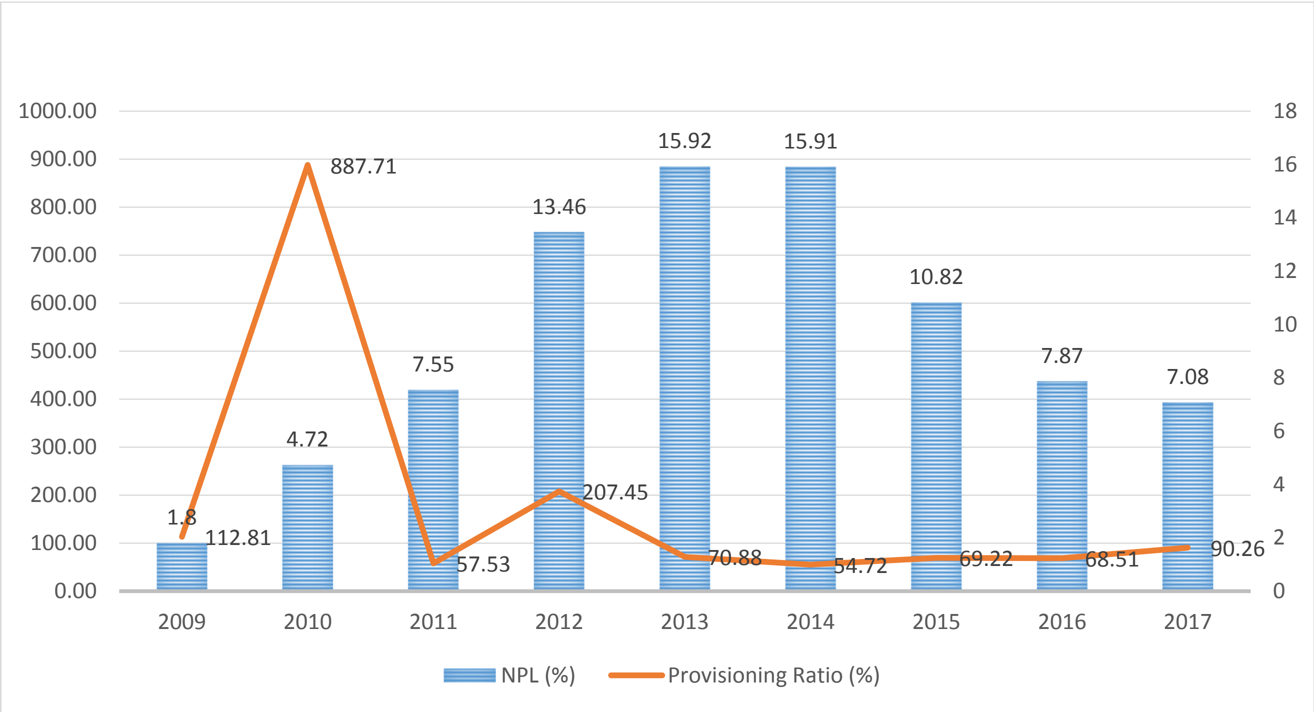
Source 3: RBZ (2018)

Trends in Figure 1.1.2 shows GDP as leading indicator since it is preceding the non-performing loans trend implying that the latter is a lagging indicator of the former.

Banking sector provisioning ratios are of paramount importance when analyzing the ability of the sector to withstand unforeseen shocks. Figure 1.1.3 evidenced lack of alignment of provisioning ratio to NPLs. In 2009, the banking industry's provisioning ratio was 112.81% against NPLs of 1.8%. When NPLs rose to 4.72% in 2010, the sector provisioning ratio was sitting at 887.71%. Based on 2009 and 2010 ratios, there was lack of coherence between non-performing loans ratios and provisioning ratios.

Figure 1.1.3 further indicates that provisioning ratio drastically dropped from 887.71% to 57.53% whilst non-performing loans burgeoned from 4.72% to 7.55% during 2011. In 2012, non-performing loans ratio further worsened to 13.46% whilst provisioning ratio improved to 207.45%. In this regard, there was an improvement in provisioning ratio, although the trends are not aligned. In face of rising non-performing loans in 2013, the provisioning ratio dropped to 70.88 against non-performing loans ratio of 15.92%. Provisioning ratio further dropped to 54.72 in 2014 when non-performing loans ratio marginally decreased to 15.91%.

Figure 1.1.3: NPL &Provisioning Ratio (2009-2017)



Source 4: RBZ (2018)

An unrelated change in trend was evidenced in 2015 when provisioning ratio improved from 54.72% to 69.22% whilst non-performing loans ratio dropped to 10.82%. In 2016, provisioning ratio marginally dropped to 68.51% when non-performing loans ratio declined to 7.87%. Provisioning ratio improved in 2017 from 68.51% to 90.26% whilst non-performing loan marginally dropped to 7.08%. In summary, there was lack of definable trend between changes in provisioning ratios in response to non-performing loans. Based on Figure 1.1.3, it can be discerned that the Zimbabwean banking sector is not aligning provisioning ratio to actual non-performing loans ratio hence weakening sector's resilience in the event of shocks.

1.2. Problem Statement

In Zimbabwe, a number of institutions and policies were established to curb non-performing loans and promote stable macroeconomic environment. Firstly, the adoption of multiple currency regime in 2009 promoted macroeconomic stability in Zimbabwe. In July 2014, Zimbabwe Asset Management Corporation (ZAMCO) was formed with the main aim to reduce NPLs to below 5% in Zimbabwe. In light of all these policies, non-performing loans ratio remained above 5% threshold and the economy continued to post stunted growth in economic activity. The study is therefore motivated by the adverse trend in NPLs witnessed following adoption of multicurrency system. There is need to understand whether the drivers of these NPLs were bank specific or macroeconomic as well as uncovering short-run and long-run linkages between macroeconomic variables and NPLs, which proxy for the financial sector developments, in Zimbabwe. More specifically, the study is motivated by the need to understand the nexus between economic activity and NPLs thus leading to the question “what relationship do exist between NPLs and economic performance in Zimbabwe and, of the relationships, what are the directions and magnitudes of movement between NPLs and real economy?

1.3. Research objectives

The main aim of this study is to assess the dynamics of NPLs in Zimbabwe and the linkages with the overall economic performance. The specific objectives of the study are to:

i. Assess the dynamics of NPLs in Zimbabwe;
ii. Examine direction and magnitude of the linkage between NPLs and real economy in Zimbabwe; and
iii. Identify determinants of non-performing loans.

1.4. Research Hypothesis

The study tested the following hypothesis:

$H_{0:}$ There is absence of feedback effects of the of the rise in NPLs on the macroeconomy.

$H_{1:}$ There is presence of feedback effects of the rise in NPLs on the macroeconomy.

1.5. Scope of the study

The study analyzed nine banks in Zimbabwe for the period from 2009 to 2017. The main benefits of using panel analysis is that it accounts for individual banks' heterogeneity as well as allowing for more data points. The main reason for selecting nine banks is that some banks may be outliers if incorporated into the analysis because of limited data availability as some banks commenced operations after 2009. Example of banks that were excluded in the analysis include Steward Bank which was formed in 2013.

1.6. Significance of the study

Many studies identified determinants of NPLs in Zimbabwe and the studies includes work done by Manzote (2016), Chikoko (2012), Mabvure (2012) and Mukoki (2015). Existing literature gap from these studies is that none of the studies conducted in Zimbabwe attempted to establish whether the relationship between NPLs and economic activity trends is a short run or long run relationship and that whether the relationship is one-way or two-way, that is, the possibility of feedback and spill-over effects. More so few studies conducted in Zimbabwe employed a dynamic model to study traits of NPLs overtime thus this study covered the existing gap by employing both static and dynamic models and also added on existing literature by examining the linkage that exist between financial sector and real economy. The study will therefore contribute to uncover the nature of the relationship, that is whether short-run or long-run, between macroeconomic variables and NPLs as well as identifying the relationships in static and dynamic models. This study will help regulatory authorities understand the nature of relationship that exists between the real economy and NPLs in Zimbabwe.

1.7. Assumptions of the study

The study was conducted under the following assumptions:

- Data that was used in this study was free from errors.
- Selected panel of banks fully represents the Zimbabwean banking industry.

1.8. Limitations of the Study

A number of challenges were faced during the study period and they include:

- Limited time to adequately conduct the study.
- Limited knowledge on how to use Stata data analysis econometrics package that was used to estimate results.

1.9. Definition of key terms

Macrofinancial linkages refers to the interaction between the banking sector loan portfolio quality and the macroeconomy.

1.10. Organization of the study

Chapter one looked at the introduction, the problem statement, research objectives, research hypothesis, scope of the study, significance of the study, assumptions and limitations of the study. Chapter two discussed theoretical and empirical works related to determinants of NPLs and interactions between macroeconomy and NPLs as cited by various researchers. Chapter three discussed research methodology while Chapter four discussed research results. Chapter five summarized researcher conclusions and recommendations.

CHAPTER 2: LITERATURE REVIEW

2.0. Introduction

This section discusses theories and empirical finding from previous studies. The first section looked at theories explaining determinants of non-performing loans. Last section looked at empirical literature review, putting much emphasis on findings drawn from similar studies conducted in different countries.

2.1. Theoretical literature review

This section first looked at theories explaining determinants of nonperforming loans from previous studies. Later section covered empirical findings related to determinant of NPLs and linkages between banking industry and the real economy.

2.1.1. Determinants of Non-Performing Loans

Two main sets of factors of determinants of non-performing loans are external and bank-level factors.

2.1.2. *Moral Hazard Hypothesis (MHH)*

According to moral hazard hypothesis high loans to assets ratio results in the growth of NPLs (Ahmad 2013). In most cases, managers engage in riskier lending than optimal because of two primary “moral hazard” problems (Jensen 1976). These primary moral hazard problems are that management rather maximizes their own benefits than those of the firm and a conflict arises between shareholders and creditors since shareholders prefer risk and try to shift it to creditors. Moral hazard hypothesis is the notion that banks with lower capital tend to increase the riskiness of their loan portfolio in response to moral hazard incentives. This theory was put forward by (Keeton 1987) and the authors explained that such a combination of low capital and high desire to take on more risk yields burgeon in non-performing loans in the long-run. Keeton (1987) explained that one of the forms of risk-taking activities is excess lending. This theory partly explained the Zimbabwean experience few years after dollarization, that is between 2009 to 2014, when there was drastic growth in total loans as evidenced in Figure 1.1.1. During this period banks were lending aggressively and such a lending culture led to rapid growth in non-performing loans trend. Relating to moral hazard theory, most banks were undercapitalized between 2009 and 2014 but total loans continued to rise resulting in many bank failure cases.

Keeton (1987) indicated that non-performing loans were high in banks lower equity-to-assets ratio. The theory explains inverse association between non-performing loans and capital ratios and were supported by (Salas 2002). In theory, negative association between capital ratios and non-performing loans infer that the later rises as the former decreases and this was the exact snapshot of the Zimbabwean banking industry between 2009 and 2014 where bank were lowly capitalized coupled with rising problem loans.

2.1.3. Quiet life hypothesis (QLH)

Quiet life hypothesis holds that banks charges higher fees in order to cover up for management's slackness. Firms with high market power may also take advantage of gains from non-competitive pricing in more relaxed environment in which less effort is put to minimize cost (AI-Muharrami 2009). High market power creates sufficient environment to charge high fees for bank products. Charging of high fees by banks imply that customers access bank services that are expensive. The expensiveness of bank products to customers will create an incentive for customers to venture into risky projects in order to earn high returns. Venturing into risky projects by bank customers increases their probability of default and ultimately a rise in non-performing loans.

High bank charges attract bad borrowers and deters good borrowers. This is because higher fees infer overpricing of services to those borrowers with good credit rating but are a lower pricing for bad borrowers that lies in the bottom part of the credit market with lower credit rating. Ultimately banks' balance sheet will mainly constitute of bad borrowers because of the bank charges that they consider underpriced when considering their credit risk profiles. The obvious outcome would be rise in non-performing loans in banks. Slack managers do not perform thorough vetting. Applying this knowledge to Zimbabwe, bank lending rates were passively monitored by the Reserve Bank of Zimbabwe resulting in banks charging different exorbitant charges to customers. However, years later after adoption of multiple currency regime, central bank became stricter in monitoring bank lending rates when it placed a ceiling in lending rates and such an initiative contributed in reshaping the non-performing loans trend. The main findings of (Chikoko 2012) revealed that NPLs were that non-performing loans were stemming from limited client knowledge and weak internal systems supported the view of slack managers and charging of high fees by banks in Zimbabwe.

2.1.4. Bad Management Hypothesis (BMH)

Berger (1997) opined that decrease in cost efficiency is most likely to result in high ratios of non-performing loans and they termed this "*bad management hypothesis*". These authors stated that subpar managers catalyze burgeon in non-performing loans due to inefficiencies. Bad managers are mainly characterized by, inter alia, poor loan underwriting and monitoring standards and inappropriate collateral valuation (Berger, 1997; Quadt, 2016; Ahmad, 2013). Various studies used different efficiency proxy in testing for the linkage between NPLs and efficiency. Messai (2013) used ROA as a proxy for efficiency and they found that ROA variable negatively correlate with non-performing loans ratio, thus supporting bad management hypothesis.

Nyamutowa (2013) and Chikoko (2012) conducted studies that well answered the level of skills of bank managers in Zimbabwe. With regard to loan underwriting and monitoring, (Nyamutowa 2013) indicated that Zimbabwean banks had formal risk reporting structures with each risk factor being analyzed independently. This infer that banks clearly separated all risks into categories hence lower chances of under provisioning resources for loans monitoring. Banks also form credit committees to manage credit risk. In order to ensure that credit risk exposure is within acceptable parameter, banks frequency produce arrears reports, facilities management reports, guarantees reports, insider loans reports, inspection reports, early alert reports and underwriting standards. All these reports provided banks with a clear picture on credit risk hence the need to know why credit risk trended with such systems in place.

Chikoko (2012) provided supportive study on the issue of poor managerial practices in managing non-performing loans. The study indicated that most banks continued to use Zimbabwe dollar era credit policies and this was prominent in local banks, of which all were aggressively lending. Banks used reactive rather than proactive approach and all these explain poor managerial practices hence matching bad management hypothesis. Continuous usage of old credit policies infers poor loan underwriting and monitoring.

2.1.5. Skimping Hypothesis (SH)

Berger (1997) developed skimping hypothesis which suggest positive association between cost efficiency and NPLs ratio. The hypothesis states that high cost-efficient banks may allocate inadequate resources for loan underwriting and monitoring resulting in high levels of non-performing loans (Klein 2013). In order to achieve high cost efficiency, managers reduce costs associated with underwriting, monitoring and controlling of borrowers (Quadt 2016) . Cost cutting measures are taken with the goal to improve short-term profitability by compromising long-term loan portfolio quality. Skimping behavior portrays deceiving image that banks are efficient in the short-run yet less resources would have been devoted for loan underwriting and monitoring. The key decision for bank managers to make under this hypothesis is the trade-off that exist between long-term loan portfolio quality and short-term cost efficiency (Berger 1997)

A study conducted by Chikoko (2012) on bank credit culture indicated that approximately 40% of banks operating in Zimbabwe were current profit driven and these findings matched expected outcome from the hypothesis as the non-performing loans ratio for the same period was rising as shown in Figure 1.1.2. This means that bank managers that are short-term profit driven may allocate inadequate resources for loan monitoring in order to incur less operating cost. Consequently, due to inadequate loan monitoring, non-performing loans ratio will rise.

2.1.6. Bad Luck Hypothesis (BLH)

This theory was developed by Berger (1997) and it states that rise in non-performing loans stems from adverse macroeconomic conditions. The theory explains that rise in non-performing loans is precipitated by external events. Adverse external events include, but not limited to, regional recession and company closures Berger (1997). These adverse external events incapacitate or weakens borrowers’ repayment capacity resulting in high rates of defaults and hence rising non-performing loans. Additionally, banks incur significant costs in an attempt to recover defaulted loans and these additional costs include, among others, expenses for workout arrangements, monitoring defaulted borrowers and seizing, maintaining and disposing of (Ahmad 2013).

In Zimbabwe, major banks have corporate divisions and these divisions suffered rises in non-performing loans due to increase in number of distressed and failed companies prior and post dollarization of the economy. Adverse macroeconomic conditions also extend to affecting households as individual borrowers, thus affecting loan portfolio quality for most bank divisions such as SMEs, retail and corporate divisions.

2.1.7. Size Effect Hypothesis (SEH)

This is the postulation that increase in bank size leads to decrease in future non-performing loans (Ahmad 2013). Size effect hypothesis looks at bank size from total loans perspective. The theory argues that large banks enjoy diversification benefits in lending than smaller banks. According to the hypothesis, large banks benefit from diversification by lending to diverse clientele base, including different sector of the economy, which then reduces the chance of non-performing loans rising when compared to smaller banks that faces high concentration risk due to limited clientele base and lending resources. Based on these arguments, the theory assumes negative correlation between bank size and NPLs. Negative connection implies that non-performing loans decreases as bank size increases.

