DETERMINANTS OF CREDIT RISKS IN THE KENYAN BANKING SECTOR

BY

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DECLARATION

I declare that this is my original work and to the best of my knowledge it has not been submitted

for a degree award in any other university or institution of higher learning.

Signed…………………………………………Date………………………………………

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This research project report has been submitted for examination with my approval as University

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May the Almighty God bless them all.

DEDICATION

I dedicate this project to my family.

ABSTRACT

Credit risk is a wide concept in the financial sector literature. It has broadly been defined as the uncertainty on whether a borrower defaults on a loan by unfulfilling payments as agreed. This risk is mainly to the lender and it includes lost principal and interest, unbudgeted costs of collection and cash flows disruption. In Kenya, the percentage growth of credit risks has been higher than that of borrowings overtime. Since 2011, the percentage of loans that are categorized as non-performing has been increasing over the periods. The growth of credit risk has been found to be constant over the years, and the concern is how it can be reduced. The study focused on finding the main micro and macro factors that determine credit risk in the country. It used a sample of 25 banks from the 44 banks listed in the Central Bank. Panel data model was adopted with a combination of both fixed and random effects model where there were 350 observations (25 banks over the periods 2002-2015). In analyzing micro variables, a fixed effect model was used, while on macro and a combination of the two; random effects model was used. It was found that deposit rates and return on assets were the most important micro determinants of credit risks in the country, while unemployment and domestic credit to the private sector were the most important macro determinants of credit risk in the country. Exchange rate, inflation rates, GDP growth rates, bank size, bank ownership and management efficiency were all not found to be important factors in explaining credit risks in the banking sector of Kenya.

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

NPL   Non-Performing loans

ROAA   Return on Average Assets

GDP   Gross Domestic Product

GDPPC   Per Capita Gross Domestic Product

CBK   Central Bank of Kenya

LIST OF TABLES

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Credit risk happens to be one of the oldest main risks that banking and lending institutions face. The subject of risks has been reviewed by scholars over the years; nonetheless they have not exhaustively identified the main factors that expose banks to credit risks, particularly on developing countries. Banks usually are unable to meet their current financial obligations when borrowers fail to repay their credits, this is because they may face liquidity problems that in turn force them to sell their assets less than the market value therein facing a risk of insolvency. Identifying the main factors that expose banks to various forms of credit risks formed the main motivation for this paper. This study aimed at identifying the main micro (idiosyncratic) and macro (structural) determinants of credit risks using a case study of the Kenyan banks. Micro factors are related to the individual behaviors of banks and borrowers while macro factors involve the general state of the economy which in turn affects the economic parameters employed in credit analysis.

The study was a time series analysis, focusing on periods from 2002 to 2016. The starting period of study was chosen because it is the year that many financial reforms took place in the country, and the banking sector was properly in place. The macroeconomic variables that were of interest included: the GDP growth rate, inflation rates, rate of unemployment and real interest rate. The key source of micro economic factors leading to credit risks that were studied in this paper included: marginalized institutional capacity, substandard credit procedures and policies, vulnerable interest rates, mismanagement, improper laws, deposit rates, marginalized capital, direct lending, uncontrolled licensing, return on assets, substandard loan assessment, improper credit-worthiness valuation, malpractices in lending process, bureaucracy in the government and lack of thorough monitoring by the central bank. Other factors were studied as control factors and

they were majorly bank-related factors which affect credit risk. These included the structure of bank ownership, costs of operation, management efficiency, quality and composition of deposits, quality of asset, capital and size and requirement of bank reserve.

The study aimed at contributing to the literature pertaining credit risk management by giving evidence for the Kenyan banking sector. Literature on these categories of factors were analyzed, and regression models were conducted to identify the most significant factors affecting credit risk. Chapter one of this study presents a background of the Kenyan banking sector and credit risk situation of the country, thereafter chapter two reviews the literature behind credit risks globally and identifies the research gap. Chapter three describes the research methodology that was adopted for the study, thereafter chapter four discusses the estimation of results adopted from the methodology in chapter three and finally chapter five presents the conclusions of the study and provides various recommendations basing on the findings obtained.

Credit risk can be defined as the uncertainty on whether a borrower defaults on a loan by unfulfilling payments as agreed. This risk is mainly to the lender and it includes lost principal and interest, unbudgeted costs of collection and cash flows disruption. This loss can arise in a number of circumstances and may be partial and complete. (Auronen, 2003), through his theory of asymmetric information, illuminates that it may be a difficult undertaking to determine a good borrower from a bad one. This may result in inauspicious selection and moral hazards issues. Alternatively, credit risk may be defined as the risk of deterioration in the borrower's credit quality. Credit risk should be managed best on a loan-by-loan basis. However, institutions have increasingly measured and managed this risk on a portfolio basis which can give a wrong report on a borrower's credit worth. Financial institution performance is determined by so many factors

with the main one being the credit risks. Other risks that may affect performance are: interest rate risk, political risk, operations risks, liquidity and market risk.

Good practices of controlled assessment of risk and provisions for bad debts can drastically reduce risk in financial institutions. Banks have been forced to be creative and innovative and come up with in-house legal methods such as client screening to reduce chances of giving bad loans. For the past years, banks have reported increase in profits. The asset base of most banks has been increasing and the proportion of loans also has been on the growing trend (IFSB, 2005).

