DETERMINANTS OF NON-PERFORMING LOANS IN UGANDA'S COMMERCIAL BANKING INDUSTRY 2002:1 – 2017:2

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December 2018

DECLARATION

I, **SUNDAY NATHAN** hereby declare that this dissertation titled "Determinants of non-performing loans in Uganda's commercial banking industry" is my own work and that all the sources I have used or quoted have been acknowledged.

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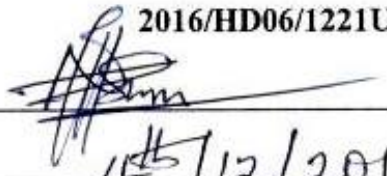
Signature 

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CERTIFICATION

The undersigned certify that they have read this dissertation titled "Determinants of non-performing loans in Uganda's commercial banking industry" in the process of guiding the author and thereby recommend it for submission to the Directorate of Research and Graduate Training of Makerere University in the partial fulfillment of the award of the degree of Master of Arts in Economics of Makerere University.

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Dr. TOM MWEBAZE

DEDICATION

This research is dedicated to my beloved mother **Mrs. Mary Nzaireki** and my father **Mr. Naboth Kisembo,** my teachers, and my sponsor (AERC).

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LIST OF ABBREVIATIONS

ADF	Augmented Dickey Fuller
ARDL	Autoregressive Distributed Lag
ASR	Annual Supervision Report
BIS	Bank for International Settlement
BOU	Bank of Uganda
BSF	Bank Specific Factors
DFCU	Development Finance Company of Uganda
FSR	Financial Stability Report
GMM	Generalized Method of Moments
HFC	Home Finance Company
ILO	International Labour Organisation
IMF	International Monetary Fund
JB	Jarque - Bera
MEF	Macro Economic Factors
NPL	Non-Performing Loan
OLS	Ordianry Least Squares
PP	Phillips – Perron
RESET	Regression Equation Specification Error Test
ROA	Returns on Asset
ROE	Returns on Equity
VECM	Vector Error Correction Model
EF	Economic Factors
NEF	Non-Economic Factors

ABSTRACT

Over the past decade, non-performing loans in Uganda's commercial banking industry have continued to show a positive trend. The continued increase in NPLs has not only affected credit growth, but has also resulted in the collapse and closure of some commercial banks such as Crane Bank (in 2017), Global Trust Bank (in 2014). It's against this background, that the study examined the determinants of NPLs in Uganda's commercial banking industry.

The study used secondary data on quarterly basis for the period 2002 quarter one to 2017 quarter two. Data on bank-specific factors was obtained from bank of Uganda while that for macroeconomic factors was obtained from IMF and World Development Indicators (World Bank) Secondary data Empirical analysis was carried out on both bank specific and macroeconomic factors using bounds test and ARDL technique. The findings of the study suggest that non-performing loans increase with increase in lending rates, real effective exchange rate and unemployment rate. Whereas increase in returns on assets and GDP growth are associated with a decreasing effect on non-performing loans.

Based on the findings, the study recommends that commercial banks should consider the international competitiveness of the domestic economy before extending loans so as to minimize the effect of real exchange rate appreciation. Efforts to lower lending rates (for example, by reducing operating costs of the banks and increasing liquidity of the banks) are of paramount importance in this regard. Furthermore, there is need to promote GDP growth for example, by creating a conducive business atmosphere and promoting high productivity industries. There is also need to reduce unemployment rate by developing labour market information system and supporting labour intensive industries. Promoting stock markets would also enable banks diversify their portfolio and therefore spread their risk.

Key words; Determinants, Non-performing loans, cointegration, ARDL.

CHAPTER ONE: INTRODUCTION

1.0 Introduction

This chapter presents the background to the study, the problem statement, objectives of the study, scope of the study, significance of the study, and organization of the study.

1.1 Background

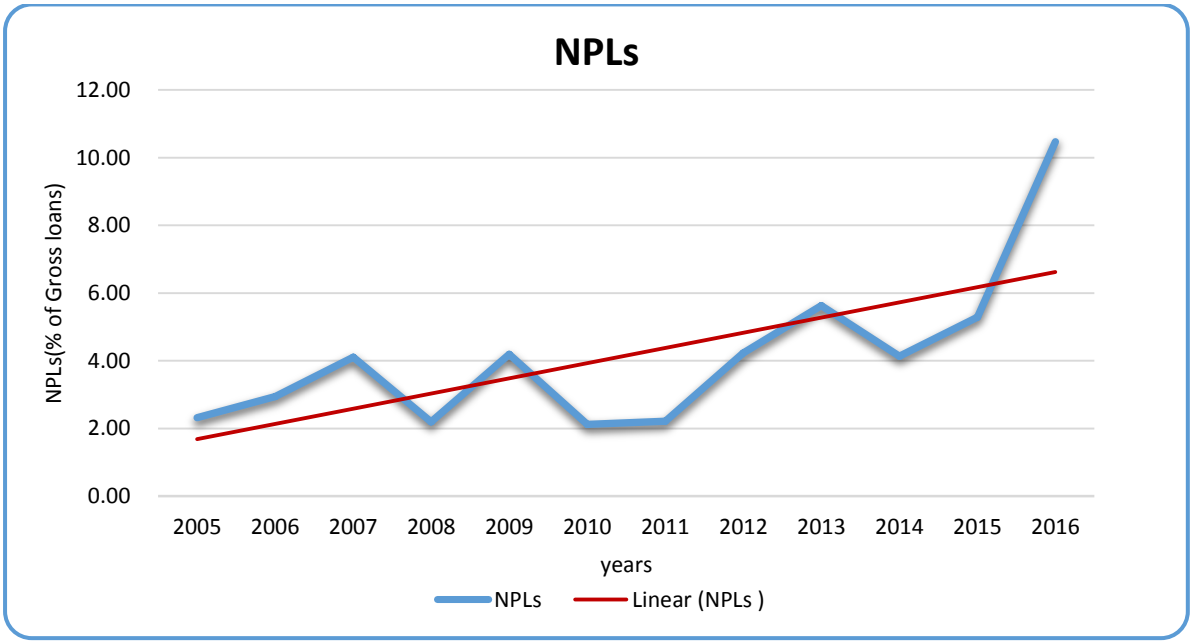
The banking sector is very instrumental in the economic growth process of any country. It plays a key role of administering the payment system and intermediating between savers and borrowers. In Uganda, the Banking sector has remained important for provision of financial intermediary services such as savings mobilization, risk management, projects evaluation, and diversification of risks. Through provision of short term, medium term and long term loans, the banking sector has also been crucial in promoting investments in areas of construction, agriculture and manufacturing. The sector has also been important in facilitating trade through provision of services such as bank drafts, cheque, bills of exchange and credit cards. Implementation of government monetary policy has also been aided by the banking sector.

One of the major activities of commercial banks in Uganda is lending. They give out various types of loans ranging from mortgages, auto loans, business loans, personal loans, and agricultural loans, among others. In fact, there has been a move by the central bank to encourage lending by commercial banks. This has been manifested by the continued reduction of the central bank rate from 23.0 in December 2011 to 12.0 by December 2012 then to 11.0 by December 2014 and falling further to 9.5 by December 2017. This has seen total gross loans increase from Ush.1.09 trillion in the first quarter of 2005 to Ush.6.89 trillion by the second quarter of 2011 and then later increased to Ush.11.57 trillion by the fourth quarter of 2016.

In the business of lending, commercial banks in Uganda are faced with the risk of default where by some individuals and companies are unable to meet their debt payment obligations on time. Some individuals/companies are unable to pay completely while others are only able to pay a fraction of the loan, which has resulted into accumulation of non-performing loans (NPLs). The problem of NPLs in Uganda has been exacerbated by the fact that banks find it difficult to realize the value of the loan collateral in the property market (Mutebile, 2017).

Bank of Uganda reported that Non-performing loans as a percentage of total gross loans in Uganda's commercial banks increased from 2.75% in 2006 to 4.23% in 2012 and later increased to 10.47% by the end of 2016 (BOU, 2017). NPLs show a steeper trend from 2011 to 2013 and 2015 to 2016 (see figure 1.1). The trend of NPLs in Uganda's commercial banks is shown in the figure below.

Figure 1. 1: Trend of NPLs in Uganda's commercial banks



Source; BOU 2017

The increase in NPLs is believed to have lowered the profitability of the banking sector especially in the periods where the sector experienced a sharp rise in NPLs. For instance Bank of Uganda reported that, for the year June 2013 to June 2014 where NPLs increased

from 4.0% to 5.8%, annual after tax profits reduced by 28% and the year from June 2015 to June 2016 where the sector experienced the highest increase in NPLs from 4.0% to 8.3%, annual after tax profits reduced by 44.2 percent from Ush.556.3 billion in June 2015 to Ush.485.6 billion in June 2016

The continued increase in NPLs has also been responsible for the closure of some commercial banks such as Global Trust bank that closed in 2014, National Bank of Commerce which was solid to Crane bank in 2012 and Crane Bank[1] itself, which was taken over by the central bank in October 2016 and later sold to DFCU bank in February 2017. (Bank of Uganda, 2017).

Analysts argue that, persistence of the problem of non-performing loans in many commercial banks in the country is likely to jeopardize financial stability of the whole sector. For example, Bank of Uganda (2017) reported that if each bank's three largest borrowers were to default, with a loan loss of 100 percent, 13 banks would become under-capitalized with an aggregate capital shortfall of USh.513.86 billion and if NPLs were to increase by 200 percent, assuming the increase is in the loss category which requires full provisioning, 9 banks would become under-capitalized with an aggregate capital shortfall of Ush.247.39 billion.

The growth of non-performing loans has also had negative effects on banks' lending behavior leading to decline in credit growth. For instance, the reduction in loan growth in the years 2011 to 2012 from 13.7% to 3.2% and the year 2015 to 2016 from 19.7% to 3.7% is believed to have been a consequence of high levels of NPLs in those years (Bank of Uganda). The

[1] Crane bank's non- performing loans increased by 122.9% from shs19.36 billion to shs142.3billions in only one year, 2014 to 2015.

decrease in credit growth is due to the fear of losses that arise with accumulation of NPLs which can easily lead to insolvency of the bank.

Literature has it that NPLs negatively affects economic growth. According to Zeng (2012), accumulation of NPLs traps resources in unproductive ventures, making it difficult for commercial banks to fund new and economically viable ventures. The setting aside of funds to cover potential losses expected from loans granted leads to financial disintermediation hence limiting financial deepening which in turn hinders economic growth (Caprio and Klingebiel, 2002). Furthermore, defensive actions undertaken by commercial banks (inform of credit rationing) hinder access to credit by even viable projects which limits the ability of the overall economy to grow. There is also the cost implication of outsourcing recovery or setting up enhanced units to track problem loans recovery activities which lowers cost efficiency of the commercial banks (Zeng, 2012).

In the bid to minimize NPLs and improve the performance of commercial banks in Uganda, a number of reforms have been undertaken. Key among these was the significant restructuring of the sector in the late 1990s and early 2000s. This restructuring saw several indigenous commercial banks declared insolvent, taken over by the central bank and eventually sold or liquidated (Mukokoma, 2012). The banks that were declared insolvent and thus taken over by the central bank included Uganda Cooperative Bank, Greenland Bank, International Credit Bank, Teefe Bank and Gold Trust Bank, which were closed or sold. All the banks that were closed, were believed to be having tremendous levels of NPLs (Odeke & Odongo, 2014).

Another important reform was the introduction of credit reference bureau[2] in 2005. The role of the credit reference bureau was to reduce information asymmetries between lenders and borrowers by; (i) availing timely and accurate information on borrowers' debt profiles and

[2] There are two credit reference bureaus in Uganda; Compuscan and Metropol (U) limited

repayment history, (ii) availing an improved pool of borrowers as more and more unbanked customers would be eligible for financial services, and (iii) reducing default rates as borrowers seek to protect their reputation collateral by meeting obligations in timely manner (Mutebile, 2008). According to Bank of Uganda, these Credit Reference Bureaus have helped to reduce the cost of screening loan applications by enabling the lenders to sort out prospective borrowers who have defaulted with other lenders.

Besides credit reference bureaus, there has also been introduction of prudential guidelines. For instance in 2005, Bank of Uganda introduced minimum core capital requirement of 8% of risk weighted assets and a total capital of not less than 12% of the total risk adjusted assets. In line with the agreement reached among the central banks of the East African Community, the minimum core capital requirement was further raised to 10% by December 2016 (BOU, 2016). In this regard, commercial banks have performed extremely well since the regulatory tier 1 capital to risk weighted assets has always been above the regulatory requirement (Bank of Uganda, 2017).