However, although the theory assumes that non-performing loans tend to decrease as bank size increases, there exist possibility of positive connection between bank size and non-performing loans ratio as large banks may also get exposed to adverse selection and moral hazard due to information asymmetry. Based on Zimbabwean banking sector, non-performing loans were rising when total loans were on rise, that is during 2009 and 2014 and both trends started to retard when total loans were declining. Conclusively, it can be argued that the relationship between bank size and non-performing loans can be either positive or negative.

2.1.8. Procyclical credit policy theory (PCPT)

There is a definite linkage between bank lending behavior and movement in economic trends. Pro-cyclicality in lending is when banks tend to use liberal credit policy during booms and stiffer credit policy during downturns (Ahmad 2013). Procyclical credit policy hypothesis posits that growth in credit results in the growth of future NPLs (Ahmad 2013). A Pro-cyclical credit policy affects overall bank's risk profile and performance. According to pro-cyclical credit policy past earnings are positively related with problem loans (Belaid 2014). The theory explains that bank managers advance credit to risky borrowers in order to convince the market for bank's profitability by inflating current earnings at the expenses of future problem loans (Belaid 2014). Lenient credit policies led to failure of such banks Interfin, Genesis and Renaissance in Zimbabwe.

2.1.9. Cognitive dissonance hypothesis (CDH)

Cognitive dissonance hypothesis states that banks engage into justifying past choices even if they have failed in the past. Cognitive dissonance arises from misinterpretation or rejecting recent information in order to justify the previous choice. Use of Zimbabwean dollar era credit policies during early periods of inception of multiple-currency regime was adequate enough to explain that banks believed in old credit policies than any new policies.

2.1.10. Competition stability and concentration-fragility hypotheses

Many researches showed much interest in understanding and testing concentration-fragility and concentration-stability theories. Competition stability hypothesis (CSH) states that less concentrated banking systems with smaller banks are most likely to suffer financial crisis than banking systems with few large banks. The CSH further explains that higher interest rates (monopoly rents) in less competitive markets result in burgeoning NPLs. Boyd and De Nicolo (2005) showed that more concentration in loans market leads to high cost of borrowing for customer resulting in high defaulting probabilities. Literally, increase in rates of interest results in increase in NPLs. In contrary, concentration-fragility hypothesis (CFH) is of the view that highly concentrated banking systems are much more fragile. Under CFH, smaller banks have high chances to assume excessive risk due to high competition.

2.1.11. Too big to fail hypothesis (TBTF)

The TBTF hypothesis explains how big banks increase risk by heightening bank leverage and advancing loans to credit unworthy customers and putting upwards pressure on non-performing loans. This hypothesis assumes positive nexus between bank size and non-performing loans (Rajha 2016).

2.2. Empirical literature review

This section looked at empirical studies that were conducted in analyzing two main areas. Firstly, the study looked at empirical work done in identifying determinants of non-performing loans in different countries. Lastly, the researcher looked at empirical findings drawn from various researchers on linkages between the banking sector and the real economy.

2.2.1. Determinants of non-performing loans

Previous literature identified that non-performing loans are either driven by internal or external factors or a mix of both.

2.2.2. Macroeconomic variables

A great deal of models was applied in the same research area, where some studies applied static models only. A study by (Mukoki 2015) analyzed on the effects of dollarization on growth of NPLs in Zimbabwe using autoregressive distributed lag (ARDL) Bond Test. The study covered from 200 to 2014 and research variables that were included in the analysis were profitability, loan provision, bank capitalization, return on asset, liquidity, dollarization, interest rates spread and expense to income ratio. These authors found that dollarization has no effect on NPLs behavior both in the short-run and in the long-run and that liquidity has negative impact on non-performing loans ratio while return on equity positively associate with non-performing loans thus conforming to procyclical credit policy hypothesis.

In the same line of research, Chikoko (2012) used a survey research approach in order to have an insight on NPLs behavior in Zimbabwe during dollarization using a panel of fifteen banks. Main findings were, among others, lack of client knowledge, ethics and corporate governance issues, multi-borrowing and high lending rates. A study by (Mabvure 2012) used CBZ case study to explain determinants of NPLs in Zimbabwe. Findings indicated that external factors dominate in causing NPLs.

Study by (Manzote 2016) analyzed macroeconomic determinants of nonperforming loans in Zimbabwe by using OLS method on quarterly time series data covering from 2009 to 2013. Study variables were inflation, unemployment and the gross domestic product. Findings revealed that inflation, unemployment and interest rates positively associate with NPLs and that real gross domestic product negatively correlate with non-performing loans.

A group of studies looked into influence of macroeconomic variables on NPLs (Bucur, 2014; Castro, 2012). Some studies looked into macro and microeconomic determinants of credit risk (Das, 2007; Messai, 2013). Ganic (2014) researched the influence of bank-level variables on non-performing loans while (Garr 2013) employed a comprehensive approach that captured macroeconomic, industry-specific and bank-specific variables.

According to previous literature, the most widely discussed macroeconomic variables were real gross domestic product growth rate, foreign direct investment, inflation, credit to private sector, unemployment rate, exchange rate fluctuations and lending rates.

Real GDP growth rate

The assumed hypothesis according to previous studies is that favorable movements in real GDP growth rate improves borrowers loan repayment capacity through improved incomes thus reducing possibility of defaulting and hence putting downward pressure on non-performing loans. This postulation assumes negative association between non-performing loans and real GDP growth rate (Dash 2010). Castro (2012) investigated macroeconomic determinants of non-performing loans using a group of countries namely Greece, Ireland, Portugal, Spain and Italy (GIPSI) using quarterly data from 1997 to 2011. The researcher used pooled OLS, fixed effects and random effects models along with GMM econometric technique. Castro (2012) found negative relationship between GDP growth rate and non-performing loans growth and results conformed to findings made by Das (2007) and Riley (2014).

Waemustafa (2015) analyzed macroeconomic and bank specific determinants of credit risk in Islamic and Conventional Banks using multivariate regression analysis on the sample of fifteen conventional banks and thirteen Islamic banks in Malaysia over the period between

2000 and 2010. The study rendered GDP growth rate as insignificant determinant of NPLs in both Islamic and conventional banks. Results indicated that non-performing loans were non-responsive to adverse movements or improvements in real GPD rate. Results concurred with findings from Bucur (2014) in Romania.

Inflation rate

Another widely discussed macroeconomic determinants of non-performing loans is inflation. Large number of researchers projected negative correlation between inflation and non-performing loans. Inverse association infer implies that higher levels of inflations erodes real value of outstanding loans thus make debt servicing easier in a high inflationary environment than in a low inflationary environment. However, this is short-term and may not hold if the economy decides to quickly switch to using other countries' currencies as well as restating debts in the new currency. Some studies found that inflation negatively influence non-performing loans in conventional banks but does not influence non-performing loans levels for banks Islamic banks (Waemustafa 2015).

A study by (Tanaskovic 2015) analyzed macroeconomic and institutional empirical determinants of growth of NPL ratios focusing on selected CEEC and SEE countries over the period between 2006 and 2013. These countries include Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Hungary, Lithuania, Montenegro, FYR Macedonia, Romania, Serbia and Slovenia. A combination of dynamic and static models was employed and findings rendered inflation as statistically insignificant to influence non-performing loans. Findings conformed to (Castro 2012). Using countries in CESEE, Klein (2013) found positive connection between inflation and NPLs. Positive association implies that NPLs are likely to increase when inflation is rising.

Unemployment rate

In Central and Eastern European (CEE) countries, (Skarica 2013) used fixed effects approach to investigate determinants of NPLs using quarterly data from 2007 to 2012. Findings suggested positive association between unemployment rate and nonperforming loans ratio. Findings were similar to those from Klein (2013). Positive correlation communicates that rise in unemployment rate leads to rise in NPLs. This interrelation explains that rising unemployment rate reduces borrowers' loan servicing capacity leading burgeon in non-performing loans.

Study by (Valahzaghard 2012) investigated on macroeconomic drivers of credit risk in Iran using a panel of public and private banks covering from 2005 to 2010. Fixed effect results revealed that changes in unemployment do not influence non-performing loans position for banks in Iran.

Lending rate

Interest rate is among macroeconomic variables that wide literature has considered as NPLs driver in the banking industry. In many studies, interest rate was rendered a significant determinant of non-performing loans and has effect on debt burden. Through debt burden, a positive association between interest rate and NPLs can be projected. The logic is that increase in interest rate will lead to rise in debt burden resulting in an increase in nonperforming loan rate Authors that found positive association between interest rates and non-performing loans include (Nkusu 2011) and (Louzis 2011). Asymmetric information theory predict that non-performing loans positively respond to rise in interest rates through adverse selection and moral hazard problems.

Prakash (2013) conducted a study on macroeconomic drivers of credit risk in Nepal using annual time series data from 2001 to 2011. The study used a static model and findings suggested that interbank rate had no influence on non-performing loans.

Capital inflows

Changes in the rate of capital inflows proved to have significant influence in the study by (Love 2013). The study found negative association between capital inflows and loan portfolio quality proxy in both the random effects and GMM models.

2.2.3. Bank-level variables

Bank Size

There are mixed findings with regard to the influence of bank size on non-performing loans ratio. Based on too big to fail hypothesis, a positive relationship between bank size and non-performing loans is expected. In contrary, size effect hypothesis predicts negative relationship between bank size and non-performing loans ratio. The notion behind size effect hypothesis is that large banks benefit from diversification by lending to diverse clientele base, including different sectors of the economy, which then reduces the chance of non-performing loans rising when compared to smaller banks that faces high concentration risk due to limited clientele base and lending resources.

Boru (2014) investigated on factors influencing credit risk in Ethiopia. The study used a combination of descriptive and econometric model using 1990-2012 data and findings showed that there is positive correlation between bank size and nonperforming loans. Positive association was in line with too big to fail hypothesis. Similar findings were made by (Das 2007). In contrary, Hu (2004) found that bank size negatively relates to nonperforming loans in Taiwan and these findings conformed to size effect hypothesis.

Loan-to-deposit ratio

The ratio of loans to deposits shows the portion of deposits that are advanced as loans. Loan to deposit is regarded as an efficiency measure which shows the ability of the bank to convert its liquid assets in more productive investments like loans and advances. Study by (Prakash 2013) and (Ganic 2014) revealed that the ratio is an insignificant determinant of non-performing loans. In contrary, (Swamy 2012)and (Boru 2014) suggest negative association between loans to deposit ratio and nonperforming loans ratio.

Return on assets

A number of researches avowed that bank profitability plays a role in determining future nom-performing loans trend. The two common profitability proxy from previous studies are return on assets and return on equity. Messai (2013) researched on the micro and macro determinants of non-performing loans in Italy, Greece and Spain. Their study covered from 2004-2008 using a sample of eighty-five banks. The study showed negative relationship between return on assets and non-performing loans. Findings were in line with conclusion made (Beaton 2016). However, in Spain, Garcia-Marco (2008) used a sample of one hundred and twenty-nine (129) banks covering from 1993 to 2000 and concluded that high rate of return on equity leads to future non-performing loans problem. Klein (2013) found negative association between return on equity and non-performing loan and findings diverged from those drawn by (Garcia-Marco 2008).

Loan-to-assets ratio

Loans to assets ratio is an indication of the overall portion that the loan portfolio constitutes in gross bank assets. Therefore, the ratio reflects bank choice for riskier investments relative to risk-free securities such as holding government securities Based on this stipulation, a higher loan to assets ratio communicates an increase in banks' exposure to non-performing loans problem. The explanation above predicts a positive nexus between loans to assets ratio and non-performing loans ratio. Riley (2014) found positive association between NPLs and loans to assets ratio.

Loan growth rate

The pace of growth in total loans is assumed to have implication on future loan portfolio quality. Quick loan portfolio growth is assumed to be inherent with adverse selection problem where banks' loan portfolios would be highly contaminated with bad borrowers that induces burgeon in nonperforming loans. Dynamic model results by Klein (2013) suggested a positive linkage between loans growth rate and non-performing loans. Wide number of literatures suggests that loans growth is an insignificant determinant of nonperforming loans ratio (Messai 2013).

Equity-to-assets ratio

Analysis of equity-to-assets ratio detects level of bank capitalization and Keeton (1987) indicated that non-performing loans were high in banks with lower equity-to-assets ratio.

This implies inverse association between non-performing loans and capital ratios and similar findings were made by (Salas 2002).

2.2.4. Macro-financial Linkage-Feedback Effects

Most studies looked at macro-financial linkage from different perspectives. Strand of studies researched on Macrofinancial linkages between economic activity and banking sector by employing panel VAR econometric modelling approach with emphasis on how economic activity influences non-performing loans and the possibility of second round effect, that is, whether non-performing loans impact real economy. The most known path of how economic activity impact non-performing loans is through how positive and negative movements in economic performance influences borrowers' loan repayment capacity. Beaton (2016) opined that non-performing loans affects the economy via non-credit supply and credit supply channels, with the later taking the lead.

There are groups of researchers that conducted cross-country versus single coverage along with bank-level versus country aggregate observations. Love (2013) are typical example of researchers that employed this approach. Some groups combined bank level and aggregate economic indicators for various countries and Nkusu (2011) is one of the authors that used this technique. Espinoza (2010) is among group of researchers which mainly used bank-level data for different countries.

Strand of studies investigated existence of spill-over and feedback effects between real economy and banking industry NPLs. Jordan (2013) conducted a study in Bahamas to examine the impact of nonperforming loans on economic growth. The authors used a combination of ordinary-least square technique and vector error correction (VEC) model using quarterly data from 2002 to 2011. Study variable were real GDP in Bahamas, United State real GDP, weighted average loan, inflation rate, credit to private sector, air arrivals and foreign direct investment. In their study, air arrivals variable was used as a proxy for determining tourism output whereas credit to private sector was a proxy for consumer demand. Justification for inclusion of US real GDP variable was that it was Bahamas major trading partner. Jordan (2013) study findings revealed that rise in economic growth is associated reduction in NPLs in the short and long-run. Study results also suggested small but significant feedback effect from non-performing loans to economic growth.

Riley (2014) analyzed macro-financial linkages in the Eastern Caribbean Central Union (ECCU) using lens of complementary approaches. The study employed a combination of static and dynamic models and the study period covered from 1995 to 2013. Annual data and set of commercial banks operating in ECCU was used. Combination of macroeconomic and bank-specific variables were incorporated and these include real GDP, lending rate, rate of inflation, ratio of loan-to-assets, cost-to-income and size. Bank size was captured as the natural logarithm of bank total assets. The choice for bank-specific variables was guided by the need to capture for bank efficiency, riskiness, size and profitability.

Riley (2014) found that non-performing loans ratio tend to decline when there is positive growth shock and that higher lending rates are associated with higher non-performing loans. The study further revealed that profitable banks are associated with lower non-performing loans while inefficient and riskier banks were associated with higher non-performing loans. Concerning macro-financial linkages, panel VAR model results indicated robust feedback effects between subdued economic activity and deterioration in bank's balance sheet. Finding relating to feedback effects matched those concluded by (Jordan 2013).

Few years later, Beaton (2016) researched on drivers of NPLs in ECCU and assessed on their impact on economic activity, that is, they looked at the existence of feedback effects from banking system to economic activity. The study uncovered determinants on non-performing loans in ECCU using both static and dynamic models whilst existence of feedback effects was analyzed using panel VAR approach. Unlike Riley (2014), the study used quarterly dataset that covered from 1996 to 2015. The study sample consisted of thirty-four banks from six countries and both foreign and local banks were incorporated into the analysis.

Beaton (2016) broadly classified study variables into global, country-level and bank-level variables. The authors concluded that deterioration in loan portfolio quality is caused by both macroeconomic and bank-level factors. Beaton (2016) found that non-performing loans were high in local banks when compared to foreign banks and that there exist macrofinancial feedback loops in ECCU. Conclusions made by Beaton (2016) with regard to existence of feedback effects in ECCU conformed to those made by Riley (2014).

Another version of cross-country analysis was performed by Nkusu (2011) on the nonperforming loans and Macrofinancial vulnerabilities. The study focused on twenty-six (26) advanced economies with the research data covering from 1998 to 2009. A complementary approach combining panel regression analysis and panel vector autoregressive model was employed. A combination dynamic and static models was applied to investigate determinants of non-performing loans. Panel vector autoregressive (PVAR) model was used to examine the interactions between study variables as well as robustness checking tool for panel regression results.