Credit risk management in financial institutions is important and forms a strong back bone for continuity and growth of these institutions. In order to manage the credit risks, understanding the main contributing factors is critical and therein addresses them effectively.

1.1.1 Kenyan Banking Sector

Financial sector reforms in Kenya are rooted back from the 1980s. The reforms in these periods of time entailed liberalizing the interest rates (currently the country has underpinned the interest rates to be only 4% above the Central Bank rates), reducing a lot of controls on borrowing by the public and private sector, enhancing competition, efficiency and productivity enhancements in the financial systems. A lot of the reforms were aimed at improving and strengthening the monetary policy to rely more on the prevailing demand and supply forces (Mwangi, 1984). In a bid to support the drive for the first financial reforms, the country accepted a World Bank adjustment credit of $170 million in 1989; these reforms were later applied in the 1990 structural adjustment program.

Interest rate liberalization was one the features of the structural adjustment program. This was adopted in 1991 following the gradual rise in nominal interest in the phases of 1980s. Interest rate liberalization led to an increase in independence of the market trends in defining the rates by

creating opportunities for government lending tools such as bonds and also by scrapping off special loan arrangements. The most significant constituent of the reforms was the reconstituting of financial institutions. In 1986, Kenya's baking sector experienced a crisis, where several small banks collapsed. This led to merging of several banks. In the merging process, the government increased the initial capital requirements for both the commercial banks and non-financial institutions. Among the reforms to regulate the financial sector, was the introduction of the cash ratio, which helped with the moderation of excess liquidity within commercial banks.

In 1998, there was a crisis which placed five banks under receivership management (Ngugi, 2001). These banks failures were majorly factored by high non-performing debt. In line with this, the CBK adopted a number of rules to ensure a strong and reliable banking system. Part of reforms adopted was the Banking Act which gave CBK the powers to regulate and enforce guidelines governing banks. These reforms over time have led to mergers and acquisitions, majorly to meet the increase in the minimum capital requirements set by the CBK and also to enhance domestic market share in the banking industry.

In terms of securing banks and their risks, banks have adopted an ownership of insurance companies. Separately, other banks have engaged insurances indirectly to ensure their bank assurances agenda. To establish stability, other banks have expanded to own and acquire firms like cooperative bank and Equity bank. In the event of these mergers and acquisitions, there has been a rise in synergies between the banking, security markets and insurances agencies. This has led to elimination of regulatory barriers between different economic agents and segment of the banking and financial sector at large. This mergers and expansion have spurred players in the market to call for an establishment of an overall service regulatory body to secure and regulate their enterprises (Mutuku, 2008).

4

1.1.2 Credit in Kenya

The absolute amounts of credit have been increasing over the years, though the rate of growth has not been following the same trends over the same years. There was a sharp growth of loans in 2010 attributed to recoveries and improved credit appraisal monitoring standards and robust domestic economic growth (CBK, Central Bank supervisory annual report, 2010). However, the growth experienced a decline from 2011 due to a decline in customer deposits. The growth however resumed a positive growth from 2011 to 2013. Nonetheless from 2013 to 2016 the growth of loans has been declining over the years.

Over the years, growth in percentage of NPL over time has been higher than that of loans, specifically from 2011 onwards to 2016. Since 2011, the percentage of loans that are categorized as non-performing has been increasing over the periods. The bulk of non-performing loans is from personal/households, trade, manufacturing, real estate, agriculture, and transport sectors. The huge bulk of non-performing loans has been on the personal/households and trade sectors, though for personal it has been declining over the years while that of trade has been increasing over the same periods. Manufacturing and building sectors, though lower in proportion of NPL as compared to personal and trade, they have been experiencing an increase in percentage contribution to NPL as from 2012 onwards (CBK, 2002-2017).

1.2 Research Problem

Giving credit to customers is an important activity for both banks and the same customers. To banks it can be argued from the profitability and growth aspects while for customers it can argued from development and economic growth aspects. Repayments of these credits guarantees continuity and growth of the two players in the market (credit givers and credit takers). Nonetheless, there could exist some degree of non-repayments from the credit takers. These are

forms of credit risks which have been attributed to various factors in theory, ranging from financial crises to poor macroeconomic conditions.

Kenyan banks are experiencing these forms of credit risks as well. The growth rate of the NPL has been increasing over years. The adverse effects of these NPLs range from a collapse of the credit system to total collapse of any economy's economic system. In order to address these risks, it is important to understand the main factors that contribute to them and the nature of the influence.

Several authors have tried to address this issue, notably (Souza & Feijo, 2011) who identifies interest rates to be an important aspect that contribute to credit risk. Ongeri (2014) addresses the same concern of credit risks but only focussing on macro factors, where he finds interest rates to be of importance in credit default. Nontheless his R^2 was very low reflecting omition of important variables to explain credit risks. Washington (2014), also discourses the main macro determinants of credit risks in Kenya, and identifies GDP growth rate, exchange rates and lending rates to be important aspects. However, though these studies have made progress in trying to explain the main factors explaining credit risks, they have not exhausted this subject particularly on the interaction of both the micro and macro determinants. This forms the backbone of this paper, where it tends to discuss both the micro and macro aspects in one model to explain the credit risks experienced by Kenyan banking industry.