1.2 Problem statement

Despite the various reforms such as restructuring of the banking sector, introduction of Credit Reference Bureaus, and prudential regulations, non-performing loans in Uganda's commercial banking industry have remained high and continued to increase. As a ratio of total gross loans, NPLs increased from 2.32% in 2005 to 4.20% in 2009, which then increased to 5.63% by the end of 2013, before shooting to a record figure of 10.47% in 2016 (BOU, 2017). The continued increase in NPLs has adversely affected the profitability and the lending behaviors of the commercial banks. For instance, between June 2015 and June 2016 when NPLs increased from 4.0% to 8.3%, annual after tax profits for commercial banks reduced by 44.2% and in the same year, credit growth reduced from 19.7% to 3.7%. The

trend exhibited by these NPLs therefore puts the banking sector at a risk of systemic instability which in turn can harm the whole economy and thus retard economic growth. Given the above, it's therefore imperative to control NPLs. However, in order to control non-performing loans, it's necessary to understand the factors responsible for the increase in NPLs. It's in light of this, that the study examined the determinants of non-performing loans in Uganda's commercial banking industry.

1.3 Objectives of the study

1.3.1 General objective

To investigate the determinants of non-performing loans in Uganda's commercial banking industry.

1.3.2 Specific objectives

a) To investigate bank specific determinants of NPLs in Uganda's commercial banking industry.
b) To investigate macroeconomic determinants of NPLs in Uganda's commercial banking industry.

1.4 Scope of the study

The study covers commercial banking industry in Uganda using aggregated quarterly data for the period 2002 quarter one to 2017 quarter two. Due to lack data at bank level, aggregated data was used. According data for bank-specific variables represents sector averages.

1.5 Justification / significance of the study

Studies that have examined the determinants of NPLs have mixed findings, for example, while Khemraj and Pasha (2009) find appreciation of the domestic currency to increases non-performing loans, Jakubik and Reninger (2013) find appreciation of the domestic currency to decrease non-performing loans. In case of Uganda, Nanteza (2015) only considered economic

factors, moreover using a small sample (14 years), while Area (2016) focused on qualitative factors, using only one bank (Uganda Development Bank). No study has considered both Macroeconomic and Bank-specific factors in the context of Uganda. Therefore as a contribution to the literature, this study examines both bank-specific and macroeconomic determinants of non-performing loans in Uganda's commercial banking industry, using most recent data spanning from 2002q1 to 2017q2. The study also applies a technique of ARDL bounds test which has not been used to analyze non-performing loans in Uganda.

Regarding policy, the findings of the study will enable commercial banks improve on their credit risk management strategies. Knowledge of the macroeconomic factors that significantly impact on loan performance will be of great use to the policy makers. It will enable them to design appropriate policies to influence macroeconomic variables in the manner that can reduce non-performing loans. The results of the study will also be of great importance to the regulatory authority (Bank of Uganda) by enabling it adjust its prudential regulations so as to reduce the risk exposure of the commercial banks.

1.5 Organization of the study

The study is organized into five chapters. Chapter one is the introduction part of the study and it consists of the background of the study, the problem statement, the objectives of the study, the scope of the study, the significance of the study and ultimately the organization of the study. Chapter two reviews the relevant literature as regards NPLs. Chapter three presents the methodology adopted for the study encompassing the theoretical frame work, specification of the empirical model, definition and explanation of the variables used in the empirical analysis, estimation procedure, and the sources of data. Chapter four presents the estimated results and their interpretation. And finally chapter five gives conclusion, recommendations, limitations of the study and the area of further research.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

This chapter starts with presentation of theoretical review, under which the concept of NPLs loans is explored and the theoretical underpinnings of NPLs discussed. Thereafter empirical studies about the determinants of NPLs are reviewed. The chapter concludes by presenting the summary of the literature and the knowledge gap.

2.1 Theoretical review

This section presents the description of the concept of non-performing loans and the theoretical explanations of the causes of non-performing loans in commercial banks.

2.1.1 The concept of Non-performing loans

According to IMF (2009), a loan is non-performing when payments of interests and principal are past due by 90 days or more, or at least 90 days of interest payment have been capitalized, or payments are less than 90 days overdue, but there are other good reasons to doubt that payment will be made in full. Bank for international settlements (BIS) considers a default to have occurred with regard to a particular obligor when the obligor is past due more than 90 days on any material credit obligation to the bank (BIS, 2006). The default often happens when a borrower faces unexpected financial difficulties, for example when an individual loses their job and therefore cannot repay their mortgage as agreed, or when a company experiences financial difficulties among other reasons.

NPLs can be measured by non-performing loans net of provision of capital, which is calculated by taking the value of non-performing loans (NPLs) less the value of specific loan provisions as the numerator and capital as the denominator (Warue, 2012). However, the most prominent way of measuring NPLs is by taking the ratio of non-performing loans to total gross loans. This is calculated by using the value of NPLs as the numerator and the total value of the loan portfolio as the denominator (IMF, 2004).

2.1.2 Theoretical underpinnings of NPLs

According to asymmetric information theory, NPLs arise due to high interest rate which induces moral hazard and adverse selection problems in the credit markets. High interest rate scares away good borrowers, leaving the bank with a pool of highly risky borrowers thus leading to adverse selection (Stiglitz and Weiss, 1981). Regarding moral hazard, high interest rate induces the borrower to choose projects that have high expected returns so as to raise the funds for repaying the loan. However such projects are associated with high risk of defaulting (Stiglitz and Weiss, 1981).

NPLs also arise from a fall in prices (deflation). This argument is based on the debt deflationary theory advanced by Fisher (1933) which posits that a fall in prices increases the debt burden of the borrower in real terms thus reducing their debt repayment capacity.

The business cycle theory postulates that NPLs are counter cyclical, decreasing during a boom and increasing during a recession. The general explanation is that a recession is associated with lower real GDP growth which translates into less income which in turn retards the debt servicing capacity of borrowers. Moreover, lower GDP growth is associated with high unemployment rates which adversely affects people's incomes (Salas and Suarina, 2002; Fofack, 2005; and Jimenez and Saurina, 2005).

Berger and De Young (1997) link nonperforming loans to cost efficiency. According Berger and De young, low measured cost efficiency is a signal of poor senior management practice which translates in poor underwriting, poor monitoring and evaluation of bad loans. All these result in to increased levels of NPLs.

According to MacDonald and Timothy (2006), there are five Cs that help explain credit default. These are; (i) **Complacency:** this refers to the tendency to assume that because things were good in the past, they will be good in the future. For instance, assuming that

borrower will pay the loan since they have always paid; (ii) **Carelessness:** this represents the poor underwriting which is evidenced by inadequate loan documentation, lack of current financial information or other pertinent information in the credit files, and lack of protective covenants in the loan agreement. These make it difficult to monitor a borrower's progress and identify problems before they are unmanageable; **(iii) Communication ineffectiveness:** this represents the inability to clearly communicate the bank's objectives and policies to the loan officers and failure of the loan officers to communicate problems with existing loans to the bank management; (iv) **Contingencies:** this refers the lenders' tendency to ignore circumstances under which the borrower might default. In this case, banks tend to focus more on trying to make a deal work rather than identifying down side risk; (v) **Competition:** this involves following the competitors' action rather than monitoring the bank's own credit standards.

Keeton and Morris (1987) formulated the "moral hazard" hypothesis which asserts that banks with relatively low capital respond to moral hazard incentives by increasing the riskiness of their loan portfolio, which in turn results in higher non-performing loans in the future. Furthermore, Louzis, Vouldis and Metaxas (2011) discussed the moral hazard of "too-big-to-fail" where big banks may opt to undertaking excessive risk with expectations that government will protect them in case of failure. This compounds into accumulation of NPLs.

2.2 Empirical literature

Credit quality of loan portfolios across most countries in the world remained relatively stable until financial crises hit the global economy in 2007–2008. Since then, the average bank asset quality deteriorated sharply and most countries experienced rapid growth in NPLs. However, the growth varied significantly among different groups of countries, and among countries in the same group. For example, in 2008 the number of NPLs as a share of total loans in high-income countries from Organization for Economic Co-operation and Development (OECD)

was 3%, and increased to 8% in 2014, while in Central and Southeastern Europe it was 4% in 2002, and reached almost 15% in 2014 (Kjosevski and Mihail, 2017).

According to Fofack (2005), the banking crisis which affected a large number of Sub-Saharan African countries in the 1990s was also accompanied by a rapid accumulation of nonperforming loans. More so, the ratio of NPLs to total loans in sub-Saharan Africa has remained high and continued to show an upward trend, increasing from 4.9% in 2012 to 6.3% in 2015.

In the bid to determine the cause of NPLs, a number of empirical studies have been carried out, with some studies focusing on bank specific factors only, while others have focused on macroeconomic factors only. There also exits studies that have looked at both bank specific factor and macroeconomic factors. Below are examples of some of these studies.

A study by Khemraj and Pasha (2009), who used panel data techniques (fixed effect) to examine the determinants of non-performing loans in Guyana found that appreciation of the real effective exchange rate and increase in lending rate tend to increase NPLs whereas improvement in the economic conditions has a decreasing effect on non-performing loans. Contrary to earlier studies, the study did not find support for the view that large banks are more effective in screening loan customers when compared to their smaller counterparts.

In line with Khemraj and Pasha (2009) and Matteo, Valeria, and Guiseppe (2010), Fainstein and Novikov (2011) who used VECM, found real GDP growth to be as the main determinant of NPLs in the Baltic countries studied. Specifically, the study found that increase in real GDP growth tends to reduce the level of NPLs. The authors argue that increase in GDP growth increase people's incomes thus increasing their debt repayment capacity. The results further showed that real estate market growth played an important role but only in Latvia and Lithuania.

In the context of Romanian banking sector, Vogiazes and Nikolaidu (2011) found that NPLs are influenced by macroeconomic variables, specifically the construction and investment expenditure, the inflation and the unemployment rate, and the country's external debt to GDP and M2 together with Greek-specific variables (such as the Greek crisis). On the other hand, bank-specific variables, the financial markets, and interest rates indicators were not found to possess explanatory power when added to the baseline model. In the same vein, a study by Nkusu (2011) for twenty-six (26) advanced economies over the period 1998-2009 shows that adverse macroeconomic development in particular a contraction of real GDP, a high unemployment rate, high interest rates, a fall in house prices and a fall in equity prices negatively affect non-performing loans.

Following the methodology used by Khemraj and Pasha (2009), Messai and Jouini (2013) evaluated the determinants of non-performing loans for a sample of 85 banks in three countries (Italy, Greece and Spain) for the period of 2004-2008. The study found that problem loans vary negatively with the growth rate of GDP, the profitability of banks' assets and positively with the unemployment rate, the loan loss reserves to total loans and the real interest rate.

Marijana et al (2013), used Generalized Method of Moments estimator for dynamic panel models to investigate determinants of non-performing loans in Southeastern European banking systems for the period between 2003 and 2010. In line with Messai and Jouini (2013), Marijana et al (2013) found that nonperforming loans vary inversely with returns on assets and economic growth. In addition, the study found that increase in real interest rate, inflation and solvency of the bank tend to increase NPLs whereas increase in the size of the bank results in lower levels of NPLs suggesting that large banks are more effective in screening loan customers when compared to their smaller counterparts. Contrary to the

findings of Khemraj and Pasha (2009), marijuana et al (2013), did not find support for the view that appreciation of exchange rate deteriorates the quality of the loan portfolio as the coefficient of exchange rate was no significant.

A study by Beck, Jakubik and Piloui (2013) for 75 advanced and emerging economies for the period 2000 to 2010 confirmed the inverse relationship between real GDP growth and NPLs. The authors find share prices, nominal effective exchange rate of the local currency and bank lending rate to be the other factors that influence NPL ratio in these countries. The study, however revealed that direction of the impact of exchange rates is a function of the extent of foreign exchange lending to unhedged borrowers. Additionally, the results showed that the impact of the share prices was larger in countries that had a large stock market.

Using 44 commercial banks in Kenya, Warue (2013) investigated the link between NPLs and bank specific and macroeconomic factors or the period 1995 to 2009. While employing Panel econometrics approach, the study found evidence that bank specific factors contribute to NPLs performance at higher magnitude compared with macroeconomic factors. Specifically, return on assets (ROA) was negative and significantly related to NPLs levels in large banks and small banks but insignificant in medium banks. Furthermore, return on asset (ROA) was negative and significant in local banks and government banks but not in foreign banks. However the study found no evidence that banks asset size was related to NPLs levels across all bank categories in Kenya. This result was in line with Khemraj and pasha (2009) and in contrast with the finding of Marijana et al (2013). Furthermore, Per capita income was found to be negatively and significantly related to NPL levels across bank size categories and across bank ownership categories.

Abid et al, (2014), while studying Macroeconomic and Bank Specific Determinants of Household's Non-Performing Loans in Tunisia, summarized that macroeconomics factors

such as Gross Domestic Product (GDP) had negative impact on NPL. This was in support of the findings by Beck, Jakubik and Piloui (2013) and Khemraj and Pasha (2009). The study also found inflation rate and interest rate to have a positive impact on NPLs. Banking specific factors such as solvency ratio, returns on equity had negative and significant impacts, while operations inefficiency was found to have a positive impact on NPLs. Given the positive relationship between NPLs and size of the bank, the study therefore finds support for the notion of "too-big-to-fail" discussed by Louzis, Vouldis and Metaxas (2011).