Nkusu (2011) used several study variables which include GDP growth, inflation, rate of unemployment, credit to private sector in percentage of GDP, policy rate of interest, nominal effective exchange rate, change in stock price index and change in house price index. Nkusu (2011) findings revealed that burgeon in non-performing loans adversely impact macroeconomic performance from different fronts. Furthermore, findings showed that deterioration in macroeconomic environment triggers debt servicing problems thus resulting higher non-performing loans.

In Egypt, Love (2013) analyzed Macrofinancial linkages using two complementary approaches. The two approaches investigated interactions among macroeconomic variables and loan portfolio quality using multivariate framework and panel vector autoregressive model. Panel vector autoregressive model was used to control for bank-level characteristics as well as to investigate the extent to which macroeconomic shocks affects the banking industry. The study covered from 1993 to 2010 and a sample of all banks operating in Egypt was used in the analysis. Determinants of loan portfolio quality were captured using static and dynamic regression models.

Love (2013) incorporated macroeconomic, market share and bank-level variables. Market share variable was captured in two folds as share in total assets of state banks and share in total assets of foreign banks. Furthermore, macroeconomic variables incorporated in the analysis were GDP growth rate, domestic credit to private sector, aggregate lending rate, nominal effective exchange rate and capital inflows. Bank-level variables that were included in the analysis were loan to assets ratio, loans growth rate and return on average equity. Love (2013) found that macroeconomic shocks in Egypt were transmitted through the credit channel to the banking industry. The authors also revealed that capital inflows and macroeconomic shocks have adverse effect on loan portfolio quality and that higher lending rates erodes loan portfolio quality through adverse selection problem.

In Guyana, (Khemraj 2009) conducted a study to analyze the responsiveness of non-performing loans to macroeconomic and bank-level variables. Research data was obtained from a panel of six commercial banks covering from 1994 to 2004. The authors used fixed effects and pooled least square regression analysis techniques. Macroeconomic variables that were incorporated into the study were inflation, real GDP growth and real effective exchange rate. Additionally, bank-level variables were bank size, loan to assets ratio, loans growth rate and real interest rate. The authors shoed that growth in NPLs negatively correlates with GDP growth rate and inflation variables.

In the same line of research, (Espinoza 2010) examined the degree to which non-performing loans are affected by macroeconomic factors. Their study sample comprised of banks in Gulf Cooperative Council countries. Panel VAR model was used in their study and findings detected a strong and short-lived feedback effect from non-performing loans to economic growth. In parallel. Badar (2013) employed bivariate and multivariate cointegration analysis and VEC model to examine short and long-run linkage between macroeconomic factors and non-performing loans. Their findings revealed existence of long-run linkage between NPLs and macroeconomic variables. VEC model detected weak short-run linkage between NPLs, exchange rate and inflation.

Studies by Greenidge (2009) and Chase (2005) examined determinants of NPLs in Barbados. Chase (2005) incorporated inflation, real GDP growth and nominal interest rates as macroeconomic variables and findings were in line with theoretical expectations. Study by (Greenidge 2009) advanced the work of (Chase 2005) by including two more microeconomic variables namely loan growth and bank size. Study conducted by (Belgrave 2012) used VAR model to analyze the relationship between industry-specific income shocks and NPLs in Barbados. VAR results indicated that positive shocks to the distribution, professional and tourism industries lead to a reduction in NPLs and that shocks to the mining, quarrying and construction industries tend to increase NPLs.

2.3. Summary

This section discussed theories and empirical findings that were put forward by different researchers in various countries. A number of studies were conducted to analyze causes of NPLs in Zimbabwe without emphasizing for the possibility of existence of short and long-run linkage between nonperforming loans and macroeconomic variables. More so, the studies applied static models and qualitative approaches which do not capture persistent growth in NPLs hence this study covered the existing gap by employing both static and dynamic models.

CHAPTER 3: RESEARCH METHODOLOGY

3.0. Introduction

This chapter discusses the methodology applied to assess the link between financial sector and real economy, pre-estimation and post-estimation test performed in order to meet the research objectives. The first section of the chapter discussed models employed to investigate NPLs drivers in Zimbabwe. The later section discussed models that were employed to investigate the macrofinancial linkages in Zimbabwe. The ratio of non-performing loans to gross loans was used to proxy for developments in the financial sector. Analysis of NPLs relative to macroeconomic aggregates was made to investigate macrofinancial linkages in Zimbabwe.

3.1. Model Specification

3.1.1. Static and Dynamic Model

A dynamic model approach was applied following the approach used by Klein (2013) with minor modifications on the equation. Equation (1) is a static model whereas equation (2) is a dynamic model.

$$\boldsymbol{y_{i,t} = \alpha_i + \beta B_{i,t} + \gamma M_t + \varepsilon_{i,t}} \qquad \textbf{\textit{(1)}}$$

$$\boldsymbol{y_{i,t} = \alpha y_{t-1} + \beta B_{i,t} + \gamma M_t + \varepsilon_{i,t}} \qquad \textbf{\textit{(2)}}$$

Where:

$\boldsymbol{y_{i,t}}$ is the non-performing loans ratio for bank ***i*** at time t.

$\boldsymbol{y_{i,t-1}}$ is the lagged dependent variable.

$\boldsymbol{B_{i,t}}$ are bank-level variables.

$\boldsymbol{M_t}$ are macroeconomics variables.

Inputs into $\boldsymbol{B_{i,t}}$ and $\boldsymbol{M_t}$ are presented in Table 1.

3.2. Definitions, sources and apriori expectations of variables used.

Research variables were extracted from various sources which include World bank database, banks' financial statements and RBZ reports. Refer to Appendix A for definitions, apriori expectations and source of data for variables used.

3.3. Justification of variables used.

3.3.1. Real GDP growth rate (GDP)

Contractions and expansions in economic activity have implications on the rate of loan defaults by economic agents. Movements in the trend of economic activity is usually proxied by changes in the rate of growth in real gross domestic product. Relating to macrofinancial linkages literature, Jordan (2013) are among group of researchers that concluded that increase in economic growth results in reduction of NPLs both in the short-run and long-run. Changes in real GDP can be further analyzed by looking into general relationships that were concluded by various authors when investigating its impact on growth of nonperforming loans. Authors such as Riley (2014) and Dash (2010) found that increase in real GDP leads to reduction in nonperforming loans whilst Bucur (2014) concluded that changes in real GDP do not influence nonperforming loans trend. This being so, the researcher expected two possible relations between real GDP and nonperforming loans, namely negative relationship or non-responsiveness of nonperforming loans to changes in real GDP.

3.3.2. Bank Size (SIZE)

Bank size was captured as the natural logarithm of individual banks' total assets. Boru (2014) found negative connection between bank size and NPLs whilst (Hu 2004) supports a positive relationship. In this regard, the researcher predicts either positive or inverse association between the proxy for bank size and nonperforming loans in the regression analysis.

3.3.3. Loan-to-total assets ratio (LTA)

The ratio of loans to total assets is another bank specific variable that was only employed to demystify NPLs determinants. The ratio is an indication of the proportion at risk of the entire banks' assets. It also shows banks' choice for risky investment in loans relative to investing in risk-free government securities. Higher ratio infers large investment in loans and lower ratio imply less investment in loans. In ECCU, Riley (2014) found positive relationship between loan to assets ratio and NPLs hence the researcher expected positive association between the two variables.

3.3.4. Loans-to-deposit ratio (LTD)

Another bank level variable that was employed in the analysis of NPLs determinants is the ratio of total loans relative to total bank deposits. This ratio communicates the proportion of deposits that banks advance as loans to clients. Swamy (2012) found negative relationship while Ganic (2014) rendered the variable an insignificant determinant of nonperforming loans. However, the researcher expects either negative or no relationship.

3.3.5. Equity to assets ratio (ETA)

The final bank level variable that was incorporated in the study is the ratio of equity to assets which communicates level of bank capitalization. Keeton (1987) and Salas (2002) predicted inverse linkage between nonperforming loans and the ratio of equity to assets. The researcher, therefore, expects negative connection between nonperforming loans and equity to assets ratio.

3.3.6. Lending rates (IR)

Lending rate is one of the macroeconomic variables that was incorporated to explain macrofinancial linkage in Zimbabwe. The lending rate used in this study is a sector average not interest rate for individual banks. Love (2013) stated that higher lending rates erode loans portfolio quality in their macrofinancial analysis hence the researcher expects negative relationship between lending rates and nonperforming loans both in the long and short-run.

3.3.7. Inflation rate (INFR)

Inflation is among widely discussed macroeconomic variables that influence bank loan portfolio quality. Some studies found weak short-run relation between nonperforming loans and inflation variable (Badar 2013). The researcher expects strong positive association between NPLs and inflation.

3.3.8. Capital Inflows (CPINF)

Capital inflows is among macroeconomic variables that Love (2013) used to proxy for macroeconomic environment. The researcher expects negative association between NPLs and capital inflows.

3.4. Estimation Procedure, Diagnostic and Model Specification Test

The study employed several regression estimation techniques namely pooled, fixed effects, random effects and difference generalized methods of moments. Three of the performed models are static in nature which only shows a snapshot at a particular point in time and they include pooled, random effects and fixed effects models. The remaining model is dynamic in nature implying that the model captures the evolution of NPLs over time. Diagnostic checks were done before final panel regression analysis and PVAR.

3.4.1. Multicollinearity Test

The study performed correlation analysis through the construction of correlation matrix. Variables showing correlation coefficients above 0.8 were dropped from the analysis. Variance inflation factor technique was also used to check for multicollinearity in research variables and the guideline is that variables showing VIF values are greater than 10 were dropped.

3.4.2. Panel Unit root test

Levin-Lin-Chu unit root testing criteria was conducted to detect whether variables were stationary or not.

3.4.3. Hausman Test

Hausman test was used to select the best model between fixed effects and random effects models. Panel data has both random and fixed effects, therefore, there is need to conduct Hausman test in order to select the appropriate model between fixed effects and random effects.

3.4.4. Lag selection test

The study performed lag selection test which is a pre-estimation test in order to identify the optimal lag to be used in the analysis. Optimal lag selection was performed by selecting lag order with smallest modified Bayesian information criterion (MBIC), modified Akaike information criterion (MAIC) and modified quasi-information criterion (MQIC).

3.5. Panel Vector Autoregression

The researcher estimated panel VAR and uncover impulse responses. The linkage between non-performing loans, which is a financial stability measure, and real economy was investigated using panel vector autogressive analysis. The panel vector autogressive (PVAR) analysis was conducted using five variables namely NPLs, unemployment rate, real GDP growth, lending rate, inflation and nonperforming loans ratio. Panel VAR model was used to allow for endogeneity in study variables (Love, 2013). Macro-financial linkages were investigated using nine banks over nine-year period covering from 2009 to 2017.

3.5.1. Model Specification- PVAR

The model was adopted from Love (2013) with minor modifications and is specified as follows:

$$\boldsymbol{yit} = \mu_{\boldsymbol{i}} + \boldsymbol{\theta}(\boldsymbol{L})\boldsymbol{yit} + \varepsilon\boldsymbol{it}\,,\ \boldsymbol{yit} = [\boldsymbol{npl}_{i,t}, \boldsymbol{ir}_{i,t}, \boldsymbol{\Delta infr}_{i,t}, \boldsymbol{\Delta cpinf}_{i,t}, \boldsymbol{\Delta rgdp}_{i,t}] \quad (3)$$

Where

$\boldsymbol{yit}$ is a vector of macroeconomic and bank level variables.

$\boldsymbol{\theta}(\boldsymbol{L})$ is a lag operator.

Love (2013) opined that panel autoregression model accounts for individual bank specificity in the level of variables by incorporating fixed effects ($\mu_{\boldsymbol{i}}$). This imply isolation of response of the bank credit channel to macroeconomic shocks but at the same time allowing for unobserved bank heterogeneity.

The study employed Cholesky decomposition in order to determine orthogonal shock in variables of interest as well as examining their effects on other variables while holding other shocks constant. Impulse response functions were used to analyze response of study variables to orthogonal shocks.

3.6. Data Type

The research used semi-annually decomposed data, which is secondary in nature. Data was generated from bank financial statements, World Bank database and monetary policy statements.

3.7. Estimation procedure

The study first presented multicollinearity and panel unit root tests respectively. The researcher moved on to performing descriptive statistics followed by regression analysis. Lastly the researcher conducted PVAR analysis.

3.8. Summary

This chapter discussed model specification, explanatory variables incorporated into the model, diagnostic test that were carried out, data type and sources. The chapter provided brief overview of estimation procedure as well as data analysis and presentation plan. The following chapter presents panel regression analysis and panel VAR analysis to achieve the research objectives.

CHAPTER 4: RESULTS PRESENTATION AND INTERPRETATIONS

4.0. Introduction

This chapter addressed research objectives by employing both statistical measures and analytical techniques. Main sections of the chapter include interpretation of descriptive statistics, diagnostic tests, interpretation of regression results and panel VAR analysis.

4.1. Descriptive statistics

The table below shows the descriptive statistics of the key variables used in the study.

Table 4.1.1:Descriptive Statistics

Descriptive Statistics					
Variable	Obs	Mean	Std. Dev.	Min	Max
Cpinf	162	0.386659	0.652175	-0.31373	1.808625
Eta	162	0.149189	0.066851	0.079	0.6393
Infr	162	0.003189	0.03677	-0.077	0.049
Ir	162	0.204722	0.062147	0.1262	0.3063
Lta	162	0.496115	0.181218	0.1025	0.8996
Ltd	162	0.681199	0.359653	0.1664	2.608
Npl	162	0.057389	0.055231	0.0003	0.3146
Rgdp	162	0.131115	0.16001	0.006157	0.552979
Size	162	18.50811	4.705353	0.4156	21.6768

Table 4.1.1 indicates that the average growth in capital inflows was 0.387 with maximum and minimum growth of 1.809 and -0.3137 respectively. However, the level of volatility of rate of growth in capital inflows is high in Zimbabwe as denoted by high level of standard deviation of 0.652. The ratio of equity to assets is among research variables with lower level of volatility and Table 4.1.1 shows that the average ratio of equity to assets among Zimbabwean banks is 0.149 based on semi-annually decomposed data.

Among macroeconomic variables, inflation had lower standard deviation of 0.037 and minimum and maximum values of -0.77 and 0.049 correspondingly. Average lending rates oscillated around 0.2047 with minimum rate of 0.1262 and maximum rate of 0.3063. The average ratio of loan to assets in the Zimbabwean banking sector is 0.49 with a moderately high level of volatility ranging around 0.181. The minimum loan to assets ratio is 0.10 whilst the maximum value is 0.9 and such wide gap is due to lower level of lending by some of international banks included in the panel for analysis. Volatility of the ratio of loans to deposits is on the high side sitting at 0.356 and average ratio of 0.68. The average rate of growth in real GDP is 0.13 whilst average bank size is 18.51.

4.3 Diagnostic test results

4.3.1. Multicollinearity Test

As a preliminary analysis, the data was checked for multi-collinearity and the results are shown in table 4.3.1 below.

Table 4.3.1:Correlation Matrix and VIF criteria

Correlation Matrix										VIF Criteria
	Npl	Ltd	Eta	Lta	Size	Rgdp	Infr	Ir	Cpinf	
Npl	1									
Ltd	0.3116	1								2.23
Eta	0.1108	-0.0056	1							1.33
Lta	0.2993	0.6499	-0.3461	1						2.52
Size	0.0702	-0.0418	-0.0249	0.0379	1					1.05
Rgdp	-0.0342	0.1892	-0.0507	0.203	-0.1381	1				1.09
Infr	-0.034	0.1648	-0.2388	0.2277	0.0116	0.0997	1			1.21
Ir	0.0847	0.2016	-0.1478	0.3141	-0.0314	0.1289	0.2248	1		1.19
Cpinf	-0.2935	0.0663	0.0657	-0.0035	-0.1486	0.0901	-0.0066	-0.1351	1	1.07

Multicollinearity is considered present when variables exhibit a high correlation coefficient in the correlation matrix and when the tolerance value exceed 10 under VIF approach. The variables considered in this study had coefficients less than 0.8 in the correlation matrix and had tolerance values less than 10 under VIF approach, as such none of the variables was dropped in the following analysis.

4.3.2. Panel unit root test results

Table 4.3.2 presents panel unit root test results that were performed using Levin-Lin-Chu unit root testing criteria. All macroeconomic variables were stationary at level with significance level of 1%. The study assumed that all firm-level variables were stationary since the study used growth rates and percentages.

Table 4.3.2: Panel unit root test

Levin-Lin-Chu unit-root test		
Variable	p-value	Order of integration
Rgdp	0.0000***	I(0)
Infr	0.0000***	I(0)
Ir	0.0000***	I(0)
Cpinf	0.0000***	I(0)

*NB: *** (**)(*) indicates stationarity at 1%, 5% and 10% respectively*

4.3.3. Pesaran CD Test for serial correlation/cross sectional independence

The researcher tested for existence of serial correlation in the fixed effects model using Pesaran CD test. Results are presented in Table 4.3.3 below.