1.3 Research Objectives

This study's main objective is to identify the main factors contributing to credit risks that are experienced by Kenyan banking industry.

1.4 Value of Study

Understanding the determinants of credit risk is the foundation for effectiveness of risk management system and approaches. When these determinants are carefully addressed, it becomes probable to minimize the levels of non-performing loans, credit losses and bank failures. This can be observed to be beneficial to the banks if they are able to know the main factors that contribute to the credit risks, nonetheless it is also important for the government to know the best policy mix regarding the macroeconomic climate of a country and how it can affect the banking industry. Central bank policy makers can also gain an insight on how to address monetary policies which can affect the banking industry and the credit facilities at large.

This study thus provides a platform for these players in the market. Banks can stand to gain from this study as they can now align its lending decisions, while the government can use it to align its macroeconomic plans and policies to the benefit of the country.

In addition, the study also contributes to the literature on credit risks, which is going to be beneficial to academicians and researchers interested in more research in the credit risks.

CHAPTER TWO: LITRATURE REVIEW

2.1 Introduction

A lot of literature pins down credit risks to non-performing loans of banks, as they form the huge risks for banks. According to Warue 2013, the most outstanding credit risk proxy is that of a proportion between bad and doubtful loans to the total loans and advances. This counts as a measure of credit risks supported by both literature and empirical work. This chapter conducts a review of the literature behind credit risks globally and in Kenya to identify the most significant factors and the optimal tool for measuring these effects.

2.2 Theoretical Review

2.2.1 Deflation Theory

Among the initial theories that tries to explain credit risks is the theory of dept deflation. According to this theory, propounded by Fisher (1933) when debt bubble bursts, it leads to a sequence of negative events in the economy. Among the events are liquidation of debts, which brings about panic selling and diminishing deposits as bank loans are being paid. The reduction of deposits results to a downfall in the price levels. This results to a fall in the net worth of a business, thus causing bankruptcies which results to the concerns of running the business at a loss.

Subsequently, this causes a reduction of output in trade and employment of labor as well. These cycles contribute to disturbances in the rates of interest and a decrease in the value of money. These disturbances are caused by both external and internal forces in the economy

2.2.2 Financial Theory

On the other end, another view of credit risk is from the financial theory perspective. Financial theory pioneered by (Minksy, 1974) which is also called the financial instability hypothesis

presents a scenario of a financial crisis to explain the possible causes of credit risks. This theory illustrates that, when business is booming and cash flow is in surplus of what is needed to pay off debt, a temptation to obtain more loans arises. Thereafter, borrowers are overwhelmed by the debts and they are unable pay off from their incoming revenues. As a result, banks and other lending institutions reduce credit availability regardless of borrowers that can afford loans and subsequently drives the economy into a crisis.

2.2.3   Modern Theories of Macroeconomics

Modern theories advocated by (Demirguc-Kunt & Huizinga, 1998) also try to explain credit risks. They have majorly questioned the roles of macroeconomic factors of an economy particularly per capita GDP of a country. Increase in per capita GDP subsequently perceives economic growth which translates to improved productivity. Since per capita GDP is included in as a common index of economic growth, it is perceived to have a negative effect on the spread of the interest (Demirguc-Kunt & Huizinga, 1998). It is worth noting that a higher GDPPC indicates a rise in levels of purchasing power, increased disposable income which can increase the ability of borrowers to pay their loans and last but not the list, increased levels of saving. As a result, it has a negative relationship with credit risk which is represented by the loan loss provision.

In summary, credit risks theories generally contribute to the accumulation of insolvent debt into three categories which are Hedge, Speculative and Ponzi borrowers. The borrower perceived as a hedger makes complete debt payment using cash flows which are retrieved from the running investment. A borrower perceived as speculative services makes repayments with cash flow from the investments, covering the interest due and on the same time regularly rolling over, or borrowing the principal. Lastly, the borrower perceived as Ponzi, bases his borrowing upon faith hoping that returns from appreciation of the asset will suffice servicing the loan. However, this borrower does

not make repayments on interest or the principal with cash flow investment made. In this case, the Ponzi remains afloat only because the asset is appreciating in value.

2.3 Empirical Review

Empirical studies on credit risks are vast, but majorly cover sections of macro factors, micro factors and a combination of the two.

2.3.1 Macro factors of Credit risks

Investigating Government borrowing (Looney & Frederiken, 1997) suggest crowding out might occur if the government uses the limited physical or financial resources or produces an output to compete with the private sector. If the Government competes with the private sector for credit this may lead to an increase in cost of loans. Thus, the net effect of government investment on private investment depends on the extent of crowding out and the complementarities of public and private investment on the other hand. In this research, Government borrowing takes two forms- Government direct borrowing from banks and Government indirect borrowing through the issue of Government securities, which is represented by the amount of Treasury bills.

Boyd, Levine, & Smith (2001) showed in his study that high inflation goes hand in hand with underdeveloped financial systems. He also suggested that banks in high inflation economies have positive net interest margins. In line with these findings (Salas & Saurina, 2002) showed that banks accumulate risks more rapidly in economic boom and some of these risks materialize as asset quality deteriorates during subsequent economic recessions. In accordance to (Athanasoglou, Delis, & Staikouras, 2006), inflation happens to be a vastly used proxy for the effect of the macroeconomic environment on bank profitability. In their study, they found a positive relationship between inflation and profitability of the bank.