Considering the Eurozone's banking systems for the period 2000-2008, Tsagkanos et al (2014) found strong correlations between NPLs and various macroeconomic (such as unemployment, annual percentage growth rate of gross domestic product) and bank specific (such as returns on equity). Specifically, the study found that increase in GDP growth and returns on equity have a decreasing effect on non-perfoming loans while increase in unemployment rate is associated with an increase in NPLs. Contrary to the findings of Abid et al, (2014), this study did not find any significant impact of inflation rate on NPLs.

Peyavali **(**2015) employed time-series econometric techniques of unit root, co-integration, impulse response functions and forecast error variance decomposition on the quarterly data covering the period 2001 to 2014 to study bank specific determinants for non-performing loans in commercial banks in Namibia. Similar to Messai and Jouini (2013) as well as Warue (2013), the results showed a negative relationship between NPLs and returns on assets. The study further found loan to asset ratio and log of total assets to be positively related to NPLs.

Applying multiple linear regression model, Nanteza (2015) examined the effect of economic factors on NPLs in Uganda's commercial banks. In contrast to the empirical studies such as Khemraj and Pasha (2009), Messai and Jouini (2013), and Abid et al (2014), the study did not find any significant relationship between NPLs and economic factors. Precisely, the study

found that inflation rate, exchange rate, interest rate and GDP growth do not have any significant impact on NPLs in Uganda's commercial banks. The author however attributed these results to the small sample that was used in the study (annual data from 2000 to 2013).

A study by Ofori et al (2016), employed ARDL bounds test of co-integration to assess the effect of bank specific factors on the loan performance in HFC bank in Ghana using quarterly data from 2008 to 2015. The results revealed that bank's loan interest rate, loan to asset ratio and bank's loan loss provision over reserve as bank specific factors that significantly influenced loan performance in the long run. Precisely, loan interest rate was found to have a positive impact on non-performing loans, loan to asset ratio having negative impact and bank's loan loss provision over reserve having positive impact. However, Contrary to Abid et al, (2014), the study did not find any significant impact of returns on equity and inefficiency on non-performing loans.

Hanifan and Umanto (2017), used 20 banks listed in Indonesia stock exchange (index) between quarter one of 2005 to quarter four of 2014, to analyze the impact of macroeconomic and bank specific factors toward nonperforming loans. While using dynamic panel data GMM-system method, the authors found that the previous period of non-performing loans, change of gross domestic product and inflation rate had a significantly negative impact on NPLs. In line with Abid et al, (2014), Hanifan and Umanto (2017) further found operations expenses to operations income to have a positive relationship with NPLs. However, Contrary to the findings of Ofori et al (2016), the author did not find any significance of interest rate to NPLs. The authors attributed this to the fact that many of loans have a middle to long term period, so that bank interest rate would only be significant for more than four years.

2.3 Summary of the literature and research gap

On the basis of the reviewed literature on the determinants of NPLs, operating expenses, return on equity, loan to asset ratio, loan loss provision over reserves, bank size, bank liquidity, credit growth and returns on assets are some of the bank specific factors that have been found to impact on loan performance. On the other hand, GDP growth rate, inflation rate, interest rates, debt to GDP ratio, unemployment and construction and investment expenditures, are some of the macroeconomic factors that have been found to impact on loan performance. However, there are mixed findings with regards to the impact of different variables due to the variation in the environment and data used in different studies. There are also different methodological approaches regardless of whether it is cross-country or individual country studies. Panel data techniques are the most dominant especially in cases where bank level (disaggregated) data is used.

For the case of Uganda, the findings of the study conducted by Nanteza (2015) imply that economic factors are not very important in explaining the problem since they were found not be significant. Moreover this study only considered four factors ignoring other economic factors such as unemployment, debt to GDP ratio, which have been found to have a significant impact on loan performance in other countries. Another study conducted by Area (2016) looked at bank specific factors affecting loan performance using a case study of Uganda development bank limited. However, this study was qualitative in nature, mainly focusing on staff involved in credit management, the credit policy and the management information system software used, ignoring quantitative factors such as, returns on assets, lending rate and many more, which have been found to impact significantly on loan performance by various studies. More so Area's study cannot be used to explain the problem at macro level given that it focuses on only one bank (Uganda Development Bank).

Both studies therefore leave a gap as to what factors are important in explaining NPLs across commercial banks in Uganda. Moreover, to the best of my knowledge, no study has combined both macroeconomic and bank-specific factor for the case of Uganda. This study is therefore intended to close this gap by looking at both bank-specific and macroeconomic determinants of non-performing loans in Uganda's commercial banks from quantitative perspective.

CHAPTER THREE: METHODOLOGY

3.0 Introduction

In this chapter, the theoretical frame work adopted for the study, the variables used in the study, econometric model, the estimation procedure, and the data used are described.

3.1 Theoretical frame work

In order to investigate the determinants of non-performing loans in Uganda's commercial banks, the study adapted the model of NPLs developed by Zeng (2012). The model is formulated using optimal control theory based on the study by Forster (1980), which set up a differential equation of the state variable. In the model, loan balance is a control variable and non-performing loans is the state variable. For purposes of derivations, loan balance is represented by $\boldsymbol{L}$ and non-performing loans represented by $\boldsymbol{N}$.

Loan balance ($\boldsymbol{L}$) can increase production and service capacities. It also increases total consumption ($\boldsymbol{C}$) and social utility. However, since non-performing loans ($\boldsymbol{N}$) is "financial pollution"($\boldsymbol{P}$), and is harmful to social welfare, it decreases social utility. Accordingly, Zeng (2012) specifies the social utility function as shown below.

$$U = [C(L)]^{\eta} - P(N) \quad \ldots\ldots (3.1)$$

Where $C(L) = \left(\varphi L^{\theta}\right)^{\frac{1}{\eta}}$ and $P(N) = \upsilon N^{m}$

Equation (3.1) can thus be written as;

$$U = \varphi L^{\theta} - \upsilon N^{m} \quad \ldots\ldots (3.2)$$

Where;

$$0 < \theta < 1, \varphi > 0, \upsilon > 0, \text{ and } m > 1\ N > 0\ L > 0 \quad \ldots\ldots (3.3)$$

From equation (3.2), the marginal utilities with respect to loan balance are given by;

$$\frac{\partial U}{\partial L} = \varphi\theta L^{\theta-1} > 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.4)$$

$$\frac{\partial^2 U}{\partial L^2} = \varphi\theta(\theta-1)L^{\theta-2} < 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.5)$$

Equations (3.4) and (3.5) imply that the marginal utility with respect to loan balance is positive but diminishing, and the social utility function is concave in relation to loan balances.

Similarly, the marginal utilities with respect to non-performing loans can be obtained from equation (3.2).

$$\frac{\partial U}{\partial N} = -\upsilon m N^{m-1} < 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.6)$$

$$\frac{\partial^2 U}{\partial L^2} = -\upsilon m(m-1)N^{m-2} < 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.7)$$

Equations (3.6) and (3.7) imply that the marginal utility with respect to non-performing loans is negative and diminishing, and the social utility function is convex in relation to loan balance.

Following Zeng (2012), the growth rate of non-performing loans is modelled as shown below;

$$\dot{N} = -\alpha L - \beta A^2 - \delta N + h|\Delta G| + \gamma(i-r) + aS + b\Delta E \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.8)$$

Where $\boldsymbol{L}$ is loan balance, $\boldsymbol{N}$ is bank non-performing loans, $\boldsymbol{A}$ is the effort of internal bank management, $|\Delta \boldsymbol{G}|$ is the amplitude of economic growth rate; $\boldsymbol{i}$ is the nominal interest rate, **r** is the profit margin of an enterprise, $\boldsymbol{S}$ is the animal sprit of the enterpriser (an increase in an enterpriser's irrational behavior), $\Delta \boldsymbol{E}$ is amplitude of the exchange rate. $\alpha, \beta, \delta, h, \gamma, a, b$ are coefficients, where by α is assumed to be negative and the rest positive.

From equation (3.2), the social objective function is given by;

$$Max \int_0^T Udt = Max \int_0^T \left(\varphi L^{\theta} - \upsilon N^{m}\right) dt \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.9)$$

The objective function in equation (3.9) is subject to the constraint conditions in equations (3.3) and (3.8). The current value Hamiltonian function for the above problem is thus given as;

$$H = U(N, L) + \lambda(-\alpha L - \beta A^2 - \delta N + h|\Delta G| + \gamma(i - r) + aS + b\Delta E) \ldots\ldots\ldots\ldots\ldots (3.10)$$

The first order conditions are given by;

$$\frac{\partial U}{\partial L} = \varphi\theta L^{\theta-1} - \alpha\lambda = 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.11)$$

From equation (3.11), λ is given as;

$$\lambda = \frac{\varphi\theta L^{\theta-1}}{\alpha} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.12)$$

Differentiating equation (3.12) with respect to time gives;

$$\dot{\lambda} = \frac{\varphi\theta(\theta - 1)L^{\theta-2}\dot{L}}{\alpha} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.13)$$

Setting $\dot{\lambda} = -\frac{\partial U}{\partial N}$ give;

$$\dot{\lambda} = -\left(-\upsilon m N^{m-1} - \delta\lambda\right) = \upsilon m N^{m-1} + \delta\lambda \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.14)$$

From equations (3.12), (3.13) and (3.14),

$$\dot{L} = \frac{\alpha\left[\upsilon m N^{m-1} + \delta\left(\frac{\varphi\theta L^{\theta-1}}{\alpha}\right)\right]}{\varphi\theta(\theta - 1)L^{\theta-2}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.15)$$

In the steady state, $\dot{L}$ and $\dot{N}$ are equal to zero, therefore, from equations (3.15), the following equation is obtained;

$$N = \left(\frac{-\delta\varphi\theta L^{\theta-1}}{\alpha v m}\right)^{\frac{1}{m-1}} = nL^{\frac{\theta-1}{m-1}} > 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots . (3.16)$$

Where $n = \left(\frac{-\delta\varphi\theta}{\alpha v m}\right)^{\frac{1}{m-1}} > 0$ since $\alpha < 0$

And from equation (3.8) we get;

$$N = \frac{1}{\delta}(-\alpha L - \beta A^2 + h|\Delta G| + \gamma(i - r) + aS + b\Delta E) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots .. (3.17)$$

Combining (3.16) and (3.17) yields the following equation.

$$N = \frac{1}{2\delta}\left(\delta n L^{\frac{\theta-1}{m-1}} - \alpha L - \beta A^2 + h|\Delta G| + \gamma(i - r) + aS + b\Delta E\right) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots . (3.18)$$

According to equation (3.18), non-performing loans are determined by loan balances (L), effort of internal bank management (A), economic growth rate (G), nominal interest rate (i), profit margins (r), enterpriser's irrational behavior (S), and exchange rate (E).

3.2 Econometric model

Empirical model for the study is developed by modifying the model in equation (3.18), to include unemployment rate and the amount of large exposure to total growth loans (measure of loan concentration) as suggested by empirical literature and Bank of Uganda, respectively. To avoid collinearity that may arise between lending rates and loan balances, the empirical model doesn't include loan balances. The exclusion of loan balances and enterpriser's irrational behavior and other variables such as institutional quality is further explained by absence of data. Given that it's a time series analysis, there is need to conserve degrees of freedom. This further limits inclusion of some variables in the model.

The study employs a linear regression model similar to that used by Khemraj and pasha (2009), where the dependent variable is transformed into logs. The transformation of the

dependent variable, lending rate, and large exposure into logs is further informed by the fact that these variables are not normally distributed in their original state and the log transformation helps convert them to normal distribution. The model is specified as;

$$LNPLs_t = \beta_0 + \beta_1 LLR_t + \beta_2 ROA_t + \beta_3 LLEL_t + \beta_4 RER_t + \beta_5 UE_t + \beta_6 GDPG_t + e_t \ldots (3.19)$$

Where; $\boldsymbol{LNPLs}$ is the logarithm of non-performing loans, $\boldsymbol{LLR}$ is the logarithm of lending rate, $\boldsymbol{ROA}$ is returns on assets, $\boldsymbol{LLEL}$ is logarithm of large exposure to total gross loans, $\boldsymbol{RER}$ is real effective exchange rate, $\boldsymbol{UE}$ is unemployment, $\boldsymbol{GDPG}$ is GDP growth rate, $\boldsymbol{e}$ is the error term

By letting

$$\beta' = (\beta_1\ \beta_2\ \beta_3\ \beta_4\ \beta_5\ \beta_6) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.20)$$

And

$$x_t' = (LLR_t\ ROA_t\ LLEL_t\ RER_t\ UE_t\ GDPG_t) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.21),$$

Equation (3.19) can be reduced to the form of;

$$y_t = \beta_0 + \beta' x_t + e_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.22)$$

Where β is a vector of parameters to be estimated and y_t is the dependent variable which is defined as the ratio of nonperforming loans to total gross loans. x_t is a vector of the explanatory variables[3]. Equations (3.20) and (3.21) enable us to reduce our model for easy manipulation in the subsequent sections.