Table 4.3.3:Pesaran and Sargan Tests

<table>
<tr><td colspan="2"></td></tr>
<tr><td>Pesaran's test
Pesaran's test of cross-sectional independence = -1.052, Pr = 0.2928
Average absolute value of the off-diagonal elements = 0.336</td><td>Sargan Test of Overidentifying Restrictions
H_0: Overidentifying restrictions are valid
chi2(126) = 145.72
Prob> chi2 = 0.110</td></tr>
<tr><td colspan="2">Test for Serial Correlation for Instrument validation</td></tr>
<tr><td colspan="2">Arellano-Bond test for AR(1) in first differences: z= -4.8 Pr>z=0.0000
Arellano-Bond test for AR(2) in first differences: z = 1.31 Pr >z=0.191</td></tr>
</table>

Pesaran CD test results showed a p-value of 0.2982, which is more than 5% hence the researcher failed to reject the null hypothesis hence there is no serial correlation in the model.

4.3.4. Sargan Test of Over-identifying Restrictions

Table 4.3.3 presented Sargan test of over-identifying restrictions and test for serial correlation for instruments. The p-value for Sargan test was 0.11 implying that the researcher cannot reject the null hypothesis that overidentifying restrictions are valid hence the instruments were valid.

4.3.5. Arellano-Bond test for Serial Correlation for Instrument validation

Another test result presented in Table 4.3.3 is the Arellano-Bond test for AR (1) and AR (2) in first differences. According to test results, instruments are valid since the p-value for Arellano-Bond test for AR (1) is less than 5% and the p-value of Arellano-Bond test for AR (2) is above 5%.

4.3.6. Hausman test

Hausman test results in Table 4.4.1 indicated that the p-value is below 0.05 hence the researcher rejected the null hypothesis, implying that fixed effects model was considered appropriate.

4.4. Estimation of regression results: Determinants of non-performing loans

Table 4.4.1 presents regression results for pooled, fixed effects (FIXED), random effects (RANDOM) and one step generalized methods of moments (GMM) models. All models were statistically significant at 1% implying greater model reliability.

Table 4.4.1: Regression Results

Regression results				
VARIABLE	POOLED	FIXED	RANDOM	GMM
Ltd	0.02615* (0.081)	-.06018486*** (0.001)	-0.02652 (0.124)	0.01515* (0.054)
Eta	.17539811*** (0.008)	0.12386756* (0.064)	.15324692** (0.021)	-0.01723 (0.704)
Lta	.09160622*** (0.005)	.14865302*** (0.000)	.12589*** (0.000)	
Size	0.000165 (0.844)	0.0011401 (0.300)	0.000692 (0.492)	0.000639 (0.175)
Rgdp	-0.02621 (0.295)	-0.00561967 (0.797)	-0.01351 (0.549)	0.007646 (0.573)
Infr	-0.1018 (0.360)	-0.07516063 (0.436)	-0.08108 (0.418)	-0.07287 (0.298)
Ir	-0.02624 (0.696)	0.01781929 (0.765)	0.00094 (0.988)	0.044164 (0.224)
Cpinf	-.02652165*** (0.000)	-.01820053*** (0.003)	-.02204291*** (0.000)	-0.00199 (0.577)
npl L1.				.82846572*** (0.000)
Lta L1.				0.005794 (0.717)
_cons	-0.0157	-0.010577	-0.01232	-0.02029
N	162	162	162	153

R^2	0.261838				
Prob > chi2	0.0000	0.0001	0.0001	0.000	
Adj- R^2	0.223241				

Hausman Test

H_0: Random effect model is appropriate

chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 19.19

Prob>chi2 = 0.0139

*NB: *** (**)(*) indicates stationarity at 1%, 5% and 10% respectively*

Findings revealed that there are mixed results with regard to direction of influence of loans to deposit ratio on non-performing loans. Fixed effects model suggests that the loans to deposit ratio negatively influence nonperforming loans in Zimbabwe. The variable was statistically significant at 1% in fixed effects model and findings were in line with Swamy (2012). Pooled and GMM results showed that loans to deposits ratio have direct influence on NPLs whilst fixed and random effects suggest negative influence. The variable is statistically significant at 10% in pooled and GMM models. Random effects model suggested negative relationship between loans to deposit ratio and nonperforming loans but the variable was an insignificant determinant in the model.

One step GMM estimation results suggest that equity to assets ratio is statistically insignificant determinant of NPLs in Zimbabwe. On static models’ side, pooled, fixed and random effects model suggested positive influence of the equity to assets ratio on NPLs in Zimbabwe. The equity to assets variable is significant at 1% in the pooled model, 5% and 10% in the fixed and random effects models respectively. Findings diverged from findings drawn by some of the researchers such as Salas (2002) when they concluded inverse association between the ratio of equity to assets and nonperforming loans. According to research findings, positive association imply that banks with high equity to assets ratio, highly capitalized, are most likely to experience burgeon in non-performing loans.

Findings uncovered positive nexus between the loans-to-assets ratio and NPLs ratio. Positive linkage imply that increase in loans to assets ratio will result in rise in non-performing loans in Zimbabwe. Positive association between these two ratios is also in support of the moral hazard hypothesis which stipulates that high loans to assets ratio results in the growth of NPLs Ahmad (2013). The variable was statistically significant at 1% in random effects, fixed effects and pooled model. Research findings conformed to work done by Riley (2014) in the Eastern Caribbean Central Union (ECCU).

Static models suggested that capital inflows negatively influence non-performing loans in Zimbabwe. Negative correlation infer that rise in capital inflows tends to results in reduction in NPLs. Increase in capital inflows results in increase in loanable funds which puts downwards pressure on lending rates hence limiting the incentive for moral hazard thus leading to improved loan portfolio quality in the banking sector. Capital inflows variable is significant at 1% in pooled, fixed effects and random effects models. Findings conformed to those made by Love (2013) in Egypt when they concluded that rise in capital inflows leads to reduction in no-performing loans hence improved loan portfolio quality. However, GMM results concluded that NPLs are nonresponsive to changes in capital inflows in Zimbabwe.

The significance of one-period lagged NPLs indicates that NPLs ratio is a function of its past realization, that is, it evolves overtime. It has been found that 82.85 percent of non-performing loans in each half of the year is driven by NPLs in the previous month. The GMM model was significant at 1% and this is an indication that the model is reliable. Findings also revealed that bank size, changes in inflation rate, changes in real GDP growth rate and changes in lending rates do not influence non-performing loans in Zimbabwe. Findings conformed with (Gezu 2014) when the author concluded that inflation does not influence non-performing loans. Great deal of studies concluded that GDP growth rate is an insignificant determinant of non-performing loans (Bucur 2014).

4.5. Panel VAR Analysis: Macrofinancial linkages

This section addressed macrofinancial linkages part of the research objectives.

4.5.1. Panel VAR lag order selection test

Table 4.5.1 presents (Andrews 2001) moment model selection criteria, (Hansen 1982) J p-value and J statistic and model over-all coefficient of determination (CD) that were used to guide panel VAR order selection in this study.

Table 4.5.1:PVAR Lag order selection

		Panel VAR Lag order selection				
lag	CD	J	J pvalue	MBIC	MAIC	MQIC
1	.7927621	27.16928	.007305	-29.97681	3.169277	-10.28763
2	.8531358	21.20489	.0066226	-16.8925	5.204893	-3.766375
3	.8745909	2.666386	.6151094	-16.38231	-5.333614	-9.819249
4	.8482733	-	-	-	-	-

Results from Table 4.5.1 showed that first-order panel VAR is the most appropriate model since it has lower MQIC and MBIC based on (Andrews 2001) selection criteria which correct for the degrees of freedom unlike the Hansen's J statistics.

4.5.2. Panel VAR-Stability test

The study performed stability check on panel VAR estimates. Stability check was guided by modulus for each of the eigenvalue of estimated model.

Table 4.5.2:Panel VAR Stability Test

Eigenvalue Stability Condition		
Eigenvalue		
Real	Imaginary	Modulus
.9367673	.2971964	.9827811
.9367673	-.2971964	.9827811
.7136982	0	.7136982
.2802701	-.1128968	.302154
.2802701	.1128968	.302154

Guided by propositions made by (Lutkepohl 2005) that panel VAR may be considered stable if all moduli of companion matrix are strictly less than one, the researcher concluded that panel VAR estimates were stable.

Figure 4.5.1: Unit Circle

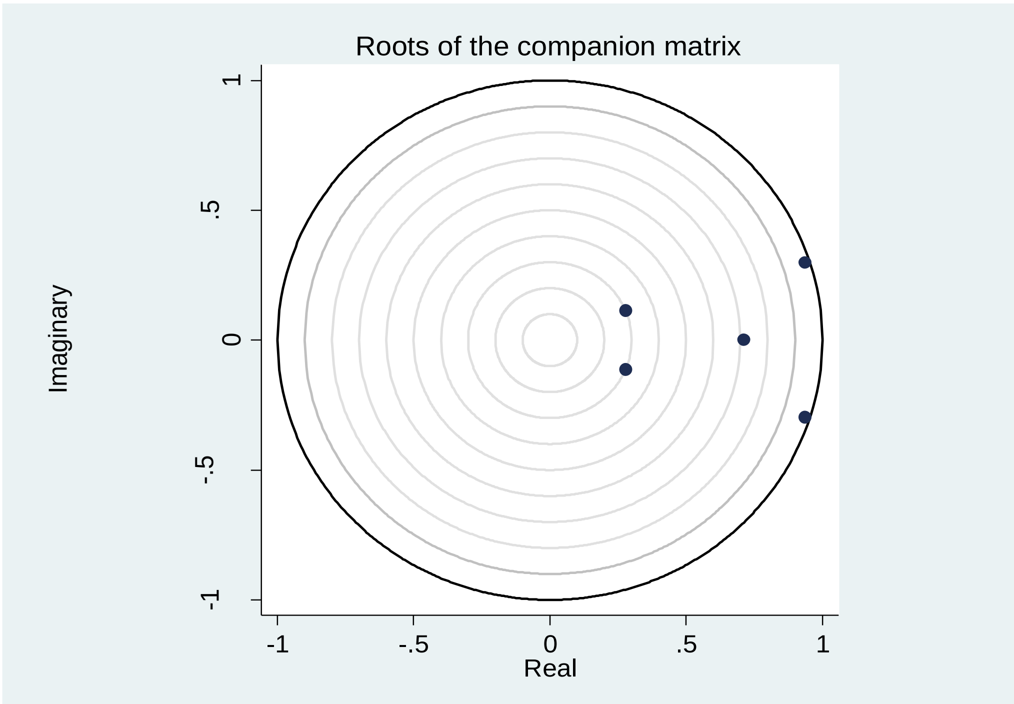


Table 4.5.2 and Figure 4.5.1 showed that all the moduli are less than one and that they plot within the circle in the companion matrix. Stability in panel VAR infer that it is invertible and has infinite-order vector moving average representation, thus providing known interpretation to estimated impulse response functions and forecast error variance decomposition (Abrigo 2015).

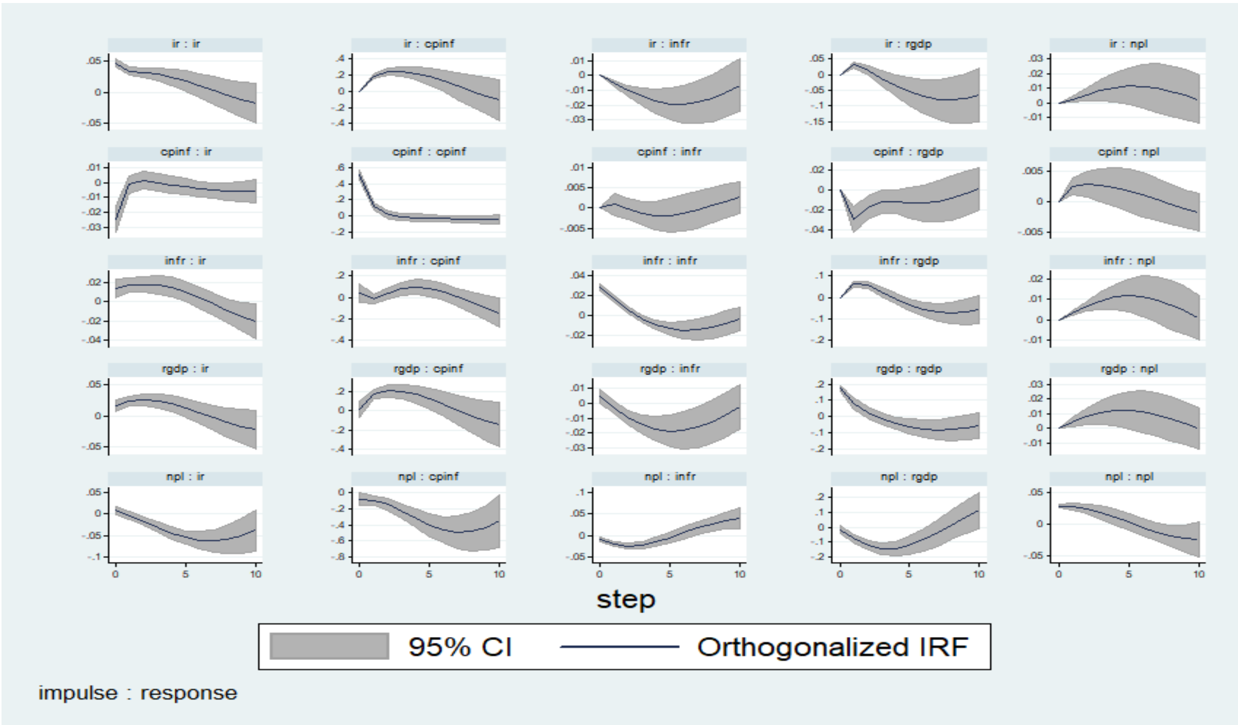
4.5.3. Panel VAR Impulse Response Function

The researcher fitted first order panel VAR model using GMM-style estimation technique. Specification of instruments was similar to that used in panel VAR lag order test. Panel VAR model are rarely used to interpret findings but in real practice, most researchers often use impulse response functions to analyze results. Refer to appendix F for panel VAR regression results. Figure 4.5.2 illustrate orthogonalized impulse response functions used to interpret panel VAR results. Impulse response functions depicted more interesting forms of short and long-run interactions in the study variables. Basing the analysis from last column from the right-hand side, that is the response of non-performing loans to a shock in lending rate, non-performing loans tend to increase between period zero to five and then decrease between period five to ten if there is a one standard deviation shock in interest rate. This means that non-performing loans increase in the short run and then decrease in the long run in response to a shock in lending rates in Zimbabwe. These results concurred with those concluded by Riley (2014) in ECCU. Riley (2014) found that non-performing loans tend to increase in the short run and decrease in the long run in response to a shock in interest rates.

Panel VAR impulse response results revealed that a shock in capital inflows growth leads to short run increase in NPLs but decline in nonperforming loans in the long-run in Zimbabwe. These results suggest that non-performing respond positively to a shock in capital inflows growth in the short run and then negatively in the long run. Similarly, shocks in inflation growth rate results in rising non-performing loans ratio in the short run and a decrease in the long run and findings relate to conclusion drawn by (Klein 2013). Findings also suggested that a one standard deviation shock in real GDP growth rate will first lead to increase in NPLs in the short run and then a decline in non-performing loans trend in the long run. Response of non-performing loans to a shock in NPLs (own shock) is negative both in the short run and in the long run.

Basing the analysis on the second column from right hand side, findings indicated that shock in lending rate results in a short-lived rise in real GDP growth rate between period zero and three and the plunge in real GDP growth rate in the later stage of the short run period and the entire long run period. Response of real GDP to a shock in capital inflows shock is mixed in the short run. Firstly, real GDP declines and then rise in the last part of the short run period extending into entire long run period. A shock in the rate of inflation initially leads to rise in real GDP growth rate then a short-lived steady state and a complete decline extending into the long run. Response of real GDP to a shock in GDP is continuous decline in both the short run and long run phases. Results showed that real GDP growth rate first decreases in the short run and then increase in the long run in response to a shock in non-performing loans in Zimbabwe and findings conformed to Nkusu (2011) and Riley (2014).

Figure 4.5.2:Panel VAR Impulse Response Functions



Third column from the right-hand side indicates that inflation rate responds negatively in the short run and positively in the long run to one standard deviation shock in lending rates. A shock in capital inflows growth rate leads to an initial increase in the inflation rate between period zero and two and then decreases between period two and five and finally increase between period five and ten. This is to say that inflation first increase and then decrease in the short run but later increase in the long run in response to a shock in capital inflows growth in Zimbabwe. Response of inflation to own shock is negative in the short run and positive in the long run to a standard deviation shock in capital inflows growth. Similarly, response of inflation to real GDP growth rate shock is negative in the short run and positive in the long run. A shock in non-performing loans will first lead to decline in the rate of inflation between period zero and three and then a rise inflation rate in the long run and results concurred with (Klein 2013).