Castro, (2012) determined that there was negative and significant relationship between exchange rate and credit risk when analyzing the linkage between banking credit risk and macroeconomic developments while employing dynamic panel data approaches to five countries (Italy, Ireland, Spain, Greece and Portugal) over the period 1997-2011. This finding conforms to that of (Prakash & Poudel, 2012) who also found that foreign exchange rates influenced credit risks negatively in the Nepalese Banking Industry.

Some studies have found inflation rate as a significant variable explaining credit risk. Mileris (2012) found that an increase in inflation rate had a profound positive relationship to non-performing loans. This was in stark contrast with Prakash & Poudel (2012) and Warue (2013).

Prakash & Poudel (2012) conducted a research on Macroeconomic Determinants of Credit Risk in Nepalese Banking Industry to find out that inflation rate influenced credit risk negatively. Warue, (2013) on the other side also found out that inflation was negatively related to credit risk /non-performing loans in Kenya.

Several studies have found Lending interest rates to be a significant macroeconomic variable explaining credit risk. Park & Zhang (2012) who investigated the effects of macroeconomic and bank-specific determinants of Non-Performing Loans in the U.S.A: Before and During the Recent Crisis, using two distinct time periods 2002-2006 before the crises and 2007-2010 after the crises and showed that the coefficients for the Federal Funds rate/interest rate was negative in relation to credit risk. This however shows disparity with Warue (2013) who employed both pooled (unbalanced) panel and fixed effect panel models using panel econometrics approach to find out that lending interest rates were both positive and significant in affecting non-performing loans in commercial banks.

A number of studies have also found GDP per capita growth rate to be a significant variable explaining credit risk. Prakash & Poudel (2012) found out that GDP growth, growth of Broad Money Supply and Market Interest Rate failed to influence credit risk in the Nepalese banking industry. In contrary to these findings, Beck, Jakubík, & Piloiu (2013) employed estimate fixed-effects and dynamic panel regressions to investigate the impact of GDP growth rate on the NPL ratio on the basis of annual data for 75 advanced and emerging economies in the period from 2000 to 2010 and found that GDP rate having a positive significance effect to non-performing loans.

2.3.2 Micro factors of Credit risks

Majority of the studies which have studied the main micro factors that affect credit risks have majorly questioned the bank specific factors. On structure and ownership of banks, (Demirguc-Kunt & Huizinga, 1998) argued that in terms of margins and profits, foreign banks were performing better in comparison to domestic banks in developing countries. Further to their finding, opposite holds in developed countries. In the same quest (Garcia-Herrero, 2006), observed that foreign banks were more efficient due to use of better production technology which in turn made them more profitable. Secondly, as a way of attracting foreign investment by governments, foreign banks could actually enjoy relaxed regulatory and tax conditions but also face information disadvantages.

However, Dietrich & Wanzenried (2009) in their study focusing on Switzerland banks found that Swiss owned banks in Switzerland perform better in terms of profits compared to foreign banks. To drive the same point home, Bashir (2000) also enlightens that Islamic banks in Islamic countries outperforms foreign owned banks. Hu, Li, & Chiu (2004) analyzed the relationship between the ownership structure and impaired loans of banking sector in Taiwan covering the period 1996-1999. He also argues that the size of banks is negatively related to the NPL and that when the

portion of bank capital is owned by the state, there is a decline in non-performing loans. Goldlewski (2004) using return on assets as a performance indicator showed that the impact of banks' profitability is negative on the level of NPL ratio. In contrary, using a panel of 129 banks in Spain for the period 1993-2000, Garcia-Marco & Robles-Fernandez (2008) illustrated that high levels of return on equity were followed by a bigger future risk. Their overall point is that profit maximization policy goes hand in hand with high risk levels.

Banks use the Discount Rate to influence the flow of money and credit in a desired direction due to the fact that the discount rate is considered an important indicator of the condition of credit in an economy. In order to fight recession and inflation, banks lower or raise discount rates to affect the borrowing cost. The discount rate was highly significant in the models of (Folawewo & Tennant, 2008) where it is positively correlated with banking sector spreads. Awojobi & Amel, (2011) employed panel data for analysis the determinants of Credit risk efficiency of Nigerian banking industry. Capital adequacy, proxy for Credit risk efficiency, was the independent variable while bank specific determinants: Credit risk (total loan over the asset), insolvency risk (current asset over current liability), Interest sensitivity ratio, market risk, management quality, and bank size were the main explanatory variables. They found that Credit risk, insolvency risk, market risk and bank size had a positive influence on credit risk efficiency. However, management quality had a negative impact on credit risk efficiency.

Ganic, (2012) conducted research on Bank Specific Determinants of Credit Risk in the Banking Sector of Bosnia and Herzegovina using the panel regression model and found that inefficiency and credit growth had a significant negative influence on credit risk while deposit rate had significant positive impact on credit risk. However, capital adequacy, liquidity, market power, and reserve ratio had an insignificant impact on credit risk.