3.3 Hypotheses of the study

a) Lending rate has a positive impact on NPLs.

b) Returns on assets has a negative impact on NPLs.

c) Large exposures has a positive impact on NPLs.

[3] In all the subsequent equation x_t is considered as a vector of these explanatory variable and y_t is NPLs.

d) Real effective exchange rate has a positive impact on NPLs

e) Unemployment has a positive impact on NPLs.

f) GDP growth has a negative impact on NPLs.

3.4 Definition and measurement of variables included in empirical analysis.

3.4.1 Dependent Variable (NPLs)

In line with the previous empirical studies and IMF, our dependent variable is measured as the percentage of total non-performing loans to total gross loans. That's;

$$NPLs = \frac{Total\ non-performing\ loans}{gross\ loans} x100$$

3.4.2. Independent Variables

The explanatory variables used in the study were categorized into two that is; Bank Specific Factors and Macroeconomic factors. These are discussed below.

Bank specific factors

Loan interest rate (LR): This is the rate at which borrowers service the loan. The coefficient is expected to be positive; this is because a rise in the interest rate on loan makes the loan expensive, thus imposing higher risk on borrower's ability to pay the interest due to the reduction in the borrower's ability in meeting his obligations (Ofori et al, 2016). Inclusion of this variable in the model is also based on the fact that lending rates in Uganda have remained high while at the same time NPLs continue to rise.

Return on Assets (ROA): This measures how well the bank's assets are utilized in realizing profits (Warue, 2013). ROA gives a manager an idea as to how efficient a company's management is at using its assets to generate earnings. Return on assets is displayed as a percentage and it's calculated as the ratio of net income to total assets. Literature has it that, high returns on assets is associated with lower levels of NPLs since, high ROA makes bank

managers less pressured in creating revenue from credit activities and thus, there is less exposure to credit risk (Kjosevski and Mihail ,2017; Marijana et al, 2013). Therefore the expected sign is negative**.** Inclusion of ROA was mainly guided by empirical literature.

Large exposure to total gross loans (LEL): Large exposure is defined as the sum of all exposures of a bank to a counterparty, or to a group of connected counterparties which is equal to, or which exceeds 10% of the bank's eligible capital base. *i.e.*, tier 1 capital (BIS, 2014). According to Basel III, large exposures framework was developed to complement the committee's risk-based capital standard because the latter is not designed specifically to protect banks from large losses resulting from the sudden default of a single counterparty. In particular, the minimum capital requirements (pillar 1) of the Basel risk-based capital framework implicitly assume that a bank holds infinitely granular portfolios, ie no form of concentration risk is considered in calculating capital requirements.

This study uses large exposure as a measure of the extent of commercial bank's loan concentration (concentrated exposures to individual counterparties) and its inclusion in the model was based on the argument by Bank of Uganda, that the increase in NPLs in 2016 were due to credit concentration. The study expects a positive sign because increase in large exposure to gross loans implies increased concentration of the loan portfolio which increases concentration risk.

Macroeconomic factors

Real effective exchange rate (RER): The real effective exchange rate is the weighted average of a country's currency relative to an index or basket of other major currencies, adjusted for the effects of inflation. It is the nominal effective exchange rate divided by a price deflator or index of costs (IMF, 2006). Real effective exchange rate is an indicator of a country's international competitiveness in terms of foreign exchange market. Increase in RER weakens the performance of the export-oriented sectors of the economy, which reduces their

debt repayment capacity (Olayika and Mofoluwaso, 2014; Beck, Jakubik and Piloui, 2013; Khemraj and Pasha, 2009). On the other hand however, an increase in the foreign exchange rate can improve the debt servicing capacity of those who borrow in foreign currency thus leading to a negative relationship between NPLs and exchange rate (Nkusu, 2011). Therefore we expect either positive or negative sign. Both empirical literature and continued depreciation of the local currency were the key considerations in deciding to include this variable in the model.

Unemployment (UE): Unemployment is a phenomenon that occurs when a person who is actively searching for employment is unable to find work. The most frequent measure of unemployment is the unemployment rate, which is the number of unemployed people divided by the number of people in the labor force (ILO, 2013). The high rate of unemployment in Uganda was the major basis for selecting this variable. This study used Modelled ILO estimates for unemployment in the analysis. Due to lack of quarterly data on this particular variable, annual data will be interpolated to quarterly using Eviews software. It's said that high unemployment rate negatively affects income of individuals thereby increasing their debt burden (olayika and mofoluwaso, 2014). In addition, higher unemployment rate negatively affects the demand for products of firms which ultimately leads to decline in revenues of the firms. (Kjosevski and Mihail, 2017). Therefore we expect a positive coefficient.

GDP growth rate (GDPG): Economic growth usually increases the income which ultimately enhances the loan payment capacity of the borrower which in turn contributes to lower bad loan and vice versa (Khemraj and Pasha, 2009). Accordingly the expected sign is negative. Slowdown in GDP growth in the recent past was the basis for considering GDP growth with the intention of testing whether this has been responsible for the rise in NPLs.

3.5 Estimation procedure

3.5.1 Unit root tests

Estimation of the model using time series data techniques without testing for stationarity may result into spurious regression leading to false conclusion. When a nonstationary time series is regressed on another nonstationary series, spurious regressions may occur. Spurious results are characterized by a fairly high R^2, highly uncorrelated residuals and significant coefficients of the regressors and very low Durbin Watson statistic (Gujarati, 2004). It's therefore against this background that we explore the stationarity properties of the data before carrying out model estimation. The study adopts the augmented dickey fuller (ADF) and the Phillips-Perron (PP) tests for unit root. In case of disagreement in the two tests, the KPSS test is used as confirmatory test.

Augmented dickey fuller test (ADF)

This is a modified version of the Dicky Fuller test which ensures that the unit root test is valid even with the presence of serial correlation of unknown form, say $AR(p)$ process. This is done by augmenting the ordinary Dickey Fuller equation with lagged values of the differenced dependent variable as show below.

$$\Delta Z_t = \alpha_0 + \alpha_2 t + \rho Z_{t-1} + \sum_{i=1}^{M} \beta_i \Delta Z_{t-i} + u_t \quad \ldots (3.23)$$

Where Z_t is the time series being tested, M is the optimal number of lags, u_t is the error term. The test is conducted under the null hypothesis $\rho = 0$ (series has a unit root) against the alternative that $\rho < 0$. The decision is based on the dickey fuller tau statistic which is given as;

$$DF_\tau = \frac{\widehat{\rho} - 1}{Est.std.error(\widehat{\rho})} \quad \ldots (3.24)$$

In this study, ADF test is conducted in two form; with intercept only and then with both intercept and trend. The null hypothesis is rejected if the computed tau statistic is less than the critical dickey fuller values at a given level of significance.

Phillips-Perron (PP)

Phillips and Perron (1988) suggested a nonparametric statistical method to take care of the serial correlation in the error terms without adding lagged difference terms (Guajarati, 2004). It is similar to Dickey Fuller in terms of the null hypothesis, the alternative hypothesis and the decision rule. This test is based on the following first order auto-regressive process.

$$\Delta Z_t = \alpha_0 + \alpha_1 Z_{t-1} + u_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.25)$$

Phillips-Perron test is more robust to general form of heteroscedasticity and autocorrelation in the error term and one doesn't have to specify lag length for the test regression.

3.5.2 Cointegration

After testing for unit roots it's necessary to establish whether a linear combination of I (1) variables is a stationary process of I (0). If that happens then the variables are said to be cointegrated[4]. Cointegration is viewed as the statistical expression of the nature of long-run equilibrium relationships. In this case, variables are linked by some long-run relationship, from which they can deviate in the short run but must return to in the long run and the residuals are stationary. In the literature, three approaches have been used to test for existence of long run relationship among the variable (cointegration), that is; Engle and Granger (1987) approach, Johannsen and Juselius (1990) procedure and the ARDL bounds test by Pesaran et al (2001).

[4] Testing for cointegration is important because the type of model to be estimated depends on whether a "dependent" variable is cointegrated with an "independent" variable.

The Engle Granger approach is a two-step approach which uses ordinary least squares to test for cointegration. In the first step, the model is estimated using OLS and the residuals predicted, then unit root test is conducted on the residuals using the unit root tests such as the ADF, Philips Perron test or KPSS test. Absence of unit root in the residuals is an indicator that the variables are cointegrated. When this happens, the Granger representation theorem tells us that there is some valid error correction representation of the model which describes how the dependent variable and the independent variables behave in the short run and long run. The second step therefore involves estimation of the error correction model with the lagged residuals from the first step included as error correction term (provided they are stationary).

The Engle-Granger approach is however limited in a way that the error made in the first step is carried forward into the second step which leads to poor estimation. In addition, OLS estimation of the static level models may create bias in finite samples due to the omitted short-run dynamics (Banerjee, Dolado, Hendry, and Smith, 1986). More still, Engle and Granger assume that the cointegrating variable is unique and so fails to estimate with more than two variables.

In the bid to resolve the shortcomings of the Engle-granger approach, Johansen and Juselius (1990) developed a method that is based on maximum likelihood estimation. This approach can estimate and test even in the presence of multiple cointegrating vectors. The Johansen and Juselius (1990) method is based on VAR and the maximum Eigen value or the likelihood ratio. However there arises identification issues when using the method and usually the number of cointegrating relations depends on the number of lags chosen (Greene, 2002). More so, the technique requires all variables to be integrated of the same order (preferably of order one, I (1)).

3.5.3 ARDL model

The study adopts ARDL approach to cointegration to analyze the determinants of NPLs in Uganda's commercial banks. The choice of this model is primary based on the advantages it has over the other estimation techniques, that is; (i) Unlike the Johansen, ARDL approach is still effective even when there is a mixture of I(0) and I(1) variables in the data set; (ii) It can be applied for small sample size such as the one in this particular study; (iii) it also produces unbiased estimates even in the presence of endogenous covariates (Harris & Sollis, 2003); (iv) the method can be applied even when the variables have different optimal number of lags; (v) the ARDL approach can further estimate the short run and long run dynamic relationship between NPLs and the explanatory variables. The basic ARDL model in the literature is given as;

$$y_t = \beta_0 + \sum_{i=1}^{p} \phi_i y_{t-i} + \sum_{i=0}^{q} \psi_i^{'} x_{t-i} + e_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.26)$$

Where ϕ_i and ψ_i are the coefficients of the lags of the dependent variable and the independent variables respectively. Note that ψ_0 is exactly equal to vector β defined earlier (See appendix A). The lags in equation (3.26) imply a set of dynamic responses in nonperforming loans(y) to any given change in explanatory variables(x). There is an immediate response followed by short run and long run responses

Reparameterization of the model in equation (3.26) gives rise to the error correction version of the ARDL model show below[5].

$$\Delta y_t = \beta_0 - \alpha[y_{t-1} - \theta' x_{t-1}] + \sum_{i=1}^{p-1} \gamma_i \Delta y_{t-i} + \sum_{i=0}^{q-1} \lambda_i' \Delta x_{t-i} + e_t \dots\dots\dots\dots\dots\dots\dots\dots (3.27)$$

[5] Check appendix A for the reparameterization process.

In the above model, x & and y are as defined in section three, $\alpha = 1 - \sum_{i=1}^{p} \phi_i$ is the speed of adjustment coefficient and $\theta = \frac{\sum_{i=0}^{q} \psi_i}{\alpha}$ is a vector of long run coefficients. γ and λ are the short run coefficients and the term in the brackets is the error correction term that is;

$$ECT_{t-1} = y_{t-1} - \theta' x_{t-1} \ldots \ldots (3.28)$$

Thus, the model in equation (3.27) can be written as;

$$\Delta y_t = \beta_0 + \sum_{i=1}^{p-1} \gamma_i \Delta y_{t-i} + \sum_{i=0}^{q-1} \lambda_i' \Delta x_{t-i} + \varphi ECT_{t-1} + e_t \ldots \ldots (3.29)$$

Where $\varphi = -\alpha$ is the speed of adjustment towards long run equilibrium. In this case, φ must be negative and statistically significant if long run equilibrium is to be restored. The optimal lag orders p and q (possibly different across regressors) can be obtained by the minimizing model selection criterion, for example by using the Akaike information criterion (AIC) or the Bayesian information criterion (BIC).