Basing our analysis from the first column from the left-hand side, response of lending rates to a standard deviation shock in lending rate is negative in the short run and long run. Response of lending rates to shocks in capital inflows growth rate is positive in the sort-run and negative in the long run in Zimbabwe. Lending rates respond positively in the short run and negatively in the long run to a shock in the rate of inflation. Similarly, lending rates respond positively in the short run and negatively in the long run to a shock in the rate of growth in real GDP. Panel VAR impulse response function showed that one standard deviation shock in non-performing loans growth causes lending rates to decline in the short run and the declining trend partly extends into the long run, although, lending rate trend will final increase in the long run. Long run results were similar to findings by (Riley 2014).

Focusing on the second column from left-hand side, capital inflows firstly increase in the short run and then decrease in the long run in response to shocks in lending rates. Response of capital inflows growth to shocks in capital inflows is negative both in the short run and long run. Response of capital inflows growth rate to a shock in inflation rate is mixed in the short run. Firstly, capital inflows decline and then increase in the short run and lastly decrease in the long run in response to a shock in inflation rate. Response of capital inflows to a shock in real GDP is positive in the short run and negative in the long run. In the same vein, response of capital inflows growth to a shock in non-performing loans is negative in the short-run and positive in the long run.

4.5.4. Panel VAR-Granger causality Wald test

Panel VAR granger causality Wald test was performed to see how macroeconomic variables relate to non-performing loans as well as to each other. Table 4.5.3 indicates that NPLs Granger-causes real GDP growth rate, capital inflows growth, inflation rate and lending rates. Similarly, real GDP growth rate Granger-causes nonperforming loans, inflation, capital inflows growth rate and lending rates.

In the same vein, study results showed that inflation Granger-causes non-performing loans, real GDP and lending interest rates but do not Granger-cause capital inflows.

Table 4.5.3: Panel VAR-Granger causality test

Equation \ Excluded	**Prob > chi2**
Npl	
Rgdp	0.019
Infr	0.000
Cpinfr	0.000
Ir	0.013
ALL	0.000
Rgdp	
Npl	0.000
Infr	0.000
Cpinfr	0.013
Ir	0.000
ALL	0.000
Infr	
Npl	0.000
Rgdp	0.003
Cpinfr	0.134
Ir	0.000
ALL	0.000
Cpinfr	
Npl	0.000
Rgdp	0.000
Infr	0.000
Ir	0.000
ALL	0.000
Ir	

Npl	0.214
Rgdp	0.000
Infr	0.004
Cpinfr	0.000
ALL	0.000

Table 4.5.3 also showed that capital inflows Granger-causes nonperforming loans, real GDP, inflation and lending rate, although finding also suggested that inflation do not Granger-cause capital inflows. Although non-performing loans Granger-causes lending rates, finding revealed that lending rates do not Granger-cause non-performing loans. The study also evidenced that lending rates do Granger-cause real GDP, inflation and capital inflows.

4.5.5. Panel VAR- Cholesky forecast-error variance decomposition (FEVD)

Table 4.5.4. presents forecast-error variance decomposition (FEVD) that was computed based on a Cholesky decomposition of the residual covariance matrix of the underlying panel VAR model. Semi-annual data was used to produce a ten-period forecast, thus the researcher summarized findings by categorizing period two as the short run and period ten as the long run. The study observed that in the short run, innovation or shock to non-performing loans account for 97.37% variation of the fluctuation in nonperforming loans, implying strong endogeneity. In the short run, shock to real GDP can cause 1.19% fluctuation in nonperforming loans, innovation in inflation contribute about 0.7% of variation in non-performing loans while capital inflows growth rate and lending interest rates equally accounts for 0.37% fluctuation in the variance of nonperforming loans.

Findings revealed that in the long-run, that is period 10, 62.82% of the variation in NPLs is explained by own shock, 12.87% being explained by real GDP, 11.96% by inflation rate while 0.56% and 11.78% of the variations are explained by capital inflows growth rate and lending interest rates respectively. In this regard, findings suggest strong endogenous influence both in the short run and in the long run.

Table 4.5.4:Forecast-error variance decomposition

	Forecast-error variance decomposition (FEVD)				
Response variable and forecast horizon	Impulse variable				
	Npl	Rgdp	Infr	Cpinf	Ir
Npl					
0	0	0	0	0	0
1	1	0	0	0	0
2	0.973731	0.011912	0.007002	0.003702	0.003653
3	0.91903	0.035511	0.023207	0.005999	0.016253
4	0.842196	0.06579	0.047305	0.007244	0.037466
5	0.754912	0.097514	0.075653	0.007786	0.064136
6	0.673438	0.124823	0.102753	0.00776	0.091227
7	0.614911	0.142271	0.122659	0.007303	0.112856
8	0.590362	0.147105	0.131409	0.006637	0.124487
9	0.59882	0.140901	0.129085	0.006023	0.125171
10	0.628224	0.128705	0.119587	0.005651	0.117834
Rgdp					
0	0	0	0	0	0
1	0.008427	0.991573	0	0	0
2	0.119348	0.763118	0.079044	0.01779	0.020701
3	0.299449	0.559345	0.106001	0.017295	0.01791
4	0.456657	0.425028	0.088861	0.014606	0.014848
5	0.542602	0.351687	0.070583	0.012763	0.022365
6	0.559005	0.320811	0.067613	0.011794	0.040778
7	0.528304	0.314794	0.078914	0.011243	0.066745
8	0.477583	0.318889	0.097572	0.010708	0.095248
9	0.432846	0.321298	0.115598	0.009991	0.120267
10	0.413611	0.314396	0.126527	0.009109	0.136357
Infr					
0	0	0	0	0	0
1	0.10292	0.027008	0.870072	0	0
2	0.309786	0.020582	0.650523	0.00054	0.018569
3	0.443878	0.049168	0.451315	0.00038	0.055259
4	0.466149	0.096273	0.335436	0.000776	0.101366
5	0.416737	0.146487	0.285687	0.001389	0.1497
6	0.34677	0.188183	0.270463	0.001743	0.192841
7	0.297997	0.212692	0.264856	0.001716	0.222739
8	0.294579	0.216277	0.253941	0.001478	0.233726
9	0.337411	0.202109	0.233169	0.001304	0.226008
10	0.408457	0.178528	0.205956	0.001392	0.205667

Cpinf					
0	0	0	0	0	0
1	0.02565	0.001645	0.005177	0.967529	0
2	0.046224	0.084889	0.004964	0.76633	0.097593
3	0.080246	0.152031	0.006299	0.566297	0.195127
4	0.142146	0.176872	0.01506	0.425246	0.240678
5	0.23243	0.171776	0.022791	0.328425	0.244578
6	0.338073	0.151422	0.024695	0.26099	0.22482
7	0.441011	0.127356	0.022065	0.213673	0.195896
8	0.526272	0.107063	0.018547	0.180581	0.167538
9	0.585502	0.094242	0.017372	0.157671	0.145214
10	0.616717	0.089736	0.020344	0.142015	0.131189
Ir					
0	0	0	0	0	0
1	0.019102	0.072313	0.062073	0.178644	0.667869
2	0.013628	0.139156	0.09455	0.112298	0.640369
3	0.045735	0.182082	0.10962	0.079538	0.583025
4	0.126585	0.189619	0.111444	0.058869	0.513483
5	0.241207	0.172327	0.102548	0.045222	0.438696
6	0.364012	0.145136	0.087658	0.036225	0.366969
7	0.472398	0.119336	0.072434	0.030409	0.305423
8	0.552949	0.101013	0.061278	0.026765	0.257995
9	0.601211	0.092144	0.056497	0.024562	0.225586
10	0.619133	0.092103	0.058492	0.02326	0.207013

Short run findings suggested that about 11.93%% of variation in real GDP can be explained by financial stability, 76.31% being explained by own shock whereas rate of inflation and capital inflows explain 7.9% and 1.78% of the total variance in real GDP correspondingly. Study findings revealed that in the short run, 2.07% of the variation in real GDP growth is explained by lending interest rates. Long run results indicated that 41.36% and 31.44% of variations in real GDP are explained by financial stability and real GDP in their order whilst 12.65%, 0.9% and 13.64% of the variations are respectively explained by inflation rate, capital inflows growth rate and lending interest rates. In reiteration, the study proved that there is strong endogeneity influence in the short run.

Results showed that, in the short run, 30.98% and 2.06% of variations in rate of inflation are explained by financial stability and real GDP in their order whilst 0.05% and 1.86% are explained by capital inflows and lending interest rates respectively. Short run results evidenced that innovation in inflation rates explain 65.05% of the total variance in inflation in Zimbabwe. With regard to long run results, 40.85% and 17.85% of variations in rate of inflation are respectively explained by financial stability and real GDP. In the long run, 20.6%, 0.1% and 20.57% of the variations in inflation rate are explained by inflation rate, capital inflows growth rate and lending interest rates. In summary, results indicated that capital inflows growth rate is strongly exogenous in both the short run and long run while real GDP and lending interest rates are strongly exogenous in the short run and strongly endogenous in the long run.

The study observed that in the short run, shocks to financial stability account for 4.46% variation of the fluctuation in capital inflows growth rates while shocks to real GDP account for 8.49%. In the short run, shocks to inflation rate can cause 0.5% fluctuation in capital inflows growth rate, innovation in capital inflows growth rate contribute about 76.63% of variation in capital inflows growth rate while lending interest rates accounts for 9.76% fluctuation in the variance of capital inflows growth rate. In the long run, shocks to financial stability account for 61.67% variation of the fluctuation in capital inflows growth rates while shocks to real GDP account for 8.97%. Shocks to inflation rate can cause 2.03% fluctuation in capital inflows growth rate, innovation in capital inflows growth rate contribute about 14.2% of variation in capital inflows growth rate while lending interest rates accounts for 13.12% fluctuation in the variance of capital inflows growth rate. In this regard, findings suggest strong endogeneity of capital inflows in the short run in Zimbabwe. However, there is weak own influence in the long run.

In the short run, financial stability and real GDP growth rate explain 1.36% and 13.92% of the total variance in lending interest rates with 9.56% and 11.23% being explained by rate of inflation and capital inflows growth rate correspondingly. Results concluded that 64.04% of variations in lending interest rates are explained by own shock. Concerning long run results, 61.91% and 9.21% of variations in lending interest rates are respectively explained by financial stability and real GDP whilst 5.85%, 2.33% and 20.7% of the variations in lending interest rates are explained by inflation rate, capital inflows growth rate and lending interest rates correspondingly.

4.6. Summary

This chapter covered the analysis and interpretation of research findings along with diagnostic test necessary for panel regression and panel VAR analysis. Findings revealed that bank-level and macroeconomic variables can both influence non-performing loans growth in Zimbabwe. Findings also showed interesting short run and long run macrofinancial linkages in Zimbabwe through panel VAR analysis. The next chapter articulates policy recommendations based on research findings and also suggestions for future research.

CHAPTER 5: CONCLUSIONS AND POLICY RECOMMENDATIONS

5.0. Introduction

This chapter summarized research findings, conclusions, policy recommendations and scope for further studies.

5.1. Summary

The study investigated the determinants of NPLs as well as demystifying macrofinancial linkages in Zimbabwe using multivariate framework on a panel of nine banks and semi-annually decomposed data from the first half of 2009 to the last half of 2017. A combination of panel regressions techniques and panel VAR analysis was employed to meet research objectives. Firstly, and foremost, empirical findings revealed that growth in NPLs is driven by both bank-specific and macroeconomic factors in Zimbabwe.

Static models confirmed that the main drivers of nonperforming loans in Zimbabwe are loan-to-assets ratio, equity-to-assets ratio, loan-to-deposits ratio and capital inflows. The static models suggested negative and positive influence of loans-to-deposit on non-performing loans while capital inflows have negative influence on nonperforming loans. More so, static models revealed positive influence of equity-to-assets and loans-to-assets ratio on non-performing loans while such variables as size, real GDP, inflation rate and lending interest rates had no influence in Zimbabwe. Dynamic model suggested that non-performing loans are solely driven by one-period lagged non-performing loans ratio hence are nonresponsive to other bank level and macroeconomic variables.

Concerning macrofinancial linkages, orthogonalized impulse response functions showed that the response of NPLs to an innovation in lending rates is that they increase in the short run and then decrease in the long run. The study uncovered the presence of feedback effects from banking sector to the real economy and evidences possibility of second-round effects from real economy to the banking sector. Panel VAR results also showed that non-performing loans respond positively to a shock in capital inflows growth in the short run and then inversely in the long run while shocks in inflation growth rate results in rising non-performing loans ratio in the short run and a decrease in the long run. Findings revealed that a shock in real GDP growth rate lead to increase in non-performing loans in the short run and then a decline in the long run whereas response of non-performing loans to own shock is negative both in the short run and in the long run.

Findings indicated that shocks in lending rates initially results in a short-lived rise in real GDP growth rate and then a decline in real GDP growth rate in the later stage of the short run period and the decrease continues into the entire long run period. The study showed that lending rates respond directly in the short run and inversely in the long run to a shock in the rate of inflation. Lending rates respond directly in the short run and inversely in the long run to a shock in the rate of growth in real GDP while shock in non-performing loans growth causes lending rates to decline in the short run and the declining trend partly extends into the long run, although, lending rate trend will final increase in the long run. Response of capital inflows growth to a shock in non-performing loans is inverse in the short-run and direct in the long run.

Panel granger causality test results revealed that NPLs Granger-causes real GDP growth rate, inflation rate, capital inflows growth and lending rates while real GDP growth rate Granger-causes nonperforming loans, inflation, capital inflows growth rate and lending rates. Results also showed that inflation Granger-causes non-performing loans, real GDP and lending interest rates but do not Granger-cause capital inflows. Results also showed that capital inflows Granger-causes nonperforming loans, real GDP, inflation and lending rate, although finding also suggested that inflation do not Granger-cause capital inflows. Although non-performing loans Granger-causes lending rates, finding revealed that lending rates do not Granger-cause non-performing loans. The study also evidenced that lending rates do Granger-cause real GDP, inflation and capital inflows.

5.2. Policy Recommendations and Implications

Based on conclusions drawn from the study, the following recommendations were put forward:

- Policy implications of this study would be that banks must strengthen loan origination along with periodically monitoring loan-to-assets in order to be able to curb non-performing loans at institutional level. Continued monitoring of loans to assets ratio helps banks to identify the possibility of future problem loans earlier thus promoting banking sector resilience.
- The researcher recommends that regulatory authorities along with the central government engage in crafting policies that promote capital inflows growth in Zimbabwe. Findings detected that growth in capital inflows leads to reduction in non-performing loans hence the need to promote capital inflows growth in Zimbabwe. Favorable policies that promote growth in capital inflows include designing lucrative interest rates package that attracts foreign investors as well as promoting policy consistency in Zimbabwe to allow investors better plan and forecast the future environment.
- Regulatory authorities must maintain banking sector lending rates capping policy in order to ensure reduction in non-performing loans in the long run. Monitoring of lending interest rates through capping policy is also of paramount importance in that it adversely affects real GDP growth rate and capital inflows in the long run.
- Regulatory authorities, through ZAMCO, must create policies that further drives down the non-performing loans trend since shock in non-performing loans showed robust negative influence in lending interest rates, capital inflows growth rate, inflation rates and real GDP growth rate in the short run. One of the policies that can help banks reduce non-performing loans growth is through limited lending in order to clean-up banks' loan portfolios. More efficient and centralized credit bureau are also a better way for achieving long run reduction in nonperforming loans growth.
- The researcher recommends that the Zimbabwean government initiate and maintain policies for promoting long term growth in real GDP since lending rates tend to reduce in response to shocks in real GDP in the long run.

5.3. Suggestions for Future Studies

The researcher suggest that future researchers must analyze macro-financial linkages by sectors and then derive sector-specific policies. Analysis of macrofinancial linkages by decomposing the overall economy into sectors will help policy makers in understanding how each sector is linked to other sectors as well as overall economy. The researcher also wishes forthcoming researchers to incorporate influence of money supply in examining macrofinancial linkages in Zimbabwe. Incorporation of such a variable is of key importance since it is among key monetary policy instruments.