2.4   Summary of Literature and Knowledge Gaps

Different theories have different views on credit risks. Deflation theory subjects disturbances in the economy to be the fueling factor that causes existence of indebtedness between lenders, borrowers or both.   As a result, an increase in number of loan defaulters is expected and subsequently causes the financial crisis as expounded by the Financial theory. These are among the classical theories of credit risks. However, modern theories have also questioned the role of GDP growth rate of a country, nonetheless this can also be hinged to the deflation theory of credit risks of an economy.

Empirical studies have really explored the main macro and micro factors that affect credit risks. Particularly on macro factors, exchange rates, inflation rates, lending interest rates, GDP growth rates and government borrowing have been questioned. On the micro front, insolvency risk, Interest sensitivity ratio, market risk, management quality, bank size, bank ownership and structure, inefficiency, deposit rates, capital adequacy, liquidity, market power, and reserve ratio have been explored.

Most of these studies are not conclusive, while some find a positive effect on some variables; some find a negative influence on the same. From these studies, we cannot warranty which are the main policy factors that can be addressed particularly for developing nations, unless we conduct an empirical study on the same. This study has filled this gap by incorporating both the main micro and macro determinants identified in literature to deduce the best policy mix to address credit risks in Kenya.

2.5 Conceptual Framework

From the literature reviewed above, a set of variables were picked to explain credit risks. Notably, credit risk was the dependent variable and was defined to be determined by a set of micro and macro variables. For each bank, there was a set of independent variables (size of banks, type of ownership, deposit rates, management efficiency, and return on assets). Macroeconomic variables also formed another set of independent variables namely exchange rates, inflation rates, domestic credit to the private sector, real interest rates, unemployment rates and GDP growth rates.

The micro factors were captured on the basis of a bank and a specified time, while macro factors were captured on the basis of time only, since they were shared by all banks.

The interrelationship of the variables is represented in figure 1 below:

Figure 1: Conceptual Framework
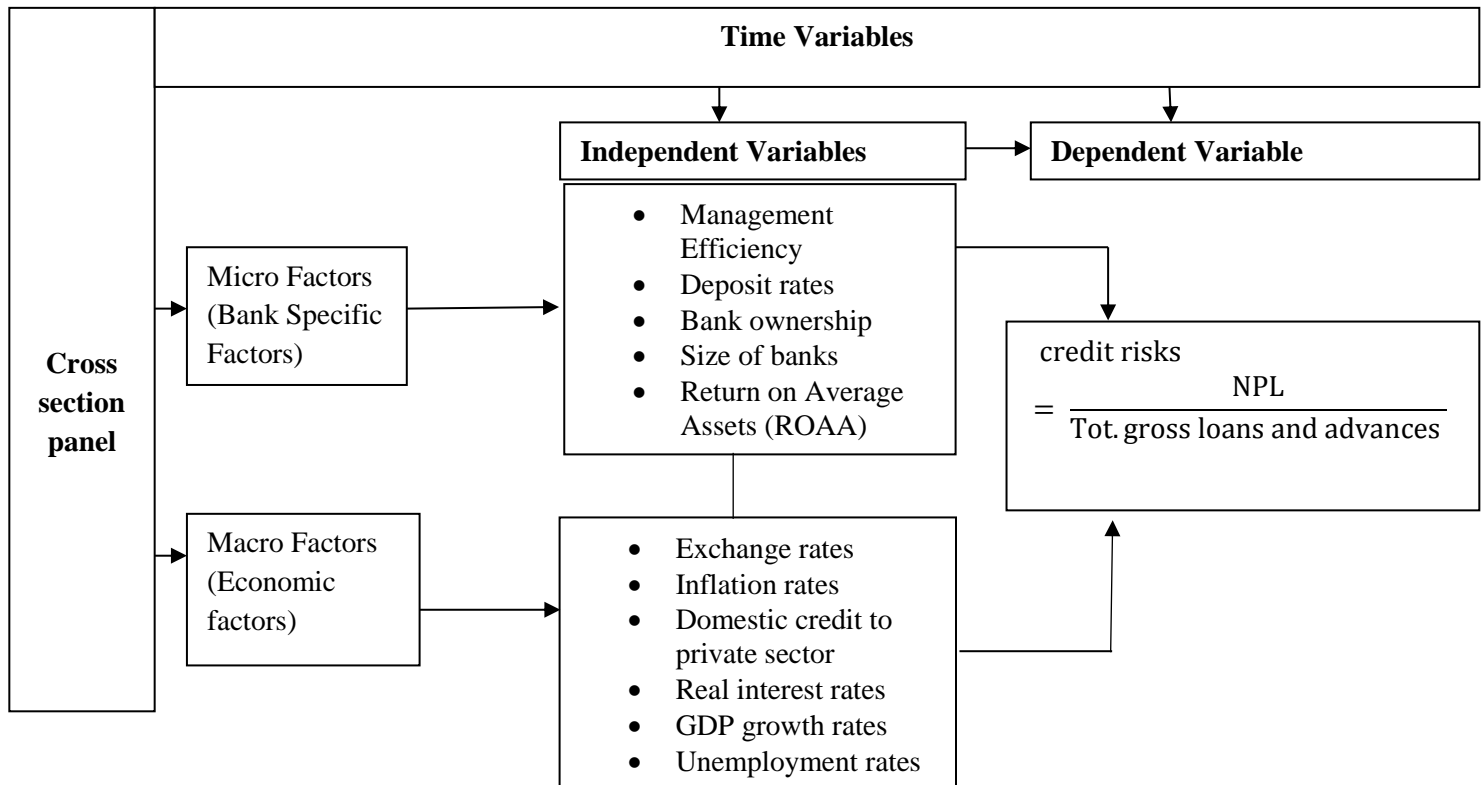
CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter introduces the various procedures and methods which are adopted in this study. They are adopted in order to achieve the objective of evaluating the main micro and macro determinants of credit the Kenyan Banks. The chapter also discusses the main theoretical framework that was adopted for the study and the empirical model that was estimated on the same.