To test for the existence of a long run relationship among the variables, model in equation (3.29) is estimated using OLS and then Wald test (F-statistic) is conducted under the null hypothesis of no cointegration among the variables against the alternative that variables are cointegrated. This process is termed as bounds test. The null hypothesis for the test according to our reduced form model is algebraically expressed as:

$$H_0^F: (\alpha = 0) \cap \left(\sum_{i=0}^{q} \psi_i = 0 \right)$$

According to Pesaran, Shin and Smith (2001), the null of no cointegration among the variables in the model (no level relationship) is rejected if the computed F-statistic exceeds the upper critical, if the computed F-statistic is lower than the lower bound critical value, we fail to reject the null hypothesis, and conclude absence of cointegration. However, if the computed F-statistic falls within the bounds, the test is inconclusive. In this case, prior

knowledge about the order of integration is important in order to make a decision on the long run relationship.

3.5.4 Diagnostic tests

Diagnostic tests are carried out to check if the model satisfies the assumptions of the classical linear regression model. In this study, the following diagnostic tests are considered; stability (CUSUM) test, serial correlation, heteroscedasticity, normality, multicollinearity and specification test (Ramsey reset test).

3.5.4.1 Normality test

The study applies the Jarque-Bera test to test for normality of the residuals. This test matches the skewness and kurtosis of data to see if it matches a normal distribution. The test is preferred to its competitors (such as Shapiro-Wilk test) because it has high power especially in cases of symmetric distributions with medium up to long tails and for slightly skewed distributions with long tails. The test statistic is given by;

$$JB = N\left[\left(\frac{S^2}{6} + \frac{(K-3)^2}{24}\right)\right] \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \quad (3.30)$$

With *S*, *K*, and *N* denoting the sample skewness, the sample kurtosis, and the sample size, respectively. Under the null hypothesis of normality, JB is distributed as a chi-square statistic with two degrees of freedom. Normality is rejected if the test statistic is greater than the tabulated chi-squared value. However, as per the central limit theorem, if the disturbances are not normally distributed, the OLS estimators are still normally distributed approximately if there are large-sample data.

3.5.4.2 Serial correlation

Serial correlation occurs in time-series studies when the errors associated with a given time period carry over into future time periods. In presence of serial correlation, the error term either takes an autoregressive process or a moving average process;

$$AR(q);\ u_t = \rho_1 u_{t-1} + \rho_2 u_{t-2} + \cdots + \rho_q u_{t-q} + e_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.31)$$

$$MA(p);\ u_t = \rho_1 e_t + \rho_2 u_{t-1} + \cdots + \rho_p u_{t-p} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.32)$$

Serial correlation is a problem in time series studies because it leads to downward biased standard errors and thus incorrect statistical tests and confidence intervals. Presence of serial correlation also results into inefficient least squares estimates (Greene, 2007). Testing for serial correlation entails testing the null hypothesis; $\rho_1 = \rho_2 = \cdots = \rho_q = 0$

The study adopts Breusch–Godfrey serial correlation (LM) test to test for serial correlation. Breusch–Godfrey test is statistically more powerful than Durbin's h statistic in the sense that; (i) its procedure extends to testing higher orders of serial correlation; (ii) Unlike the Durbin Watson test which requires non-stochastic regressors, the LM test can be applied even in the presence of stochastic regressors since its limiting distribution is chi-squared independently of the data and the parameters (Greene, 2007); (iii) it can also test against the alternative of an MA(P) process for the disturbances (Johnston and Dinardo,1997); (iv) more so, the Durbin Watson test is not likely to be valid when the lagged dependent variable is used as one of the explanatory variables as the statistic will be biased towards finding no serial correlation (Greene, 2007). The LM test is also more powerful than the box-pierce test when the null hypothesis is false since the box-pierce test doesn't condition on x_t (Greene, 2007).

3.5.4.3 Test for Heteroscedasticity

Heteroscedasticity occurs when the variance of errors or the model is not the same for all observations. Heteroscedasticity poses potentially severe problems for inferences based on least Squares as the t-statistic and F-statistic do not follow t and F distributions respectively (Greene, 2007). This is the case because the standard errors are normally inflated in presence of heteroscedasticity. The two commonly used tests for heteroscedasticity are Breusch-Pagan LM test and White test.

In this study we test for Heteroscedasticity using Breusch-Pagan LM test. This test is preferred over the White test because; (i) the White test may reveal heteroscedasticity, when in the actual sense the model simply suffers from other specification errors; (ii) the White test is non-constructive that is; if the null hypothesis is rejected, the test gives no indication of what to do next (Greene, 2007); (iii) White test can also lose its power very quickly particularly if the model has many regressors. The null hypothesis of the test is that residuals are homoscedastic against the alternative that residuals are heteroscedastic**.** If the test statistic has a p-value below an appropriate threshold (e.g. $p<0.05$) then the null hypothesis of homoscedasticity is rejected and heteroscedasticity assumed**.**

3.5.4.4 Specification test

The study adopts Ramsey's (1969) Regression Equation Specification Error Test (RESET) to test if the model is correctly specified. RESET tests whether non-linear combinations of the fitted values help explain the dependent variable. The intuition behind the test is that if non-linear combinations of the explanatory variables have any power in explaining the response variable, the model is mis-specified in the sense that the data generating process might be better approximated by a polynomial or another non-linear functional form. The null hypothesis is "the model is correctly specified" against the alternative "model is not correctly specified". Testing the null is based on the argument that;

$$y = X\beta + Z\alpha + v \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..(3.33)$$

Where Z contains powers of the predicted values of the dependent variable that is;

$$Z = [\hat{y}^2\ \hat{y}^3\ \hat{y}^4] \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..(3.34)$$

The test is therefore conducted using the F-statistic for the hypothesis that $\alpha = 0$. A significant F-statistic (large value) indicates some sort of functional form problem.

3.5.4.5 Parameter stability

The CUSUM and CUSUMSQ test are widely used in the literature to test for model stability. CUSUM and CUSUM of squares tests are based on recursive residuals to test for the constancy over time of the coefficients of a linear regression model. The power of CUSUM and CUSUMSQ tests depends on the nature of the structural change taking place. If the break is in the intercept of the regression equation then the CUSUM test has higher power. However, if the structural change involves a slope coefficient or the variance of the error term, then the CUSUMSQ test has higher power (Ploberger and Krämer, 1992). Under the null hypothesis of coefficient constancy, CUSUM and CUSUMQ lines moving outside the 5% critical region bands leads us to rejection of the null. Implying parameters are not stable.

3.5.4.6. Multicollinearity test

Multicollinearity is a state of very high inter-correlations or inter-associations among the independent variables. In the presence of perfect multicollinearity, the regression coefficients are indeterminate and their standard errors are infinite and if multicollinearity is less than perfect, the regression coefficients, although determinate, possess large standard errors (in relation to the coefficients themselves), implying that the coefficients cannot be estimated with great precision or accuracy (Gujarati, 2004). The study uses Variance Inflation Factor (VIF) to test for multicollinearity. VIF is given by; $VIF = \frac{1}{1-R^2}$. A value of VIF that is 10 and

above, implies that multicollinearity is severe and calls for correcting (O'brien, 2007). The problem of multicollinearity is solved by dropping highly correlated variables. However as Greene (2013) puts it, dropping a variable that belongs in the population model can lead to bias.

3.6 Data types and sources

Aggregated, quarterly data for the period from, the first quarter of 2002 to the second quarter of 2017 was used in the study. Data about the bank specific factors was obtained from Bank of Uganda while data about macroeconomic variables was obtained from world development indicators (WDI) data base. Secondary data was used because it is easily accessible, relatively less expensive, and quickly obtained.

CHAPTER FOUR: PRESENTATION AND DISCUSSION RESULTS

4.0 Introduction

This chapter presents the empirical results of the estimated model developed in chapter three and their interpretation. First, the data collected from different sources is analyzed using descriptive statistics to know the behavior of the data. This is followed by Pairwise correlation matrix which is computed to determine the extent of the linear relation between two variables. Thereafter, results of the estimated model are presented. Results of diagnostic tests are presented before interpretation and discussion of the results is done.

4.1 Data description

Table 4.1 shows the descriptive analysis of the data used in the study. These results show that, the mean values obtained are good measures of central tendency since, for most of the variables, the mean lies midway between the minimum and the maximum values.

Table 4. 1: descriptive statistics

stats	NPLs	LR	ROA	LEL	RER	UE	GDPG
Mean	3.910	21.15	3.217	40.10	104.1	2.534	5.208
Median	3.565	20.46	3.388	39.79	103.6	2.425	5.281
Variance	2.592	5.123	0.621	52.63	31.13	0.429	4.321
sd	1.610	2.263	0.788	7.254	5.580	0.655	2.079
cv	0.412	0.107	0.245	0.181	0.0536	0.258	0.399
Sum	242.4	1312	199.4	2486	6453	157.1	322.9
Min	1.812	17.73	1.330	28.23	92.95	1.255	1.123
Max	10.47	27.22	4.785	61.00	114.5	3.641	11.50
Skewness	1.729	0.796	-0.237	1.079	-0.124	0.0488	0.531
Kurtosis	6.755	2.945	2.532	4.243	2.294	1.822	3.863
JB	67.33	6.56	1.145	16.01	1.447	3.611	4.838
P-value	2.4e-15	0.0376	0.5642	3.3e-04	0.4851	0.1644	0.089

Source; Authors computations

The Results also show that the series display a high level of consistency as their mean and median values are perpetually within the minimum and maximum values of the series. For example, NPLs ranges from 1.812 to 10.47 with mean of 3.910 and median of 3.565. Lending rate (LR) ranges from 17.73 to 27.22 with mean of 21.15 and median of 20.46. Real effective

exchange rate (RER) ranges from 92.94 to 114.52 with mean of 104.09 and median of 103.58. Returns on assets (ROA) ranges from 1.33 to 4.78 with mean of 3.22 and median of 3.39. GDPG ranges from 1.123 to 11.50 with mean of 5.208 and median of 5.281. The results further show that there are no outliers in the series since the Standard Deviations (SD) are relatively low. GDP growth displays the highest dispersion shown by Coefficient of Variation (CV) of 0.399 while lending rate (LR) displays the lowest level of dispersion with coefficient of variation of 0.034.

The skewness, kurtosis and the Jarque-Bera (JB) values suggest that ROA, RER, UE and GDPG are symmetric and normally distributed. The skewness values for these variables are close to zero, the kurtosis values close to 3 and the Jarque-bera values for these variables are less than 6. Lending rate, large exposure and NPLs in their level states are not normally distributed but the log transformation helped to convert them to normal distribution. This explains why these variables appear in natural log form in the analysis.

4.2 Correlation of variables

Correlation analysis is carried out to determine the extent of linear association between any two variables in our study. This can also help to reveal the possibility of multicollinearity problem in the regression**.** The results are shown by the correlation matrix in table 4.2 below.

Table 4. 2: Pairwise correlation matrix.

	LLR	ROA	LLEL	RER	UE	GDPG
LLR	1					
ROA	0.00980	1				
LLEL	-0.4062*	0.0148	1			
RER	0.2581*	-0.0710	-0.3972*	1		
UE	-0.5921*	-0.0434	0.5029*	-0.4772*	1	
GDPG	-0.3663*	-0.0621	-0.120	-0.2683*	0.3309*	1

Source; Authors computations

From the correlation matrix, it can be predicted that there is no problem of collinearity among the explanatory variables since all the correlation coefficients are less than 0.8 in absolute terms (Kennedy, 2008). However, the pair wise correlation matrix can be spurious hence the need to investigate these relationships in a multivariate regression analysis.

4.3 Testing for stationarity

Visual inspection of the data in levels is carried using graphs depicted in the appendix D. The graphs show that LNPLs, LLR trend upwards suggesting that these variables are non-stationary. ROA and LLEL have a negative trend which also suggests non-stationarity of these variables. RER, GDPG and UE don't show any particular trend making it difficult to conclude about their stationarity properties. This therefore necessitates carrying out of formal unit root tests. The study adopted augmented dickey fuller and the Phillips-Perron unit root tests (with intercept only and then with both intercept and trend). The results of these tests are shown in table 4.3 and table 4.4. Critical values for the tests are attached in appendix C.

Table 4. 3: Unit root tests at level

	ADF (LEVEL)		**PHILLIPS PERRON (LEVEL)**	
Variables	Intercept	Intercept and trend	intercept	Intercept and trend
LNPLs	-1.956	-3.199*	-1.883	-3.047
LLR	-2.054	-2.491	-2.250	-3.282*
ROA	-2.963**	-4.960***	-2.332	-2.814
LLEL	-3.05**	-2.837	-2.893	-2.711
RER	-3.257**	-3.539**	-3.168**	-3.408**
UE	-3.703***	-4.231***	-2.544	-2.766
GDPG	-3.507***	-3.539**	-4.678***	-4.663***
***, **, and *** represent significance at 10%, 5% and 1% respectively**				

Source: Author's computations

The results of ADF and Phillips-Perron unit root tests show that LNPLs, LLR and LLEL are non-stationary at level since the p-values for both tests are greater 0.05. GDP growth and real effective exchange rate (RER) are stationary with both tests since the p-values for both tests are less than 0.05. However the two tests contradict on ROA and UE. The ADF show that

these variables are stationary while the Phillips-Perron shows that they are non-stationary at level. To resolve this contradiction, KPSS was applied on these variables (see appendix C for results of KPSS). The results for the KPSS test indicate that ROA and UE are trend stationary but not level stationary at 5%. Since there are nonstationary series in our data, we shift the analysis of unit roots to first difference to find whether these variables are difference stationary.