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APPENDICES

Appendix A: Definitions, sources and apriori expectations of variables used

Variable	Proxy	Definition	Expected Sign	Source	Data Frequency
NPL	Non-performing loans	Nonperforming loans/ Gross loans		Bank statements	Semi-annual
RGDP	Real GDP growth rate	[(Current year real GDP/Previous year real GDP)-1]	Negative	Global Finance	Semi-annual
INFR	Annual inflation rate	Annual inflation rates as given in world bank database	Positive	Worldbank database	Semi-annual
CPINF	Capital inflows growth rate	[(Current year real capital inflows/Previous year real capital inflows)-1]	Negative	Worldbank database	Semi-annual
IR	Interest rates	Average lending rates	Positive	Monetary policy statements	Semi-annual
LTD	Loan-to-deposit Ratio	Total loans/ Total deposits	Positive	Bank statement	Semi-annual

ETA	Equity to assets	Total equity/Total assets		Bank statement	Semi-annual
SIZE	Bank size	Ln (Total Assets)	Positive/Negative	Bank statement	Semi-annual
LTA	Loan-to-assets Ratio	Total loans/Total assets	Positive	Bank statement	Semi-annual

Appendix B: Multicollinearity Test

. correlate npl ltd eta lta roa size rgdp infr ir cpinf

(obs=162)

	npl	ltd	eta	lta	roa	size	rgdp	infr	ir	cpinf
npl	**1.0000**									
ltd	**0.3116**	**1.0000**								
eta	**0.1108**	**-0.0056**	**1.0000**							
lta	**0.2993**	**0.6499**	**-0.3461**	**1.0000**						
roa	**0.0274**	**-0.1911**	**-0.0435**	**0.0786**	**1.0000**					
size	**0.0702**	**-0.0418**	**-0.0249**	**0.0379**	**0.0617**	**1.0000**				
rgdp	**-0.0342**	**0.1892**	**-0.0507**	**0.2030**	**-0.0351**	**-0.1381**	**1.0000**			
infr	**-0.0340**	**0.1648**	**-0.2388**	**0.2277**	**0.2202**	**0.0116**	**0.0997**	**1.0000**		
ir	**0.0847**	**0.2016**	**-0.1478**	**0.3141**	**-0.0302**	**-0.0314**	**0.1289**	**0.2248**	**1.0000**	
cpinf	**-0.2935**	**0.0663**	**0.0657**	**-0.0035**	**-0.0777**	**-0.1486**	**0.0901**	**-0.0066**	**-0.1351**	**1.0000**

Appendix C: Descriptive Statistics

. summarize cpinf eta infr ir lta ltd npl rgdp size

Variable	Obs	Mean	Std. Dev.	Min	Max

cpinf	**162**	**.3866591**	**.6521748**	**-.3137303**	**1.808625**
eta	**162**	**.1491889**	**.0668513**	**.079**	**.6393**
infr	**162**	**.0031889**	**.0367695**	**-.077**	**.049**
ir	**162**	**.2047222**	**.0621468**	**.1262**	**.3063**
lta	**162**	**.4961148**	**.1812176**	**.1025**	**.8996**
ltd	**162**	**.6811988**	**.3596529**	**.1664**	**2.608**
npl	**162**	**.0573889**	**.0552307**	**.0003**	**.3146**
rgdp	**162**	**.1311148**	**.1600098**	**.006157**	**.552979**
size	**162**	**18.50811**	**4.705353**	**.4156**	**21.6768**

Appendix D: Unit Root Tests

. xtunitroot llc ltd

Levin-Lin-Chu unit-root test for ltd

Ho: Panels contain unit roots Number of panels = 9

Ha: Panels are stationary Number of periods = 18

AR parameter: Common Asymptotics: N/T -> 0

Panel means: Included

Time trend: Not included

ADF regressions: 1 lag

LR variance: Bartlett kernel, 8.00 lags average (chosen by LLC)

	Statistic	p-value
Unadjusted t	**-5.7616**	
Adjusted t*	**-1.7265**	**0.0421**

. xtunitroot llc eta

Levin-Lin-Chu unit-root test for eta

Ho: Panels contain unit roots Number of panels = 9

Ha: Panels are stationary Number of periods = 18

AR parameter: Common Asymptotics: N/T -> 0

Panel means: Included

Time trend: Not included

ADF regressions: 1 lag

LR variance: Bartlett kernel, 8.00 lags average (chosen by LLC)

	Statistic	p-value
Unadjusted t	**-20.8549**	
Adjusted t*	**-19.5768**	**0.0000**

. xtunitroot llc lta

Levin-Lin-Chu unit-root test for lta

Ho: Panels contain unit roots Number of panels = 9

Ha: Panels are stationary Number of periods = 18

AR parameter: Common Asymptotics: N/T -> 0

Panel means: Included

Time trend: Not included

ADF regressions: 1 lag

LR variance: Bartlett kernel, 8.00 lags average (chosen by LLC)

	Statistic	p-value
Unadjusted t	**-6.2313**	
Adjusted t*	**-2.6858**	**0.0036**

. xtunitroot llc roa

Levin-Lin-Chu unit-root test for roa

Ho: Panels contain unit roots Number of panels = 9

Ha: Panels are stationary Number of periods = 18

AR parameter: Common Asymptotics: N/T -> 0

Panel means: Included

Time trend: Not included

ADF regressions: 1 lag

LR variance: Bartlett kernel, 8.00 lags average (chosen by LLC)

	Statistic	p-value
Unadjusted t	**-7.7777**	
Adjusted t*	**-4.4181**	**0.0000**

. xtunitroot llc size

Levin-Lin-Chu unit-root test for size

Ho: Panels contain unit roots Number of panels = 9

Ha: Panels are stationary Number of periods = 18

AR parameter: Common Asymptotics: N/T -> 0

Panel means: Included

Time trend: Not included

ADF regressions: 1 lag

LR variance: Bartlett kernel, 8.00 lags average (chosen by LLC)

	Statistic	p-value
Unadjusted t	**-13.2980**	
Adjusted t*	**-12.8119**	**0.0000**

. xtunitroot llc rgdp

Levin-Lin-Chu unit-root test for rgdp

Ho: Panels contain unit roots Number of panels = 9

Ha: Panels are stationary Number of periods = 18

AR parameter: Common Asymptotics: N/T -> 0

Panel means: Included

Time trend: Not included

ADF regressions: 1 lag

LR variance: Bartlett kernel, 8.00 lags average (chosen by LLC)

	Statistic	p-value
Unadjusted t	**-8.3032**	
Adjusted t*	**-5.0183**	**0.0000**

. xtunitroot llc infr

Levin-Lin-Chu unit-root test for infr

Ho: Panels contain unit roots Number of panels = 9

Ha: Panels are stationary Number of periods = 18

AR parameter: Common Asymptotics: N/T -> 0

Panel means: Included

Time trend: Not included

ADF regressions: 1 lag

LR variance: Bartlett kernel, 8.00 lags average (chosen by LLC)

	Statistic	p-value
Unadjusted t	**-12.2156**	
Adjusted t*	**-6.7704**	**0.0000**

. xtunitroot llc cpinf

Levin-Lin-Chu unit-root test for cpinf

Ho: Panels contain unit roots Number of panels = 9

Ha: Panels are stationary Number of periods = 18

AR parameter: Common Asymptotics: N/T -> 0

Panel means: Included

Time trend: Not included

ADF regressions: 1 lag

LR variance: Bartlett kernel, 8.00 lags average (chosen by LLC)

	Statistic	p-value
Unadjusted t	**-8.5532**	
Adjusted t*	**-5.9849**	**0.0000**

. xtunitroot llc ir

Levin-Lin-Chu unit-root test for ir

Ho: Panels contain unit roots Number of panels = 9

Ha: Panels are stationary Number of periods = 18

AR parameter: Common Asymptotics: N/T -> 0

Panel means: Included

Time trend: Not included

ADF regressions: 1 lag

LR variance: Bartlett kernel, 8.00 lags average (chosen by LLC)

	Statistic	**p-value**
Unadjusted t	**-10.5751**	
Adjusted t*	**-5.7933**	**0.0000**

. xtunitroot llc npl

Levin-Lin-Chu unit-root test for npl

Ho: Panels contain unit roots Number of panels = 9

Ha: Panels are stationary Number of periods = 18

AR parameter: Common Asymptotics: N/T -> 0

Panel means: Included

Time trend: Not included

ADF regressions: 1 lag

LR variance: Bartlett kernel, 8.00 lags average (chosen by LLC)

	Statistic	p-value
Unadjusted t	-5.6904	
Adjusted t*	-1.7953	0.0363

Appendix E: Lag order Selection Test

. pvarsoc npl ir, maxlag(4) exog(infr cpinf rgdp) pvaropts(instl(1/4))

Running panel VAR lag order selection on estimation sample

Selection order criteria

Sample: 5 - 17 No. of obs = 117

No. of panels = 9

Ave. no. of T = 13.000

lag	CD	J	J pvalue	MBIC	MAIC	MQIC
1	.7927621	27.16928	.007305	-29.97681	3.169277	-10.28763
2	.8531358	21.20489	.0066226	-16.8925	5.204893	-3.766375
3	.8745909	2.666386	.6151094	-16.38231	-5.333614	-9.819249
4	.8482733	.	.	.	.	.

Appendix F: Panel VAR Estimations

. pvar npl rgdp infr cpinf ir , instlags(1/3) gmmstyle

Panel vector autoregresssion

GMM Estimation

Final GMM Criterion Q(b) = .891

Initial weight matrix: Identity

GMM weight matrix: Robust

No. of obs = 144

No. of panels = 9

Ave. no. of T = 16.000

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
npl						
npl						
L1.	**1.012646**	**.0639666**	**15.83**	**0.000**	**.8872741**	**1.138018**
rgdp						
L1.	**.0173953**	**.0074055**	**2.35**	**0.019**	**.0028808**	**.0319098**
infr						
L1.	**.0821312**	**.0223639**	**3.67**	**0.000**	**.0382989**	**.1259636**
cpinf						
L1.	**.007224**	**.0016726**	**4.32**	**0.000**	**.0039457**	**.0105024**
ir						
L1.	**.0511244**	**.0206526**	**2.48**	**0.013**	**.0106461**	**.0916028**

```
-------------+----------------------------------------------------------------
rgdp         |
         npl |
         L1. |  -2.018797   .3045642    -6.63   0.000    -2.615732   -1.421862
             |
        rgdp |
         L1. |   .3521245   .0854152     4.12   0.000     .1847137    .5195353
             |
        infr |
         L1. |   1.847556   .1498852    12.33   0.000     1.553786    2.141325
             |
       cpinf |
         L1. |  -.0251975   .0101077    -2.49   0.013    -.0450082   -.0053868
             |
          ir |
         L1. |   .6630346   .0983514     6.74   0.000     .4702693    .8557999
-------------+----------------------------------------------------------------
infr         |
         npl |
         L1. |  -.4920717   .0610763    -8.06   0.000    -.6117789   -.3723644
             |
        rgdp |
         L1. |  -.0246707   .0083953    -2.94   0.003    -.0411251   -.0082162
             |
        infr |
         L1. |   .6352471   .0443695    14.32   0.000     .5482843    .7222098
             |
       cpinf |
         L1. |  -.0037684   .0025134    -1.50   0.134    -.0086947    .0011578
```

ir						
L1.	-.117242	.020372	-5.76	0.000	-.1571704	-.0773136
cpinf						
npl						
L1.	-4.074342	.6498183	-6.27	0.000	-5.347962	-2.800721
rgdp						
L1.	.6879819	.0779315	8.83	0.000	.5352389	.8407249
infr						
L1.	-3.235781	.4561141	-7.09	0.000	-4.129749	-2.341814
cpinf						
L1.	.4205831	.0341659	12.31	0.000	.3536191	.4875471
ir						
L1.	3.950021	.2248558	17.57	0.000	3.509312	4.39073
ir						
npl						
L1.	-.1165633	.0938344	-1.24	0.214	-.3004754	.0673488
rgdp						
L1.	.0544194	.0058975	9.23	0.000	.0428605	.0659784
infr						
L1.	.194155	.0669389	2.90	0.004	.0629572	.3253529

cpinf						
L1.	**.0325813**	**.0023304**	**13.98**	**0.000**	**.0280137**	**.0371489**
ir						
L1.	**.7271721**	**.0449041**	**16.19**	**0.000**	**.6391616**	**.8151826**

Instruments : l(1/3).(npl rgdp infr cpinf ir)

Appendix G: PVAR Stability Check

. pvarstable, graph

Eigenvalue stability condition

Eigenvalue		
Real	**Imaginary**	**Modulus**
.9367673	**.2971964**	**.9827811**
.9367673	**-.2971964**	**.9827811**
.7136982	**0**	**.7136982**
.2802701	**-.1128968**	**.302154**
.2802701	**.1128968**	**.302154**

All the eigenvalues lie inside the unit circle.

pVAR satisfies stability condition.

Appendix H: Forecast-error variance decomposition

. pvarfevd

Forecast-error variance decomposition

Response variable and Forecast horizon	Impulse variable npl	rgdp	infr	cpinf	ir
npl					
0	0	0	0	0	0
1	1	0	0	0	0
2	.9737309	.0119116	.007002	.0037022	.0036532
3	.9190301	.0355108	.0232071	.0059994	.0162525
4	.8421957	.06579	.0473047	.0072441	.0374655
5	.754912	.0975136	.0756527	.0077855	.0641363
6	.6734381	.1248226	.1027531	.0077596	.0912265
7	.6149107	.1422711	.1226592	.0073029	.1128561
8	.5903622	.147105	.1314086	.0066373	.1244869
9	.5988197	.1409011	.1290854	.0060226	.125171
10	.6282236	.128705	.1195865	.0056508	.1178342
rgdp					
0	0	0	0	0	0
1	.0084269	.9915732	0	0	0

2	.1193481	.7631178	.0790439	.0177897	.0207005
3	.2994487	.5593447	.1060012	.0172951	.0179103
4	.4566569	.4250279	.0888608	.0146061	.0148483
5	.5426024	.351687	.0705827	.0127629	.0223651
6	.5590047	.3208109	.0676127	.0117935	.0407781
7	.5283042	.3147935	.0789144	.0112427	.0667451
8	.4775828	.3188885	.0975721	.0107083	.0952484
9	.4328462	.3212979	.1155982	.0099908	.1202668
10	.4136112	.3143963	.1265274	.0091086	.1363567
infr					
0	0	0	0	0	0
1	.1029199	.0270084	.8700716	0	0
2	.3097856	.0205819	.6505234	.0005401	.018569
3	.4438784	.0491682	.4513151	.0003797	.0552585
4	.4661493	.0962729	.335436	.000776	.1013659
5	.4167365	.1464867	.2856873	.0013894	.1497001
6	.3467699	.1881828	.2704627	.0017431	.1928414
7	.2979966	.2126919	.264856	.0017161	.2227394
8	.2945792	.2162766	.2539406	.0014779	.2337257
9	.3374105	.2021093	.2331687	.0013036	.2260079
10	.4084572	.1785277	.2059564	.0013919	.2056668
cpinf					
0	0	0	0	0	0
1	.0256495	.0016449	.005177	.9675285	0
2	.0462243	.0848889	.0049642	.7663299	.0975927
3	.0802461	.1520314	.0062987	.5662973	.1951265
4	.1421459	.1768715	.0150597	.4252455	.2406776

```
     5 | .2324301  .1717757  .0227909   .328425  .2445784
     6 |  .338073  .1514219  .0246949  .2609904  .2248197
     7 | .4410109  .1273555  .0220647  .2136729   .195896
     8 |  .526272   .107063  .0185466  .1805806  .1675377
     9 |  .585502  .0942415  .0173717  .1576707  .1452141
    10 | .6167172  .0897357  .0203439  .1420145  .1311887
----------+-------------------------------------------------------------------------------
ir       |
     0 |        0          0          0          0          0
     1 | .0191015   .072313   .062073  .1786436   .667869
     2 | .0136277  .1391557    .09455   .112298  .6403686
     3 | .0457346  .1820824  .1096197  .0795379  .5830253
     4 | .1265851  .1896194   .111444  .0588689  .5134827
     5 | .2412071  .1723274  .1025478   .045222  .4386957
     6 |  .364012  .1451362  .0876575  .0362252  .3669691
     7 | .4723982  .1193355  .0724338  .0304091  .3054233
     8 | .5529487  .1010131   .061278  .0267649  .2579953
     9 | .6012114  .0921439  .0564965  .0245619  .2255864
    10 | .6191328  .0921027  .0584924  .0232595  .2070127
------------------------------------------------------------------------------------------
```

. pvarirf, mc(200) oirf byopt(yrescale)