3.2 Research Design

The preferred research design is descriptive. This design is preferred because it involves observation and description of each variable in relation to the main concept which is credit risk without influencing it in any way. Descriptive research design is more profound when compared to an exploratory research design. The study used dependent and independent variables. The Independent part was used for experimentation based on guidance of theory and their changes were meant to affect the dependent variable. The dependent variable is meant to change when the independent variable changes. The dependent variable depends on the outcome of the independent variable.

3.3 Population and Sample

The target population for this research is the 44 Kenya banks listed on the CBK's directory that have operated in an uninterrupted period of at least ten years. The study used a census survey of the number of commercial banks operating in Kenya. Census survey is based on collecting data on a sample of the population, which represents all the members of the population. The study applied both scientific and non-scientific sampling designs. Judgmental and stratified random sampling designs were used in selection of the samples.

The sample population of the study is made up of 25 commercial banks in Kenya and the study period is thirteen years being 2002-2015.The population was classified according to the asset base of each sample. The period of study was chosen relevant to the period under which banking sector experienced tremendous growth, challenging and competitive environment. Similarly, the period of study was chosen recent enough to ensure data was readily available and reliable for the study. Banking survey 2013 report classified banks into 4 tiers based on their asset base. This tier classification technique was used to conduct a stratified random sampling design to randomly select 5 banks from each of 4 tier classification while the rest selected through judgmental sampling. The combination of these sampling designs was aimed to incorporate the effect of small and big banks in the study.

3.4 Data Collection

The study used secondary data which was collected from Central bank of Kenya statistics data repositories, Kenya National Bureau of Statistics, and annual financial statements of commercial banks in Kenya.

3.5 Data Analysis

The study used a panel data model to conduct the analysis of data in this study. This model is also referred to as longitudinal data model.

3.5.1 Theoretical Framework of the panel data model

The study employed a panel data model based on the fact that it combines both the cross-sectional and time series data of variables and looks at how the credit risk changes over time. The model does not only increase its precision due to the large number of observations that it can handle, but

it is also possible to obtain consistent estimators of the fixed effects model which usually allows

for unobserved individual heterogeneity. A panel data series is general of the form:

$$Y_{i,t} = \alpha_i + \boldsymbol{X}_{i,t}\beta + \mu_{i,t} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \text{ (1)}$$

The subscript i represents the cross-section aspect of the model and t is the time component of the

model. Y is the series of dependent variables, $\boldsymbol{X}$ is a vector of independent variables, μ is the error

term, α and β are coefficients. The panel data model can either be a pooled model, a fixed effect

model or a random effects model. In order to establish the best model to use for the study, the F-

test and the Hausman tests were ran.

A pooled model is of the form:

$$Y_{i,t} = \alpha + X_{i,t}\beta + \mu_{i,t} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \text{ (2)}$$

It assumes that all coefficients, including the intercepts are constant and the error term is assumed

to capture the differences over time and individuals.

The fixed effect model allows each cross-section unit to have a different intercept with a constant

slope so that:

$$Y_{i,t} = \alpha_i + X_{i,t}\beta + \mu_{i,t} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \text{ (3)}$$

Where $\mu_{i,t}$ is assumed to be independent and identically distributed (iid) over i and t., α_i are

random variables that capture unobserved heterogeneity. The model also assumes that the X

variables are exogenous.

The random effect model considers that the unobserved individual effects α_i are independently

distributed random variables of its regressors, and is represented as:

$$Y_{i,t} = X_{i,t}\beta + (\alpha_i + \mu_{i,t}) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \text{ (4)}$$

Among other assumptions of the random effects model, the individual error terms are iid implying expected value of the error term is zero and variance is sigma squared. The regressors are also assumed to be exogenous.

3.5.2 Empirical panel data Models

The theoretical models of panel data series were used to empirically study the determinants of credit risks in the banking sector of the country. Three empirical models that were estimated were:

$$credR_{it} = \alpha_{it} + \beta_1 MngtE_{it} + \beta_2 Depo_{it} + \beta_3 Own_{it} + \beta_4 Size_{it} + \beta_5 ROAA_{it} + \varepsilon_{it} \ldots\ldots\ldots (5)$$

$$credR_{it} = \gamma + \alpha_1 Exch_t + \alpha_2 Inflt_t + \alpha_3 GDP_t + \alpha_4 Un_t + \alpha_5 RIR_t + \alpha_6 Dc_t + \mu_t \ldots\ldots\ldots (6)$$

$$credR_{it} = \delta_{it} + \delta_1 MngtE_{it} + \delta_2 Depo_{it} + \delta_3 Own_{it} + \delta_4 Size_{it} + \delta_5 ROAA_{it} + \delta_6 Exch_t +$$

$$\delta_7 Inflt_t + \delta_8 GDP_t + \delta_9 Un_t + \delta_{10} RIR_t + \delta_{11} Dc_t + v_{it} \ldots\ldots\ldots\ldots\ldots\ldots (7)$$

The three models were estimated differently and also in their combinations so as to be able to single out the most significant factors contributing to credit risks. Equation (5) evaluated the impact of micro factors on credit risk; equation (6) evaluated the effect of macro factors on credit risks while equation (7) was a combination of the two.