Table 4. 4: Unit root tests at first difference

	ADF		**PHILLIPS PERRON**	
Variables	Intercept	Intercept and trend	Intercept	Intercept and trend
LNPLs	-5.622 ***	-5.614 ***	-7.045 ***	-7.024 ***
LLR	-8.485***	-8.423***	-8.453***	-8.394***
ROA	-4.542***	-4.612***	-5.595***	-5.570***
LLEL	-7.563***	-7.613***	-9.292***	-9.566***
UE	-3.832***	-3.834**	-4.820***	-4.800***
***, ** and *** represent significance at 10%, 5% and 1% respectively**				

Source; Author's computations

The results of the unit root test at first difference show that all variables that were not stationary at level are difference stationary. This therefore implies that the data is made up of a mixture of I (0) and I (1) variables.

4.4 Estimation of the model

Given that there is a mixture of both I (0) and I (1) and none of the variables is I (2), we adopt ARDL approach to cointegration to verify the existence of a level relationship between the variables and ARDL error correction model to estimate the short run and long coefficients. Optimal lags for the study variables are selected using the AIC with max lag of four. AIC is preferred because it's more accurate in small sample compared to BIC. Max lag four is chosen because we are using quarterly data. The model selected by AIC is ARDL (2, 0, 4, 4, 3, 0, 3). The results of the estimation are presented in table 4.5 and table 4.6, where table 4.5

presents the results of the bounds test while table 4.6 present the long run and short run coefficients, and the results of the diagnostic tests.

Table 4. 5: Bounds test

F-statistic	5.236
10% (lower bound, upper bound)	(2.12, 3.23)
5% (lower bound, upper bound)	(2.45, 3.61)
2.5% (lower bound, upper bound)	(2.75, 3.99)
1% (lower bound, upper bound)	(3.15, 4.43)

Source: author's computations

The results of the bounds test confirm the existence of a level relationship among the variables since the F-statistic is above the upper bound at all levels of significance suggesting the rejection of the null hypothesis of no level relationship.

Table 4. 6: Short run and Long run coefficients, and diagnostic tests

DEPENDENT VARIABLE D.NPLs				
	Variables	Coefficients	t-ratio	P-value
LONG RUN	LLR	1.173**	2.440	0.020
	ROA	-0.262***	-3.280	0.002
	LLEL	0.695	1.590	0.121
	RER	0.034**	2.520	0.017
	UE	0.166*	1.790	0.083
	GDPG	-0.095***	-4.030	0.000
SHORT RUN	D.LNPLs(-1)	0.400**	2.640	0.012
	D.ROA	-0.158*	-1.980	0.056
	D.ROA(-1)	0.112	1.390	0.173
	D.ROA(-2)	-0.055	-0.670	0.508
	D.ROA(-3)	0.253***	2.890	0.007
	D.LLEL	-0.661**	-2.060	0.047
	D.LLEL(-1)	-0.739**	-2.150	0.039
	D.LLEL(-2)	-0.399	-1.390	0.174
	D.LLEL(-3)	-0.510**	-2.010	0.052
	D.RER	-0.012	-1.400	0.170
	D.RER(-1)	-0.018**	-2.550	0.015
	D.RER(-2)	-0.009	-1.320	0.196
	D.GDPG	0.056**	2.500	0.017
	D.GDPG (-1)	0.042**	2.290	0.028
	D.GDPG (-2)	0.034**	2.500	0.017
	Constant	-5.437**	-1.950	0.060
	ECT	**-0.776*** **	**-4.57**	**0.000**
ANOVA	R-squared	0.671		
	Adj R-squared	0.464		
	F-stat (p-value)	3.25 (0.0009)		
DIAGNOSTIC TESTS	Test	Test statistic	P-value	
	Serial correlation	Chi2(1) = 0.203	0.6526	
	ARCH effect	Chi2(1) = 0.872	0.3503	
	Heteroscedasticity	Chi2(1) = 0.800	0.3723	
	Ramsey RESET	F(3, 37) = 1.300	0.2905	
	Normality	Chi2(2) = 1.707	0.4260	
	Multicollinearity	Mean VIF = 4.82		

Source; author's computations

4.5 Interpretation and discussion of the results

4.5.1 Diagnostic tests

The results of diagnostic tests presented in the last panel of table 4.6 show that; the residuals of the estimated model do not suffer from serial correlation. This is shown by the highly significant p-value of 0.6526 from the Breusch Godfrey test. Such p-value suggests acceptance of the null hypothesis of "no serial correlation". The LM test for ARCH effect also suggests the acceptance of the null hypothesis of "no ARCH effect" in the residuals given that its p-value is also highly significant. The estimated model also doesn't suffer from heteroscedasticity. This is shown by the results of the Breusch Pagan test for heteroscedasticity which suggests the acceptance of the null hypothesis of "constant variance". This is evident from the p-value of 0.3723 which is higher than all levels of confidence.

Furthermore, the Ramsey RESET test shows that the model is properly specified since p-value of 0.2905 suggests acceptance of the null hypothesis and therefore conclude that there are no omitted variables. Normality test shows that residuals are normally distributed. This is shown by the Jarque-bera value of 1.707 which is clearly less than 6. Besides, the probability value of 0.426 also suggests acceptance of the null hypothesis. Multicollinearity test revealed VIF of 4.82 which is less than 10 and therefore suggesting that the model doesn't suffer from multicollinearity.

Finally, the model exhibits parameter constancy. This is shown by the CUSUM and CUSUMQ lines which are contained within the critical lines of 5% significance suggesting acceptance of the null hypothesis that parameters are stable. The CUSUM and CUSUMQ curves are attached in the appendix E.

4.5.2 Goodness of fit (R^2) and overall significance of the model

Goodness of fit (also known as the coefficient of determination, R^2) shows variation in the dependent variable that is explained by the model. The R-squared for the model is 0.67. This shows that the regressors included in the model explain 67 percent of the variations in NPLs in Uganda's commercial banks. Adjusted R-squared is 0.46 which is also close to 0.5 thus showing relatively good fit. The overall F-statistic for the model is 3.25 with probability value of 0.0009 which suggest rejection of the null hypothesis "that all coefficients are statistically equal to zero". Implying that the lending rate, returns on assets, large exposure, real exchange rate, unemployment and GDP growth jointly determine NPLs in Uganda's commercial banks.

4.5.3 Error correction term

The error correction term captures the speed of adjustment towards the long run equilibrium. In our model, error correction term estimates the speed at which NPLs return to equilibrium after a change in the explanatory variables. The coefficient of the error correction term is found with the correct sign (negative) and magnitude (between -1 and 0) and is significant at 1%. Coefficient of -0.776 implies that, about 77.6% of the adjustment towards long run equilibrium takes place in the first quarter.

4.5.4 Regression coefficients

The fact that, the model (whose results are presented in table 4.6) satisfies the assumptions of linear regression and also passes various diagnostic tests, implies that meaningful interpretation and discussion can be made based on these results. This subsection therefore presents the interpretation and discussion of long run and short run coefficients.

Non-performing loans and lending rates

Lending rate is found to have a positive impact on NPLs in the long run. Coefficient of 1.17 implies that a 1 percent increase in Lending rate increases NPLs by 1.17 percent and a 1

percent decrease in lending rate reduces NPLs by 1.17 percent holding other factors constant. This result suggests that a rise in lending rate makes the loans expensive, thus imposing higher risk on borrower's ability to pay the interest. This finding was expected since lending rates in Uganda have persistently remained high even with continued reduction in the central bank rate (CBR). This result is in agreement with the findings of Jimenez, and Saurina (2005), Khemraj and Pasha (2009), Dash and Kabra (2010), Ofori et al, 2016, Warue (2013), Fofack (2005), Espnoza and Prasad (2010) and Louzis, Vouldis and Metaxas (2011) Beck, Jakubik and Piloui (2013) who all found increase in lending rate to reduce the loan repayment capacity of the borrowers and thus increase NPLs. The result however contrasts the findings of Nanteza (2015) who did a related study in Uganda and lending rate not to have any significant impact on NPLs. Nanteza however, attributed her findings to fact she used a much smaller sample (annual data from 2000 to 2013).

Non-performing loans and returns on assets

Returns on assets is found to have a negative relationship with NPLs in Uganda's commercial banks. Regression results show that, the negative impact of ROA on NPLs is statistically significant at 1%. Coefficient of -0.2619 implies that a unit increase in the ROA decreases NPLs by 26.2 percent and a unit decrease in the ROA increases NPLs by 26.2 percent in the long run, keeping other factors constant. The result is in line with our prior expectations and economic theory since higher returns on assets imply high profitability of the banks which makes bank managers less pressured in creating revenue from credit activities and thus, leading to less exposure to credit risk. This finding is well aligned with the findings of Kjosevski and Mihail (2017), Goldewski (2005), Boudriga et al. (2009), Louzis et al. (2012) and Marijana et al (2013) who argued that increase in returns on assets reduces risk exposure of the banks. In the short run, Returns on assets also have a negative impact on NPLs,

significant at 5%. It can therefore be confirmed that increase in ROA is associated with a decrease in the level of non-performing loans in Uganda's commercial banks.

Unemployment and non-performing loans

The long run partial elasticity with respect to unemployment is 0.166 and is significant at 10 percent level of significance which implies that a unit increase in unemployment rate increases NPLs by 16.6 percent and vice versa. This possibly suggests that increase in unemployment rate negatively affect income of individuals thereby reducing their debt repayment capacity. This result could also be due to the fact that higher unemployment rate negatively affects the demand for products of firms which ultimately leads to decline in revenues of the firms thus reducing their capacity to pay the loans. (Kjosevski and Mihail, 2017). This finding is well in line with theory and our prior expectation, and in agreement with the findings of Nkusu (2011), Kjosevski and Mihail (2017), Vogiazes and Nikolaidu (2011), Bofondi and Ropele (2011), and Louzis, Vouldis and Metaxas (2011) among others. All scholars either support the direct channel (unemployment affecting incomes) or the indirect channel (unemployment reducing aggregate demand).

Real effective exchange rate and nonperforming loans

Real effective exchange rate is found to have a positive impact on NPLs which is statistically significant at 5%. The long run partial elasticity with respect to real effective exchange rate of 0.034 implies that a unit increase in RER increases NPLs by 3.4 percent and unit decrease in RER reduces NPLs by 3.4 percent, keeping other factor constant. This indeed suggests that increase in real effective exchange rate weakens the performance of the export-oriented sectors of the economy, which reduces the debt repayment capacity of those engaged in these sectors. This finding is in line with the finding of other researchers such as; Beck, Jakubik and Piloui (2013), Khemraj and Pasha (2009), Fofack (2005) and Olayika and Mofoluwaso

(2014) among others and in sharp contrast with the finding of Baboučak and Jančar (2005) who argues that increase in RER reduces NPLs by increasing debt servicing capacity of those who borrow in foreign currency. The short run results however agree with Baboučak and Jančar (2005) and Nkusu, (2011), after one lag.

GDP growth and non-performing loans

The study finds a negative relationship between NPLs and GDP growth that is significant at 1 percent level of significance. The long run partial elasticity with respect to GDP growth rate of -0.095 implies that a unit change in GDP growth rate changes non-performing loans by 9.5 percent in the opposite direction (holding other factors constant). The finding is in line with prior expectations. This finding possibly confirms the argument that increase in GDP growth enhances the loan repayment capacity of the borrower which in turn contributes to lower bad loan and vice versa (Khemraj and Pasha, 2009). The result agrees with the findings of Khemraj and Pasha (2009), Louzis Vouldis and Metaxas (2012), Farhan et al (2012), Jakubik and Reninger (2013), Skarica (2014).

The short run results, however show that increase in GDP growth increases NPLs. Possible explanation for this result is that, increase in GDP growth may cause bank managers to become overconfident about the health of the economy. This wrong perception would tempt them into excessive credit risk exposure. Such kind of temptation attracts bad borrowers thereby increasing the chances of loan default. This is consistent with the principal-agent problem model (Viswanadham, 2015).

CHARPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

This chapter presents the summary, major conclusions drawn from the study, policy recommendations derived from the study findings, areas of future research and concludes by presenting the limitations of the study.

5.1 Summary

The study was intended to explore the determinants of NPLs in Uganda's commercial banking industry taking into account both bank specific and macroeconomic variables. ARDL estimation technique was employed to identify the determinants of NPLs. The empirical model was estimated using aggregated quarterly data for the period from 2002(1) to 2017(2). The results of ARDL model show that the explanatory variables included in the model explain 67 percent of the variations in NPLs in Uganda's commercial banking industry, going by the R-squared while the adjusted R-squared shows that the explanatory variables used in the study explain 46 percent of the variations in NPLs in Uganda's commercial banks. All coefficients have expected sign based on theory and the findings of the study are also in line with those of other researchers.