Appendix I: Panel VAR-Granger causality Wald test

. pvargranger

panel VAR-Granger causality Wald test

Ho: Excluded variable does not Granger-cause Equation variable

Ha: Excluded variable Granger-causes Equation variable

Equation \ Excluded	chi2	df	Prob > chi2
npl			
rgdp	5.518	1	0.019
infr	13.487	1	0.000
cpinf	18.653	1	0.000
ir	6.128	1	0.013
ALL	69.320	4	0.000
rgdp			
npl	43.937	1	0.000
infr	151.942	1	0.000
cpinf	6.215	1	0.013
ir	45.448	1	0.000
ALL	322.482	4	0.000
infr			
npl	64.910	1	0.000
rgdp	8.636	1	0.003
cpinf	2.248	1	0.134
ir	33.121	1	0.000
ALL	76.374	4	0.000
cpinf			
npl	39.313	1	0.000
rgdp	77.934	1	0.000
infr	50.328	1	0.000

ir	308.596	1	0.000	
ALL	487.234	4	0.000	
ir				
npl	1.543	1	0.214	
rgdp	85.147	1	0.000	
infr	8.413	1	0.004	
cpinf	195.462	1	0.000	
ALL	767.523	4	0.000	

Appendix J: Fixed Effects Estimations

. xtreg npl ltd eta lta size rgdp infr ir cpinf, fe

Fixed-effects (within) regression **Number of obs = 162**

Group variable: banks **Number of groups = 9**

R-sq: within = 0.1963 **Obs per group: min = 18**

between = 0.0048 **avg = 18.0**

overall = 0.0666 **max = 18**

F(8,145) = 4.43

corr(u_i, Xb) = -0.2743 **Prob > F = 0.0001**

npl	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ltd	-.0601849	.0184974	-3.25	0.001	-.0967441	-.0236256
eta	.1238676	.066366	1.87	0.064	-.0073022	.2550373
lta	.148653	.0356566	4.17	0.000	.0781791	.2191269

```
      size  |  .0011401  .0010971   1.04  0.300  -.0010282   .0033084
      rgdp |  -.0056197  .0217548  -0.26  0.797  -.0486171   .0373778
      infr  |  -.0751606  .0963083  -0.78  0.436  -.2655101   .1151889
        ir  |  .0178193  .0593707   0.30  0.765  -.0995245   .1351631
     cpinf |  -.0182005  .0059279  -3.07  0.003  -.0299167  -.0064844
     _cons |  -.0105771  .0292875  -0.36  0.719  -.0684626   .0473084
-------------+----------------------------------------------------------------
   sigma_u |  .03935548
   sigma_e |  .04170151
       rho     |  .47108118   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:   F(8, 145) =    7.93         Prob > F = 0.0000
```

. estimates store fixed

Appendix K: Random Effects Estimations

. xtreg npl ltd eta lta size rgdp infr ir cpinf, re

```
Random-effects GLS regression              Number of obs      =      162
Group variable: banks                      Number of groups   =        9

R-sq:  within  = 0.1733                    Obs per group: min =       18
       between = 0.1905                                   avg =     18.0
       overall = 0.1790                                   max =       18

                                           Wald chi2(8)       =    32.43
corr(u_i, X)   = 0 (assumed)               Prob > chi2        =   0.0001
```

npl	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
ltd	-.0265187	.0172538	-1.54	0.124	-.0603355	.007298
eta	.1532469	.0662833	2.31	0.021	.023334	.2831598
lta	.12589	.0346469	3.63	0.000	.0579834	.1937966
size	.0006924	.0010083	0.69	0.492	-.0012838	.0026685
rgdp	-.0135068	.0225645	-0.60	0.549	-.0577325	.0307188
infr	-.0810824	.1000687	-0.81	0.418	-.2772134	.1150486
ir	.0009404	.0612722	0.02	0.988	-.1191508	.1210316
cpinf	-.0220429	.0059354	-3.71	0.000	-.033676	-.0104098
_cons	-.0123192	.0288483	-0.43	0.669	-.0688609	.0442225
sigma_u	.0189796					
sigma_e	.04170151					
rho	.17159787	(fraction of variance due to u_i)				

. estimates store random

Appendix L: Hausman Test

. hausman fixed random

	---- Coefficients ----			
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	fixed	random	Difference	S.E.
ltd	-.0601849	-.0265187	-.0336661	.0066679

eta	**.1238676**	**.1532469**	**-.0293794**	**.0033122**
lta	**.148653**	**.12589**	**.022763**	**.0084255**
size	**.0011401**	**.0006924**	**.0004477**	**.0004324**
rgdp	**-.0056197**	**-.0135068**	**.0078872**	**.**
infr	**-.0751606**	**-.0810824**	**.0059218**	**.**
ir	**.0178193**	**.0009404**	**.0168789**	**.**
cpinf	**-.0182005**	**-.0220429**	**.0038424**	**.**

--

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 19.19

Prob>chi2 = 0.0139

(V_b-V_B is not positive definite)

. xtreg npl ltd eta lta size rgdp infr ir cpinf, re

Random-effects GLS regression Number of obs = 162

Group variable: banks Number of groups = 9

R-sq: within = 0.1733 Obs per group: min = 18

between = 0.1905 avg = 18.0

overall = 0.1790 max = 18

Wald chi2(8) = 32.43

corr(u_i, X) = 0 (assumed) Prob > chi2 = 0.0001

npl	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
ltd	-.0265187	.0172538	-1.54	0.124	-.0603355	.007298
eta	.1532469	.0662833	2.31	0.021	.023334	.2831598
lta	.12589	.0346469	3.63	0.000	.0579834	.1937966
size	.0006924	.0010083	0.69	0.492	-.0012838	.0026685
rgdp	-.0135068	.0225645	-0.60	0.549	-.0577325	.0307188
infr	-.0810824	.1000687	-0.81	0.418	-.2772134	.1150486
ir	.0009404	.0612722	0.02	0.988	-.1191508	.1210316
cpinf	-.0220429	.0059354	-3.71	0.000	-.033676	-.0104098
_cons	-.0123192	.0288483	-0.43	0.669	-.0688609	.0442225
sigma_u	.0189796					
sigma_e	.04170151					
rho	.17159787	(fraction of variance due to u_i)				

Appendix M: Pesaran CD Test

. xtcsd, pesaran abs

Pesaran's test of cross sectional independence = -1.040, Pr = 0.2982

Average absolute value of the off-diagonal elements = 0.327

. reg npl ltd eta lta size rgdp infr ir cpinf

Source | SS df MS Number of obs = 162

-------------+------------------------------ F(8, 153) = 6.78

Model | .128593402 8 .016074175 Prob > F = 0.0000

Residual | .36252547 153 .002369448 R-squared = 0.2618

-------------+------------------------------ Adj R-squared = 0.2232

Total | .491118872 161 .003050428 Root MSE = .04868

npl	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ltd	.0261499	.0149064	1.75	0.081	-.003299	.0555988
eta	.1753981	.065574	2.67	0.008	.0458508	.3049454
lta	.0916062	.032136	2.85	0.005	.0281187	.1550937
size	.0001649	.0008366	0.20	0.844	-.0014878	.0018176
rgdp	-.0262146	.0249676	-1.05	0.295	-.0755403	.0231111
infr	-.1018006	.1107926	-0.92	0.360	-.3206815	.1170802
ir	-.026236	.0669231	-0.39	0.696	-.1584486	.1059766
cpinf	-.0265216	.0060594	-4.38	0.000	-.0384926	-.0145507
_cons	-.0157035	.0261053	-0.60	0.548	-.0672769	.0358699

. estimates store pooled

. xtreg npl ltd eta lta size rgdp infr ir cpinf, re

Random-effects GLS regression Number of obs = 162

Group variable: banks Number of groups = 9

R-sq: within = 0.1733 Obs per group: min = 18 between = 0.1905 avg = 18.0

overall = 0.1790 max = 18

Wald chi2(8) = 32.43

corr(u_i, X) = 0 (assumed) Prob > chi2 = 0.0001

npl	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
ltd	-.0265187	.0172538	-1.54	0.124	-.0603355	.007298
eta	.1532469	.0662833	2.31	0.021	.023334	.2831598
lta	.12589	.0346469	3.63	0.000	.0579834	.1937966
size	.0006924	.0010083	0.69	0.492	-.0012838	.0026685
rgdp	-.0135068	.0225645	-0.60	0.549	-.0577325	.0307188
infr	-.0810824	.1000687	-0.81	0.418	-.2772134	.1150486
ir	.0009404	.0612722	0.02	0.988	-.1191508	.1210316
cpinf	-.0220429	.0059354	-3.71	0.000	-.033676	-.0104098
_cons	-.0123192	.0288483	-0.43	0.669	-.0688609	.0442225
sigma_u	.0189796					
sigma_e	.04170151					
rho	.17159787	(fraction of variance due to u_i)				

Appendix N: One-step GMM Estimations

. xtabond2 npl L(1/1).(npl lta) ir eta ltd rgdp size cpinf infr, gmm(npl lta) iv(eta rgdp eta ir size ltd cpinf infr)

Favoring space over speed. To switch, type or click on mata: mata set matafavor speed, perm.

Warning: Number of instruments may be large relative to number of observations.

Dynamic panel-data estimation, one-step system GMM

Group variable: banks	Number of obs = 153
Time variable : years	Number of groups = 9
Number of instruments = 136	Obs per group: min = 17
Wald chi2(9) = 538.78	avg = 17.00
Prob > chi2 = 0.000	max = 17

npl	**Coef.**	**Std. Err.**	**z**	**P>|z|**	**[95% Conf. Interval]**	
npl						
L1.	**.8284657**	**.0439665**	**18.84**	**0.000**	**.742293**	**.9146385**
lta						
L1.	**.0057944**	**.0159654**	**0.36**	**0.717**	**-.0254973**	**.0370861**
ir	**.0441645**	**.0363464**	**1.22**	**0.224**	**-.0270733**	**.1154022**
eta	**-.0172256**	**.0454028**	**-0.38**	**0.704**	**-.1062134**	**.0717622**
ltd	**.0151499**	**.0078639**	**1.93**	**0.054**	**-.000263**	**.0305628**
rgdp	**.0076456**	**.0135586**	**0.56**	**0.573**	**-.0189288**	**.03422**
size	**.0006389**	**.0004711**	**1.36**	**0.175**	**-.0002844**	**.0015623**
cpinf	**-.0019877**	**.0035639**	**-0.56**	**0.577**	**-.0089727**	**.0049974**
infr	**-.0728728**	**.0700508**	**-1.04**	**0.298**	**-.2101698**	**.0644241**
_cons	**-.0202895**	**.0158683**	**-1.28**	**0.201**	**-.0513907**	**.0108118**

Instruments for first differences equation

Standard

```
    D.(eta rgdp eta ir size ltd cpinf infr)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(1/17).(npl lta)
Instruments for levels equation
  Standard
    eta rgdp eta ir size ltd cpinf infr
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.(npl lta)
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences:   z =  -4.88   Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences:   z =   1.31   Pr > z =  0.191
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(126)  = 145.72  Prob > chi2 =  0.110
  (Not robust, but not weakened by many instruments.)

Difference-in-Sargan tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Sargan test excluding group:     chi2(113)  = 137.38  Prob > chi2 =  0.059
    Difference (null H = exogenous): chi2(13)   =   8.33  Prob > chi2 =  0.821
  iv(eta rgdp eta ir size ltd cpinf infr)
    Sargan test excluding group:     chi2(119)  = 144.92  Prob > chi2 =  0.053
    Difference (null H = exogenous): chi2(7)    =   0.80  Prob > chi2 =  0.997


. estimates store gmm
```

Appendix O: Regression Estimations

. estimates table pooled fixed random gmm, star stats(N r2 r2_a)

Variable	pooled	fixed	random	gmm
Ltd	.02614985	-.06018486**	-.02651875	.01514992
eta	.17539811**	.12386756	.15324692*	-.01722562
lta	.09160622**	.14865302***	.12589***	
size	.00016491	.0011401	.00069235	.00063893
rgdp	-.02621463	-.00561967	-.01350683	.00764559
infr	-.10180064	-.07516063	-.08108242	-.07287284
ir	-.02623601	.01781929	.0009404	.04416445
cpinf	-.02652165***	-.01820053**	-.02204291***	-.00198769
npl				
L1.				.82846572***
lta				
L1.				.00579439
_cons	-.01570352	-.01057708	-.01231922	-.02028947
N	162	162	162	153
r2	.26183763	.19626408		
r2_a	.22324091	.10757597		

legend: * p<0.05; ** p<0.01; *** p<0.001

Semi-annually decomposed data using quadratic average match criteria										
YEAR	BANK	CPINF	ETA	INFR	IR	LTA	LTD	NPL	RGDP	SIZE
2009S1	Agribank	1.034884	0.1912	-0.077	0.1262	0.3013	0.8397	0.0024	0.120196	17.274
2009S2	Agribank	1.034884	0.1912	-0.077	0.1262	0.3013	0.8397	0.0024	0.120196	17.274
2010S1	Agribank	0.167492	0.1834	0.032	0.3063	0.48	0.9305	0.0388	0.12581	17.9538
2010S2	Agribank	0.167492	0.1834	0.032	0.3063	0.48	0.9305	0.0388	0.12581	17.9538
2011S1	Agribank	1.808625	0.1847	0.049	0.19	0.7274	2.608	0.0408	0.154457	18.4194
2011S2	Agribank	1.808625	0.1847	0.049	0.19	0.7274	2.608	0.0408	0.154457	18.4194
2012S1	Agribank	0.01612	0.2091	0.0291	0.205	0.6855	1.9806	0.0707	0.147796	18.6658
2012S2	Agribank	0.01612	0.2091	0.0291	0.205	0.6855	1.9806	0.0707	0.147796	18.6658
2013S1	Agribank	0.066314	0.1328	0.0033	0.225	0.734	1.6066	0.1333	0.552979	18.6349
2013S2	Agribank	0.066314	0.1328	0.0033	0.225	0.734	1.6066	0.1333	0.552979	18.6349
2014S1	Agribank	0.26739	0.1275	-0.008	0.25	0.6818	1.3874	0.17	0.021271	18.5415
2014S2	Agribank	0.26739	0.1275	-0.008	0.25	0.6818	1.3874	0.17	0.021271	18.5415
2015S1	Agribank	-0.15567	0.1897	-0.025	0.275	0.6604	0.99	0.3146	0.016896	18.9611
2015S2	Agribank	-0.15567	0.1897	-0.025	0.275	0.6604	0.99	0.3146	0.016896	18.9611
2016S1	Agribank	-0.14075	0.2417	-0.0093	0.135	0.485	0.93	0.2444	0.006157	19.1334
2016S2	Agribank	-0.14075	0.2417	-0.0093	0.135	0.485	0.93	0.2444	0.006157	19.1334
2017S1	Agribank	-0.31373	0.2146	0.0346	0.13	0.325	0.4862	0.0766	0.034471	19.4096
2017S2	Agribank	-0.31373	0.2146	0.0346	0.13	0.325	0.4862	0.0766	0.034471	19.4096
2009S1	Barclays	1.034884	0.1904	-0.077	0.1262	0.1204	0.1664	0.0079	0.120196	18.945
2009S2	Barclays	1.034884	0.1904	-0.077	0.1262	0.1204	0.1664	0.0079	0.120196	18.945
2010S1	Barclays	0.167492	0.1351	0.032	0.3063	0.1885	0.2355	0.0037	0.12581	19.249
2010S2	Barclays	0.167492	0.1351	0.032	0.3063	0.1885	0.2355	0.0037	0.12581	19.249
2011S1	Barclays	1.808625	0.1289	0.049	0.19	0.2251	0.2739	0.0028	0.154457	19.3763
2011S2	Barclays	1.808625	0.1289	0.049	0.19	0.2251	0.2739	0.0028	0.154457	19.3763
2012S1	Barclays	0.01612	0.144	0.0291	0.205	0.327	0.4095	0.0108	0.147796	19.4557
2012S2	Barclays	0.01612	0.144	0.0291	0.205	0.327	0.4095	0.0108	0.147796	19.4557
2013S1	Barclays	0.066314	0.1247	0.0033	0.225	0.3068	0.3365	0.0135	0.552979	19.964
2013S2	Barclays	0.066314	0.1247	0.0033	0.225	0.3068	0.3365	0.0135	0.552979	19.964
2014S1	Barclays	0.26739	0.1683	-0.008	0.25	0.4247	0.603	0.02	0.021271	19.4952
2014S2	Barclays	0.26739	0.1683	-0.008	0.25	0.4247	0.603	0.02	0.021271	19.4952
2015S1	Barclays	-0.15567	0.1811	-0.025	0.275	0.4859	0.622	0.017	0.016896	19.517
2015S2	Barclays	-0.15567	0.1811	-0.025	0.275	0.4859	0.622	0.017	0.016896	19.517
2016S1	Barclays	-0.14075	0.1369	-0.0093	0.135	0.3644	0.4401	0.0138	0.006157	19.9814
2016S2	Barclays	-0.14075	0.1369	-0.0093	0.135	0.3644	0.4401	0.0138	0.006157	19.9814
2017S1	Barclays	-0.31373	0.159	0.0346	0.13	0.4013	0.4955	0.0117	0.034471	20.1356
2017S2	Barclays	-0.31373	0.159	0.0346	0.13	0.4013	0.4955	0.0117	0.034471	20.1356
2009S1	CABS	1.034884	0.6393	-0.077	0.1262	0.1025	0.3204	0.0964	0.120196	17.6752
2009S2	CABS	1.034884	0.6393	-0.077	0.1262	0.1025	0.3204	0.0964	0.120196	17.6752
2010S1	CABS	0.167492	0.1862	0.032	0.3063	0.3179	0.4792	0.0844	0.12581	19.0172
2010S2	CABS	0.167492	0.1862	0.032	0.3063	0.3179	0.4792	0.0844	0.12581	19.0172
2011S1	CABS	1.808625	0.1862	0.049	0.19	0.5807	0.8769	0.0147	0.154457	19.6294
2011S2	CABS	1.808625	0.1862	0.049	0.19	0.5807	0.8769	0.0147	0.154457	19.6294
2012S1	CABS	0.01612	0.1933	0.0291	0.205	0.5701	0.7814	0.0168	0.147796	20.0056
2012S2	CABS	0.01612	0.1933	0.0291	0.205	0.5701	0.7814	0.0168	0.147796	20.0056
2013S1	CABS	0.066314	0.1853	0.0033	0.225	0.5171	0.6983	0.0185	0.552979	20.2506