The dependent variable $credR_{it}$ is credit risks where i denote a specific bank and t is the time period. The independent variables were also evaluated at the bank levels (i) and time periods (t) for micro determinants, while the macro independent variables were only evaluated at time levels since all the banks share them in equality. The micro variables in equation (5) chosen for the study are: $MngtE_{it}$- is efficiency of the management of bank i at time t, $Depo_{it}$- deposit rates of bank i at time t, Own_{it}- ownership of bank i at period t, and $Size_{it}$- is the size of bank[1] i at period t,

$ROAA_{it}$ is return on average assets of bank i at time t, ε_{it} denotes the error term and α_{it} is a constant parameter. The macro factors of equation (6) are: $Exch_t$ -Exchange rates at period t, $Inflt_t$ inflation rates at period t, GDP_t - GDP growth rate at period t, Un_t - are the unemployment rates at period t, RIR_t is real interest rates, is Dc_t domestic credit to the private sector by banks (% of GDP), μ_t - is the error term and γ is the constant parameter. For the combined model in equation (7), the variables are as defined for individual models together with v_{it} as the error term and δ_{it} being the constant parameter.

3.6 Description of the Variables

This study adopts the definition of credit risks by (Warue, 2013) that Credit risk is the ratio of non-performing loans to total gross loans and advances. The variables

Table 1: Description of Variables

Variable	Description	Expected Sign
Management Efficiency	The ratio of operating expenses to gross income. Efficient banks have sound and effective Credit strategy, policy and procedure with a strong credit culture that enable to undertake Credit risk management function properly and reduce operating expense while improving operating income.	Negative relationship with Credit risks (As management efficiency improves, credit risks decline)
Deposit rates	Proportion of interest expense to gross deposit. Influences pricing of loans, Growth in deposit creates excessive loanable fund that motivated the bank to take credit risk or extend credit to riskier borrowers.	Positive effect on credit risks (as the rates increase, credit risks also increases)
Bank Ownership	A dummy variable, where 0 denotes banks owned by the government and 1 bank privately owned.	Positive/Negative
Return on Assets	This variable is used as a measure of the profitability of banks. More profitable banks are expected to have a lower credit risk	Negative effect. (As Return on assets increases, credit risk reduces)
Exchange rates	An increase in the Exchange rate means more money used in the importation of goods and services to the country. This means a decrease in the cash flow of investors hence increasing their probability of default.	Positive effect on credit risks (as the rates increase, credit risks also increases)
Inflation rates	An increase in the overall price level. Rising inflation results to an increase in non-performing loan.	Positive effect on credit risks (as the rates increase, credit risks also increases)
Real GDP growth rates	The size of an economy adjusted for price changes and inflation. decline or low GDP growth affects credit risk via negative effects on corporate earnings, growth of wage, and unemployment rates	Negative relationship with Credit risks (As management efficiency improves, credit risks decline
Unemployment rates	An increase in the unemployment rate should influence the cash flow streams negatively and increase the debt burden. On the firm's perspective, increases in unemployment indicate a decrease in production levels.	Positive effect on credit risks (as the rates increase, credit risks also increases)

CHAPTER FOUR: DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents an analysis of the determinants of credit risks in Kenya. The analysis is segregated on micro and macro determinants in order to single out the most important category of factors that influence credit risks in Kenya. A sample of 25 (56.82%) banks out of 44 banks[2] from the period 2002-2015 are selected for the analysis. Among the banks selected, 50% are foreign owned, 83.33% are owned by the government and 54.17% are locally owned as seen in table 3 below:

Table 2: Distribution of banks

Banks	Population-N	Sample n (%)
Foreign owned institutions	14	7(50)
Institutions with government participation	6	5 (83.33)
Institutions locally owned	24	13 (54.17)
Total	**44**	**25(56.82)**

Source: Central Bank of Kenya (Shareholding Information)

The sample of banks was collected randomly and thus ascertaining the independence and credibility of the analysis.

4.2 Descriptive Statistics of Variables

The 25 banks under study aggregated for the period 2002-2015 formed a panel of 350 observations for each variable under study. Averagely, credit risks in the Kenyan banks stand at 9.5% as seen in table 4 below, the standard deviation of 15.29 implies there is a large spread[3] of credit risk among the banks, with the minimum at -36.8% and the maximum at 83.24%. The trend of credit risks for all the banks has been fairly constant as seen in appendix 1.