Among the bank specific factors considered in the study, lending rate was found to have a positive impact on NPLs while Returns on assets are found to have a negative impact on NPLs. Regarding macroeconomic factors, real exchange rate and unemployment were found to have positive impact, while GDP growth was found to have a negative impact.

5.2 Conclusion

In the recent past, banking sectors in different countries have experienced a problem of non-performing loans. This problem has attracted interests from various policy makers and scholars, some arguing that it's caused by bank-specific factors, others attributing it to

macroeconomic factors whereas there are also those who attribute it to a combination of both set of factors. Based on the finding of this study, it can be said that NPLs in Uganda's commercial banking industry are influenced by both bank-specific and macroeconomic factors. Therefore in order to control NPLs, there is need for policy measures that influence both bank-specific factors and macroeconomic factors.

5.3 Policy recommendations

Reduce commercial banks' lending rates

Despite continued reduction in central bank rate, commercial bank's lending rates have persistently remained high suggesting that central bank rate is not effective in lowering lending rate, thus necessitating other measures. There is strong empirical evidence that reducing operating costs of the banks significantly lowers lending rates (Bhattarai, 2015). Therefore measures such as maintaining low inflation, Agency banking, and better infrastructure are vital in this regard. Besides reducing operating cost, there is also need to increase the liquidity of commercial banks by encouraging longer term savings.

Promote GDP growth

Promoting GDP growth requires a combination of many factors ranging from institutional, economic and political factors. Literature however identifies some vital issues that have proved to be critical in the growth and development process of the now developed countries. It's from these key issues that the study picks some recommendations that are particularly applicable to Uganda. These are discussed below.

Creating a conducive business atmosphere. Conducive business atmosphere is comprised of aspects such as; provision of supportive infrastructure, for example in terms of low power tariffs, better transport network among others; adherence to the rule of law so as to increase business confidence (Barro, 1996); improving regulatory framework and easing licensing

process; and sound macroeconomic management characterized by low inflation rate and stable exchange rate. All the above will significantly contribute to attraction of investments both local and foreign.

Just like the case for the Asian Tigers, there is need to promote high productivity industries and sectors. This require government to play a strong supportive role by expanding its policy stance so as to allow the use of instruments such as sensible protection levels, targeted credit and production subsides to direct limited resources towards productive ends. For government to effectively perform this role, there is need for recapitalization of Uganda development bank (UDB) to enable it extend long term credit to productive sectors especially in the case where commercial banks cannot offer long term credit.

Reducing unemployment rate

There exists ample empirical evidence on the positive relationship between employment creation and GDP growth, implying that the policy measures that promote GDP growth also serve to reduce unemployment in the country (Boltho and Glyn, 1995). Nonetheless, there also exits specific interventions that can have significant impact as far as reducing unemployment in the country is concerned. These are discussed below.

Supporting labour intensive industries. Much as there is focus on industrialization in the country (as manifested by the declining share of agriculture and increasing share of industrial sector in GDP), the employment elasticity of the industrial sector still ranges between 0 and 1 implying that a one percent increase in output is accompanied by less than proportionate increase in employment (EDA, 2018). This points to the fact that the sector is more capital intensive. The study therefore recommends the approach that was taken by the newly industrialized countries in their transition stages, where by the country needs to find and select those parts of the modern technology which are of value and combine them with

developments oriented in a labor-intensive yet modern direction (same as intermediate technology).

Another important intervention regarding unemployment is the development of reliable labour market information system (LMIS). This has proved to be successful in countries such as China, US, Australia, Ghana (among others) through; (i) Improving job placement and matching of skills by providing a pool of job market information; (ii) Providing information on professions and training offering an income generating future; (iii) helping people develop a job profile and to develop skills for searching and applying for jobs (Silke, 2012). Labour market information system will also facilitate integration of school and labour market functions by giving a clear picture of what skills are really needed in the country.

Furthermore, policy measures to maximize engagement of large corporates in the apprenticeship system would help increase employability of the youths through skills development and provision of some experience (Lizzie et al, 2013). This requires development of appropriate national apprenticeship framework and engaging large employers to sign an agreement to offer high quality apprenticeship places.

Besides interventions for reducing lending rate, increasing GDP growth and reducing unemployment (discussed above), the study further recommends commercial banks to diversify their portfolio by holding other income earning assets such as governments bonds, equity so as to reduce on credit risk exposure. Efforts to promote the performance of the stock market so as to enable banks invest more in stocks and thus avoid giving out highly risky loans would go a long way in reducing NPLs in the commercial banking industry. According to Lance (2009), the approach of promoting specific institutional investors to act as "market makers" would be more effective in promoting stock markets.

Furthermore, commercial banks need to consider the international competitiveness of the domestic economy and be able to focus on highly competitive sectors which are not highly affected by changes in exchange rates. Besides, efforts by the central bank to ensure stability in the real effective exchange would also be of immense importance.

5.4 Areas for further research

A similar study can be carried out using panel data technique. In this regard one would have to construct a panel of the different banks so as to account for the individual specific effects for the different banks. This however requires access to disaggregated data for the different banks which was not availed to the author of this paper.

In similar vein, a study that analyses NPLs across different sectors such as agriculture, building and construction, manufacturing, house hold loans would also bring out a picture of the key determinants of NPLs across different sectors in the country. This suggestion is based on the fact that no particular sector seems to have a persistent trend in terms of their contribution to total NPLs over time. More so, the weight of the various determinants (both macroeconomic and bank-specific) is expected to vary across different types of loans and different sectors.

The analysis of NPLs can be extended further to the public sector. This would help to bring to picture the causes of NPLs in the public sector for both internally borrowed funds and externally borrowed funds, which has, in one way or the other culminated into increased debt burden for the country. This study has investigated the determinants of NPLs in Uganda's commercial banking industry. A similar study could be carried out in other forms of financial institutions such as micro finance deposit taking institutions and credit institutions.

5.5 Limitations of the study

In conducting the research, a number of limitations were encountered. First; the study was unable to sample a much longer time period because of lack of data especially for the dependent variable. This made us to consider a few variables so as to conserve the degrees of freedom. Secondly, quarterly data for unemployment was not readily available and therefore the study had to rely on interpolated data for this variable which carries problems such as over simplification of the data series. Thirdly, due to lack of bank level data, it was not possible to conduct analysis at bank level, thus necessitating the use of time series analysis.

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APPENDICES

APPENDIX A: Reparameterization of ARDL model

Considering the basic ARDL model

$$y_t = \beta_0 + \sum_{i=1}^{p} \phi_i y_{t-i} + \sum_{i=0}^{q} \psi_i^{'} x_{t-i} + u_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (1)$$

Equation (1) can be written in the form of equation (2)

$$y_t = \beta_0 + \phi_1 y_{t-1} + \phi_1 y_{t-1} + \cdots + \phi_p y_{t-p} + \psi_0^{'} x_t + \psi_1^{'} x_{t-1} + \cdots + \psi_q^{'} x_{t-q} + e_t \dots\dots (2)$$

Note that $\psi_o = \beta$ (see the econometric model)

To transform the above model we make the following substitutions

$$y_t = y_{t-1} + \Delta y_t, y_{t-2} = y_{t-1} - \Delta y_{t-1}, \dots, y_{t-p} = y_{t-1} - \left(\Delta y_{t-1} + \Delta y_{t-2} + \cdots + \Delta y_{t-(p-1)}\right)$$

$$x_t = x_{t-1} + \Delta x_t, x_{t-2} = x_{t-1} - \Delta x_{t-1}, \dots, x_{t-q} = x_{t-1} - \left(\Delta x_{t-1} + \Delta x_{t-2} + \cdots + \Delta x_{t-(q-1)}\right)$$

Equation (2) becomes

$$y_{t-1} + \Delta y_t = c + \phi_1 y_{t-1} + \phi_2[y_{t-1} - \Delta y_{t-1}] + \cdots + \phi_p\left[y_{t-1} - \left(\Delta y_{t-1} + \Delta y_{t-2} + \cdots + \Delta y_{t-(p-1)}\right)\right] + \psi_0^{'}(x_{t-1} + \Delta x_t) + \psi_1^{'} x_{t-1} + \psi_2^{'}(x_{t-1} - \Delta x_{t-1}) + \cdots + \psi_q^{'}[x_{t-1} - (\Delta x_{t-1} + \Delta x_{t-2} + \cdots + \Delta x_{t-(q-1)})] + u_t \dots\dots (3)$$

Which simplifies to;

$$\begin{aligned} y_{t-1} + \Delta y_t = {} & \beta_0 + \phi_1 y_{t-1} + \phi_2[y_{t-1} - \Delta y_{t-1}] + \cdots \\ & + \phi_p[y_{t-1} - (\Delta y_{t-1} + \Delta y_{t-2} + \cdots + \Delta y_{t-(p-1)})] + \psi_0^{'}(\Delta x_{t-1} + \Delta x_t) + \psi_1^{'} x_{t-1} \\ & + \psi_2^{'}(x_{t-1} - \Delta x_{t-1}) + \cdots + \psi_q^{'}[x_{t-1} - (\Delta x_{t-1} + \Delta x_{t-2} + \cdots + \Delta x_{t-(q-1)})] \\ & + u_t \dots\dots (4) \end{aligned}$$

By letting

$$\gamma_1 = -\phi_2 - \phi_3 \dots - \phi_p, \gamma_2 = -\phi_3 - \phi_4 \dots - \phi_p, \dots, \gamma_{p-1} = -\phi_p$$

And

$$\lambda_0 = \psi_o, \lambda_1 = -\psi_2 - \psi_3 \dots - \psi_{q,} \lambda_2 = -\psi_3 - \psi_4 \dots - \psi_{q,} \dots, \lambda_{q-1} = -\psi_q,$$

The error correction model becomes;

$$\Delta y_t = \beta_0 - \left[1 - (\phi_1 + \phi_2 + \cdots + \phi_p)\right] \left[y_{t-1} - \frac{(\psi_0' + \psi_1' + \cdots + \psi_q')}{1 - (\phi_1 + \phi_2 + \cdots + \phi_p)} x_{t-1} \right] + \sum_{i=1}^{p-1} \gamma_i \Delta y_{t-i} + \sum_{i=0}^{q-1} \lambda_i^{'} \Delta x_{t-i} + e_t \ldots \ldots \ldots \ldots \ldots \ldots (5)$$

The above equation simplifies to

$$\Delta y_t = \beta_0 - \alpha [y_{t-1} - \theta' x_{t-1}] + \sum_{i=1}^{p-1} \gamma_i \Delta y_{t-i} + \sum_{i=0}^{q-1} \lambda_i' \Delta x_{t-i} + e_t \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (6)$$

Where $\alpha = 1 - \sum_{i=1}^{p} \phi_i$ And $\theta^{'} = \frac{\sum_{i=0}^{q} \psi_i^{'}}{\alpha}$

α is the speed of adjustment coefficient and θ is a vector of long run coefficients.