2013S2	CABS	0.066314	0.1853	0.0033	0.225	0.5171	0.6983	0.0185	0.552979	20.2506
2014S1	CABS	0.26739	0.1605	-0.008	0.25	0.5204	0.6808	0.0789	0.021271	20.5635
2014S2	CABS	0.26739	0.1605	-0.008	0.25	0.5204	0.6808	0.0789	0.021271	20.5635
2015S1	CABS	-0.15567	0.1469	-0.025	0.275	0.5392	0.6783	0.0778	0.016896	20.7653
2015S2	CABS	-0.15567	0.1469	-0.025	0.275	0.5392	0.6783	0.0778	0.016896	20.7653
2016S1	CABS	-0.14075	0.1641	-0.0093	0.135	0.5435	0.6902	0.0856	0.006157	20.7938
2016S2	CABS	-0.14075	0.1641	-0.0093	0.135	0.5435	0.6902	0.0856	0.006157	20.7938
2017S1	CABS	-0.31373	0.149	0.0346	0.13	0.528	0.6562	0.0647	0.034471	20.9597
2017S2	CABS	-0.31373	0.149	0.0346	0.13	0.528	0.6562	0.0647	0.034471	20.9597
2009S1	CBZ Bank	1.034884	0.0815	-0.077	0.1262	0.5948	0.6739	0.0118	0.120196	19.8199
2009S2	CBZ Bank	1.034884	0.0815	-0.077	0.1262	0.5948	0.6739	0.0118	0.120196	19.8199
2010S1	CBZ Bank	0.167492	0.0852	0.032	0.3063	0.6544	0.7356	0.0041	0.12581	20.292
2010S2	CBZ Bank	0.167492	0.0852	0.032	0.3063	0.6544	0.7356	0.0041	0.12581	20.292
2011S1	CBZ Bank	1.808625	0.0797	0.049	0.19	0.7431	0.9016	0.0647	0.154457	20.7049
2011S2	CBZ Bank	1.808625	0.0797	0.049	0.19	0.7431	0.9016	0.0647	0.154457	20.7049
2012S1	CBZ Bank	0.01612	0.0855	0.0291	0.205	0.6942	0.7715	0.0535	0.147796	20.8322
2012S2	CBZ Bank	0.01612	0.0855	0.0291	0.205	0.6942	0.7715	0.0535	0.147796	20.8322
2013S1	CBZ Bank	0.066314	0.079	0.0033	0.225	0.6296	0.6894	0.0509	0.552979	21.0794
2013S2	CBZ Bank	0.066314	0.079	0.0033	0.225	0.6296	0.6894	0.0509	0.552979	21.0794
2014S1	CBZ Bank	0.26739	0.0829	-0.008	0.25	0.6328	0.6948	0.0876	0.021271	21.1409
2014S2	CBZ Bank	0.26739	0.0829	-0.008	0.25	0.6328	0.6948	0.0876	0.021271	21.1409
2015S1	CBZ Bank	-0.15567	0.0815	-0.025	0.275	0.487	0.5346	0.0827	0.016896	21.3189
2015S2	CBZ Bank	-0.15567	0.0815	-0.025	0.275	0.487	0.5346	0.0827	0.016896	21.3189
2016S1	CBZ Bank	-0.14075	0.0871	-0.0093	0.135	0.457	0.5036	0.0772	0.006157	21.3717
2016S2	CBZ Bank	-0.14075	0.0871	-0.0093	0.135	0.457	0.5036	0.0772	0.006157	21.3717
2017S1	CBZ Bank	-0.31373	0.0945	0.0346	0.13	0.406	0.4514	0.1285	0.034471	21.4122
2017S2	CBZ Bank	-0.31373	0.0945	0.0346	0.13	0.406	0.4514	0.1285	0.034471	21.4122
2009S1	FBC Bank	1.034884	0.2113	-0.077	0.1262	0.1671	0.2194	0.0127	0.120196	18.6593
2009S2	FBC Bank	1.034884	0.2113	-0.077	0.1262	0.1671	0.2194	0.0127	0.120196	18.6593
2010S1	FBC Bank	0.167492	0.1411	0.032	0.3063	0.4595	0.5079	0.0335	0.12581	18.9309
2010S2	FBC Bank	0.167492	0.1411	0.032	0.3063	0.4595	0.5079	0.0335	0.12581	18.9309
2011S1	FBC Bank	1.808625	0.1501	0.049	0.19	0.5838	0.8401	0.062	0.154457	19.051
2011S2	FBC Bank	1.808625	0.1501	0.049	0.19	0.5838	0.8401	0.062	0.154457	19.051
2012S1	FBC Bank	0.01612	0.1225	0.0291	0.205	0.5674	0.7467	0.092	0.147796	19.4545

2012S2	FBC Bank	0.01612	0.1225	0.0291	0.205	0.5674	0.7467	0.092	0.147796	19.4545
2013S1	FBC Bank	0.066314	0.1209	0.0033	0.225	0.658	0.9637	0.0938	0.552979	19.593
2013S2	FBC Bank	0.066314	0.1209	0.0033	0.225	0.658	0.9637	0.0938	0.552979	19.593
2014S1	FBC Bank	0.26739	0.0869	-0.008	0.25	0.6606	0.9467	0.116	0.021271	19.7626
2014S2	FBC Bank	0.26739	0.0869	-0.008	0.25	0.6606	0.9467	0.116	0.021271	19.7626
2015S1	FBC Bank	-0.15567	0.1112	-0.025	0.275	0.5392	0.7659	0.0854	0.016896	19.7749
2015S2	FBC Bank	-0.15567	0.1112	-0.025	0.275	0.5392	0.7659	0.0854	0.016896	19.7749
2016S1	FBC Bank	-0.14075	0.1384	-0.0093	0.135	0.4302	0.6225	0.0466	0.006157	19.9687
2016S2	FBC Bank	-0.14075	0.1384	-0.0093	0.135	0.4302	0.6225	0.0466	0.006157	19.9687
2017S1	FBC Bank	-0.31373	0.1397	0.0346	0.13	0.398	0.4827	0.0436	0.034471	20.14
2017S2	FBC Bank	-0.31373	0.1397	0.0346	0.13	0.398	0.4827	0.0436	0.034471	20.14
2009S1	MBCA	1.034884	0.12	-0.077	0.1262	0.5369	0.6875	0.0994	0.120196	0.7088
2009S2	MBCA	1.034884	0.12	-0.077	0.1262	0.5369	0.6875	0.0994	0.120196	0.7088
2010S1	MBCA	0.167492	0.1	0.032	0.3063	0.5144	0.6103	0.0451	0.12581	0.5251
2010S2	MBCA	0.167492	0.1	0.032	0.3063	0.5144	0.6103	0.0451	0.12581	0.5251
2011S1	MBCA	1.808625	0.11	0.049	0.19	0.4492	0.5414	0.0156	0.154457	0.4156
2011S2	MBCA	1.808625	0.11	0.049	0.19	0.4492	0.5414	0.0156	0.154457	0.4156
2012S1	MBCA	0.01612	0.15	0.0291	0.205	0.492	0.63	0.031	0.147796	0.5006
2012S2	MBCA	0.01612	0.15	0.0291	0.205	0.492	0.63	0.031	0.147796	0.5006
2013S1	MBCA	0.066314	0.18	0.0033	0.225	0.43	0.89	0.0273	0.552979	0.4968
2013S2	MBCA	0.066314	0.18	0.0033	0.225	0.43	0.89	0.0273	0.552979	0.4968
2014S1	MBCA	0.26739	0.196	-0.008	0.25	0.4911	0.6679	0.0319	0.021271	19.0569
2014S2	MBCA	0.26739	0.196	-0.008	0.25	0.4911	0.6679	0.0319	0.021271	19.0569
2015S1	MBCA	-0.15567	0.1756	-0.025	0.275	0.4231	0.5341	0.065	0.016896	19.3122
2015S2	MBCA	-0.15567	0.1756	-0.025	0.275	0.4231	0.5341	0.065	0.016896	19.3122
2016S1	MBCA	-0.14075	0.1627	-0.0093	0.135	0.3179	0.4013	0.0784	0.006157	19.5156
2016S2	MBCA	-0.14075	0.1627	-0.0093	0.135	0.3179	0.4013	0.0784	0.006157	19.5156
2017S1	MBCA	-0.31373	0.1532	0.0346	0.13	0.266	0.3301	0.0769	0.034471	19.7265
2017S2	MBCA	-0.31373	0.1532	0.0346	0.13	0.266	0.3301	0.0769	0.034471	19.7265
2009S1	NMB	1.034884	0.1581	-0.077	0.1262	0.3275	0.5491	0.0079	0.120196	17.4971
2009S2	NMB	1.034884	0.1581	-0.077	0.1262	0.3275	0.5491	0.0079	0.120196	17.4971
2010S1	NMB	0.167492	0.1552	0.032	0.3063	0.5865	0.9136	0.0687	0.12581	18.4487
2010S2	NMB	0.167492	0.1552	0.032	0.3063	0.5865	0.9136	0.0687	0.12581	18.4487
2011S1	NMB	1.808625	0.1397	0.049	0.19	0.7308	0.8439	0.086	0.154457	18.9352
2011S2	NMB	1.808625	0.1397	0.049	0.19	0.7308	0.8439	0.086	0.154457	18.9352
2012S1	NMB	0.01612	0.1366	0.0291	0.205	0.6471	0.7513	0.157	0.147796	19.2384
2012S2	NMB	0.01612	0.1366	0.0291	0.205	0.6471	0.7513	0.157	0.147796	19.2384
2013S1	NMB	0.066314	0.1064	0.0033	0.225	0.6988	0.8396	0.199	0.552979	21.6768
2013S2	NMB	0.066314	0.1064	0.0033	0.225	0.6988	0.8396	0.199	0.552979	21.6768
2014S1	NMB	0.26739	0.1575	-0.008	0.25	0.7109	0.8438	0.1267	0.021271	19.4717
2014S2	NMB	0.26739	0.1575	-0.008	0.25	0.7109	0.8438	0.1267	0.021271	19.4717
2015S1	NMB	-0.15567	0.1514	-0.025	0.275	0.7042	0.8299	0.0895	0.016896	19.6261
2015S2	NMB	-0.15567	0.1514	-0.025	0.275	0.7042	0.8299	0.0895	0.016896	19.6261
2016S1	NMB	-0.14075	0.1732	-0.0093	0.135	0.6219	0.7522	0.0625	0.006157	19.5869
2016S2	NMB	-0.14075	0.1732	-0.0093	0.135	0.6219	0.7522	0.0625	0.006157	19.5869
2017S1	NMB	-0.31373	0.1554	0.0346	0.13	0.4981	0.5897	0.0539	0.034471	19.8619
2017S2	NMB	-0.31373	0.1554	0.0346	0.13	0.4981	0.5897	0.0539	0.034471	19.8619
2009S1	Stanbic	1.034884	0.0944	-0.077	0.1262	0.8335	0.8335	0.0005	0.120196	19.1207

2009S2	Stanbic	1.034884	0.0944	-0.077	0.1262	0.8335	0.8335	0.0005	0.120196	19.1207
2010S1	Stanbic	0.167492	0.0804	0.032	0.3063	0.8724	0.8724	0.0003	0.12581	19.6445
2010S2	Stanbic	0.167492	0.0804	0.032	0.3063	0.8724	0.8724	0.0003	0.12581	19.6445
2011S1	Stanbic	1.808625	0.0956	0.049	0.19	0.8996	0.5208	0.0435	0.154457	19.7055
2011S2	Stanbic	1.808625	0.0956	0.049	0.19	0.8996	0.5208	0.0435	0.154457	19.7055
2012S1	Stanbic	0.01612	0.1174	0.0291	0.205	0.8147	0.8147	0.0323	0.147796	19.7951
2012S2	Stanbic	0.01612	0.1174	0.0291	0.205	0.8147	0.8147	0.0323	0.147796	19.7951
2013S1	Stanbic	0.066314	0.1391	0.0033	0.225	0.8052	0.8055	0.0179	0.552979	19.9789
2013S2	Stanbic	0.066314	0.1391	0.0033	0.225	0.8052	0.8055	0.0179	0.552979	19.9789
2014S1	Stanbic	0.26739	0.1456	-0.008	0.25	0.4179	0.5213	0.0608	0.021271	20.1452
2014S2	Stanbic	0.26739	0.1456	-0.008	0.25	0.4179	0.5213	0.0608	0.021271	20.1452
2015S1	Stanbic	-0.15567	0.1479	-0.025	0.275	0.4274	0.5253	0.0338	0.016896	20.204
2015S2	Stanbic	-0.15567	0.1479	-0.025	0.275	0.4274	0.5253	0.0338	0.016896	20.204
2016S1	Stanbic	-0.14075	0.1298	-0.0093	0.135	0.3235	0.3895	0.05	0.006157	20.5555
2016S2	Stanbic	-0.14075	0.1298	-0.0093	0.135	0.3235	0.3895	0.05	0.006157	20.5555
2017S1	Stanbic	-0.31373	0.0981	0.0346	0.13	0.2355	0.2736	0.0272	0.034471	21.062
2017S2	Stanbic	-0.31373	0.0981	0.0346	0.13	0.2355	0.2736	0.0272	0.034471	21.062
2009S1	Stanchart	1.034884	0.0875	-0.077	0.1262	0.1732	0.2084	0.0042	0.120196	19.4134
2009S2	Stanchart	1.034884	0.0875	-0.077	0.1262	0.1732	0.2084	0.0042	0.120196	19.4134
2010S1	Stanchart	1.034884	0.1135	0.032	0.3063	0.3856	0.4867	0.0236	0.12581	19.4565
2010S2	Stanchart	1.034884	0.1135	0.032	0.3063	0.3856	0.4867	0.0236	0.12581	19.4565
2011S1	Stanchart	1.034884	0.1661	0.049	0.19	0.3597	0.4605	0.0112	0.154457	19.5997
2011S2	Stanchart	1.034884	0.1661	0.049	0.19	0.3597	0.4605	0.0112	0.154457	19.5997
2012S1	Stanchart	1.034884	0.1683	0.0291	0.205	0.5066	0.6567	0.0229	0.147796	19.7793
2012S2	Stanchart	1.034884	0.1683	0.0291	0.205	0.5066	0.6567	0.0229	0.147796	19.7793
2013S1	Stanchart	1.034884	0.1768	0.0033	0.225	0.4253	0.5747	0.0677	0.552979	19.8671
2013S2	Stanchart	1.034884	0.1768	0.0033	0.225	0.4253	0.5747	0.0677	0.552979	19.8671
2014S1	Stanchart	1.034884	0.1772	-0.008	0.25	0.4905	0.6807	0.0208	0.021271	19.8261
2014S2	Stanchart	1.034884	0.1772	-0.008	0.25	0.4905	0.6807	0.0208	0.021271	19.8261
2015S1	Stanchart	1.034884	0.1716	-0.025	0.275	0.426	0.56	0.0165	0.016896	19.7644
2015S2	Stanchart	1.034884	0.1716	-0.025	0.275	0.426	0.56	0.0165	0.016896	19.7644
2016S1	Stanchart	1.034884	0.1574	-0.0093	0.135	0.2483	0.315	0.0118	0.006157	20.0381
2016S2	Stanchart	1.034884	0.1574	-0.0093	0.135	0.2483	0.315	0.0118	0.006157	20.0381
2017S1	Stanchart	1.034884	0.1037	0.0346	0.13	0.1874	0.217	0.0045	0.034471	20.5197
2017S2	Stanchart	1.034884	0.1037	0.0346	0.13	0.1874	0.217	0.0045	0.034471	20.5197