Appendix B: Preliminary results for ARDL model

R-squared	0.919					
Adj R-squared	0.868					
Variables	Coefficient.	Std.Error	t-ratio	P>|t|	95% Conf.	Interval
L1. LNPLs	0.623	0.159	3.920	0.000	0.301	0.946
L2. LNPLs	-0.400	0.151	-2.640	0.012	-0.707	-0.092
LLR	0.911	0.302	3.020	0.005	0.297	1.524
ROA	-0.361	0.096	-3.760	0.001	-0.556	-0.166
L1. ROA	0.270	0.106	2.540	0.016	0.0546	0.486
L2. ROA	-0.168	0.116	-1.440	0.159	-0.404	0.069
L3. ROA	0.308	0.110	2.800	0.008	0.085	0.532
L4. ROA	-0.253	0.088	-2.890	0.007	-0.431	-0.075
LLEL	-0.122	0.287	-0.420	0.674	-0.705	0.461
L1. LLEL	-0.078	0.320	-0.240	0.809	-0.727	0.572
L2. LLEL	0.340	0.312	1.090	0.284	-0.294	0.973
L3. LLEL	-0.111	0.303	-0.370	0.716	-0.726	0.504
L4. LLEL	0.510	0.254	2.010	0.052	-0.006	1.026
RER	0.015	0.006	2.390	0.022	0.002	0.027
L1. RER	-0.006	0.007	-0.830	0.413	-0.021	0.009
L2. RER	0.009	0.007	1.240	0.223	-0.006	0.024
L3. RER	0.009	0.006	1.320	0.196	-0.004	0.022
UE	0.129	0.06	2.050	0.048	0.001	0.257
GDPG	-0.017	0.013	-1.310	0.200	-0.044	0.010
L1.GDPG	-0.015	0.014	-1.060	0.296	-0.042	0.013
L2.GDPG	-0.008	0.014	-0.610	0.547	-0.037	0.019
L3.GDPG	-0.034	0.013	-2.500	0.017	-0.061	-0.006
Cons	-5.437	2.793	-1.950	0.060	-11.11	0.233

Source: Author's computation

Appendix C

Table 1: Critical values for ADF and PP

	ADF (lags(1))		PHILLIPS PERRON	
Level of significance	Intercept	Intercept and trend	Intercept	Intercept and trend
1%	-3.566	-4.128	-3.565	-4.126
5%	-2.922	-3.490	-2.921	-3.489
10%	-2.596	-3.174	-2.596	-3.173

Source: Author's computation

Table 2: KPSS test for ROA and UE

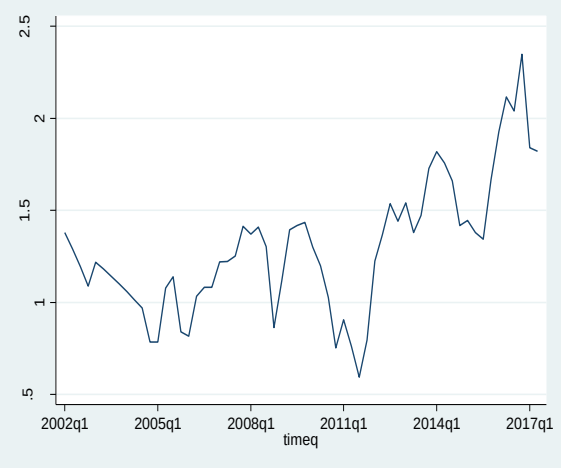
	H_O: series is trend stationary			H_O: series is level stationary		
Level of significance	**1%**	**5%**	**10%**	**1%**	**5%**	**10%**
Critical values	0.216	0.146	0.119	0.739	0.463	0.347
	ROA		UE	ROA		UE
Lags	Test statistic		Test statistic	Test statistic		Test statistic
0	0.324		0.164	1.96		1.62
1	0.177		0.0882	1.06		0.857
2	0.13		0.0643	0.77		0.614
3	0.11		0.054	0.635		0.502

Source: Author's computation

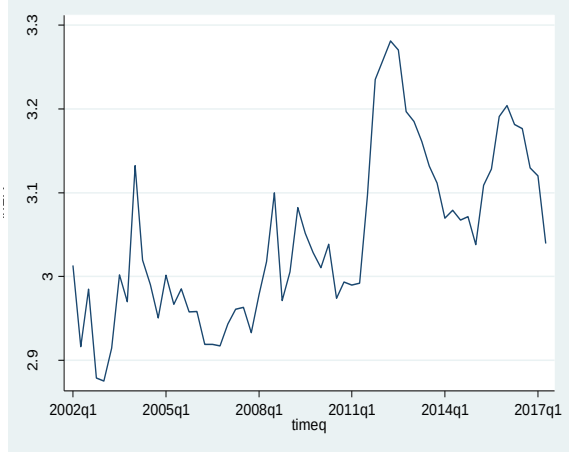
Appendix D

Graphs for the series in level

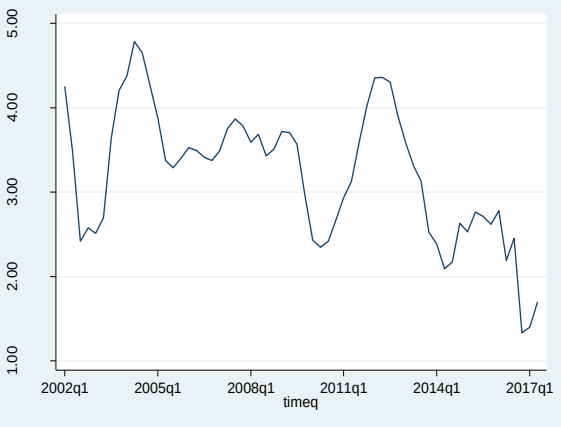
Graph of LNPLs



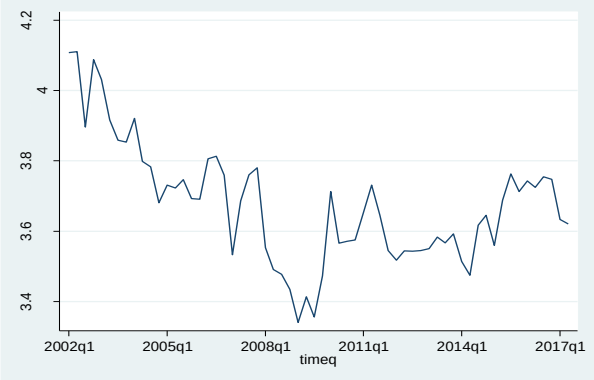
Graph of LLR



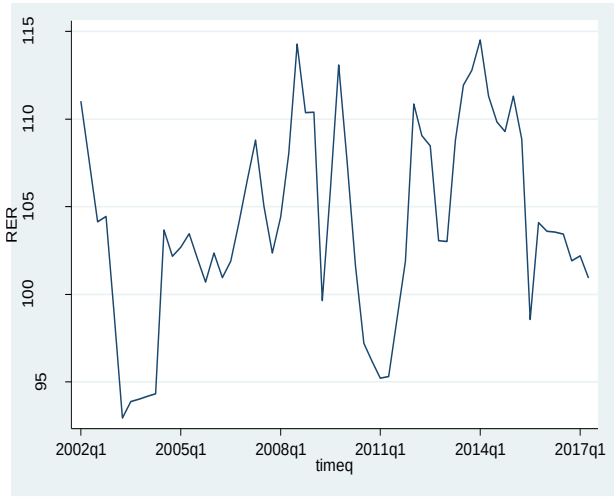
Graph of ROA



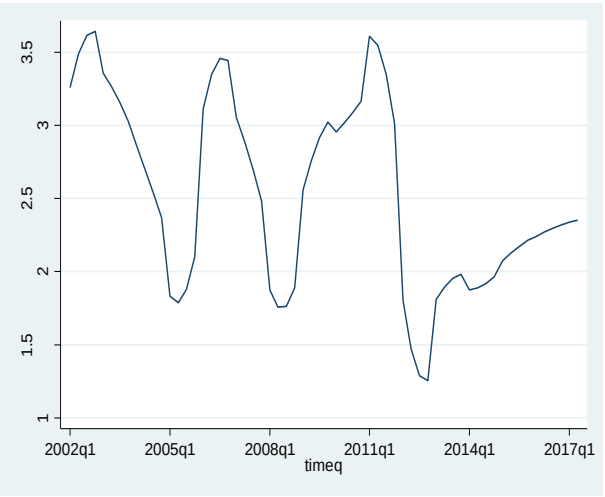
Graph for LLEL



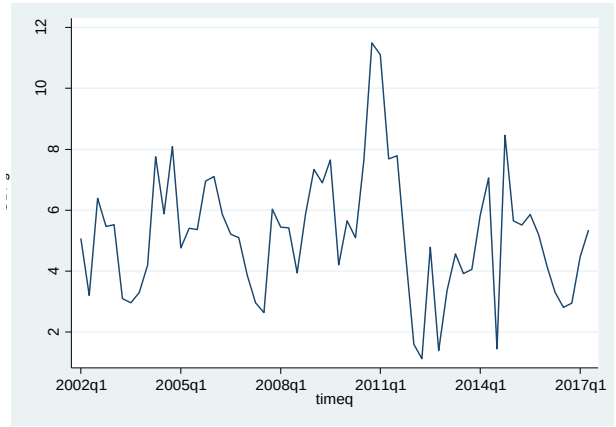
Graph for RER



Graph for UE

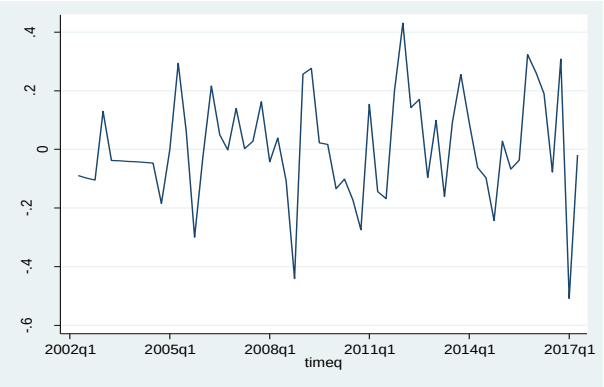


Graph for GDPG

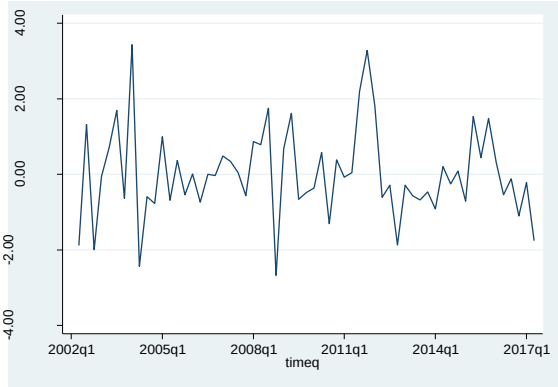


Graphs for data series in first difference

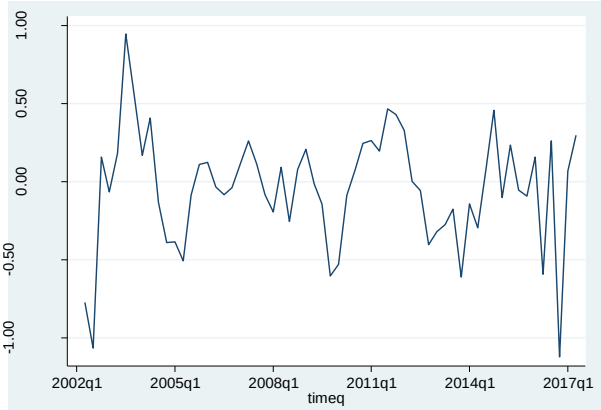
Graph for D.LNPLs



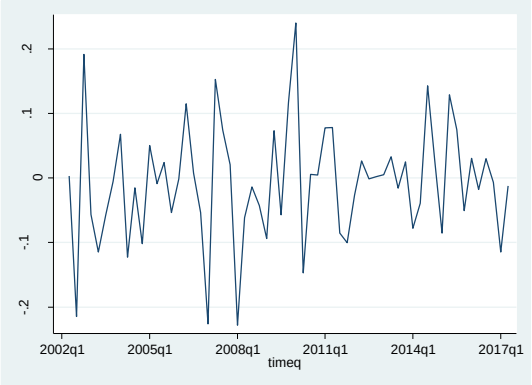
Graph for D.LR



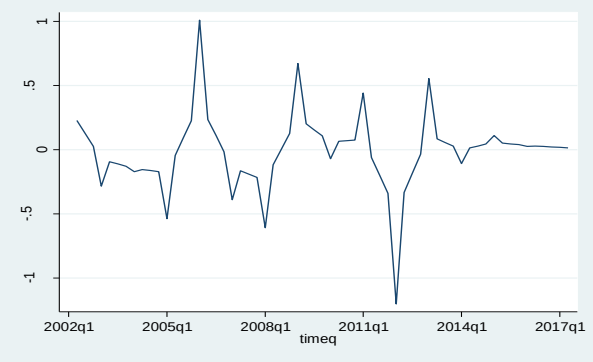
Graph for D.ROA



Graph for D.LLEL

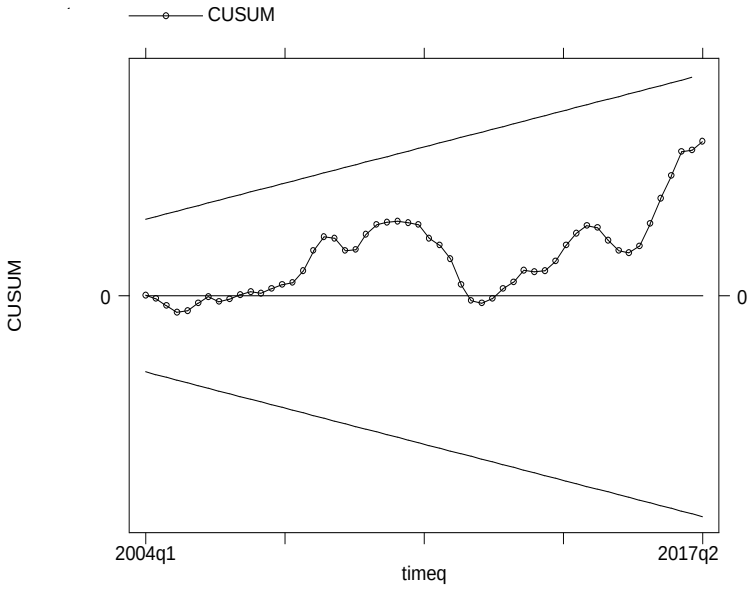


Graph for D.UE



Appendix E: CUSUM and CUSUMQ

CUSUM



CUSUMQ