Table 3: Summary Statistics

Variables	No. of observation	Mean	Std. Deviation	Minimum	Maximum
Credit risk	350	9.56881	15.28667	-36.79667	83.24
Deposit rate	350	.0450222	.0265598	.005435	.1372063
Management efficiency	350	.4386963	.2001091	.0729927	1.335526
Return on Assets (ROAA)	350	3.06803	3.747858	-19.72	16.18661
Real Interest rates	350	6.359141	5.914832	-8.009867	17.35814
GDP growth rates	350	4.812487	2.239996	.2322827	8.402277
Domestic credit to private sector	350	27.65914	3.683683	22.76716	34.61821
Exchange rates	350	80.01111	8.097707	67.31763	98.17845
Inflation rates	350	9.995706	5.642075	1.961308	26.23982
Unemployment rates	350	11.28714	.7304477	9.775	12.184

All the independent variables had small standard deviations signifying that the data values are closely distributed (instead of widely spread) around the mean value. This generally implies that these variables don't change a lot over the years.

4.3 Regression Analysis

In determining the main determinants of credit risks, an analysis was conducted on micro factors in separation with macro factors, then a combination of the two. The analysis of panel models can be conducted under a fixed effect model or a random effect model. A Hausman test was conducted to test which of the two was appropriate for the micro variables. The hypotheses for Hausman test were:

H_0: Random effects Model (Uncorrelated effects)

H_1: Fixed effects model (Correlated effects)

The results for the test are in appendix 3, they show a p-value of 0.0134, which imply the H_0 is rejected at 0.05 level of significance. As such to evaluate the micro determinants, a fixed effects model was used.

4.4 Discussion

4.4.1   Findings on Micro Factors

The main micro factors were deposit rates, management efficiency and return on assets as seen in table 4. The variables bank size and ownership were dropped in the fixed effect model due to collinearity[4] of the values.

Table 4: Micro-Determinants of Credit Risks (Fixed Effects Model)

Variables	Coefficients (Standard Errors)
Deposit rates	-260.3***
	(-8.16)
Management Efficiency	-8.167
	(-1.34)
Return on Assets	-2.875***
	(-12.23)
Constant	33.69***
	(8.18)
No. of Observations: 350	
No. of groups: 25	
R-Squared: Within = 0.4821, Between = 0.4509, Overall = 0.4721	
F-Statistic: 99.92	
(P-Value): 0.0000	

* p<0.05, **   p<0.01, *** p<0.001

Results from table 4 show that the micro determinants are important factors in explaining credit risk, this is from the F-statistic value of 99.92 which is statistically significant at 0.001 level of significance. The micro determinants explain at least 47.21% of the variations of credit risk in the country. Among the most important micro determinants are the deposit rates and return on assets. A 1% increase in the deposit rates reduces the credit risk by 260.3% which is significant at the 0.001 level of significance. Deposit rate is a ratio of total interest expenses to total deposit. As such, an increment on the deposit rates implies a reduction on total deposits and an increase in the interest expenses. A 1% increase in the return on assets reduces credit risks by 2.88% and this is significant at 0.001 level of significance. The constant implies holding all these micro variables

constant, credit risk in the Kenyan Banks stand at 33.70% and is statistically significant at 0.001 level of significance.

4.4.2   Findings on Macro Factors

On macro determinants, the Hausman test in appendix 3 showed a p-value of 1.000 implying the null hypothesis is not rejected and thus a random effect model was estimated. The results show that real interest rates, Domestic credit to private sector by banks (% of GDP) and unemployment rates are the most significant variables in explaining credit risk as seen on table 5.

Table 5: Macro-Determinants of Credit Risks (Random effects Model)

Variables	Coefficients (Standard Errors)
Real Interest rates	0.447* (2.34)
Annual GDP growth rates	0.256 (0.69)
Domestic credit to private sector by banks (% of GDP)	-2.014*** (-3.99)
Exchange rates	0.389 (1.68)
Inflation rates	0.319 (1.42)
Unemployment rates	-5.626*** (-5.52)
Constant	90.39*** (7.11)

No. of Observations: 350
No. of Groups: 25
R-Squared: Overall = 0.2284
Wald chi2(5): 155.90
Prob > chi2:   0.0000
* $p<0.05$, ** $p<0.01$, *** $p<0.001$

Analyzed on their own, macro determinants explain only 22.8% of the variations of credit risks in the country, though the values are significant from the Wald statistic of 155.90 which is significant at 0.001 level of significant. Interest rates have a positive relationship with credit risks. With a 1%

26

increase in interest rate, there is a 0.447% increase in credit risk. On the other hand, a 1% increase in domestic credit to private sector by banks (% of GDP) reduces the credit risk by 2%, while a 1% increase in unemployment rates reduces credit risks by 5.6%. All these macro factors when held constant, credit risk is around 90.39% and is statistically significant at 0.001 level of significance.

4.4.3   Findings on both Micro and Macro Factors

The analysis on isolation was to single out the most important factors in explaining credit risks on Kenyan banks. For the combination of both micro and macro variables, the Hausman test had a p-value of 0.7363 as seen in appendix 3, this indicated that the null hypothesis is not rejected and thus a use of random effects model. The variables (micro and macro) under study, explained 57.95% of the variation in credit risks as seen in table 6 below:

Table 6: Micro and Macro Determinants of Credit risks (random effects model)

Variables	Coefficients (Standard Errors)
Bank Ownership	0.784 (0.61)
Size of Bank	1.992 (1.41)
Deposit rates	-101.6** (-2.70)
Management efficiency	1.059 (0.20)
Return on Assets (ROAA)	-2.240*** (-9.85)
Real Interest rates	0.238 (1.49)
Annual GDP growth rates	0.382 (1.23)
Domestic credit to private sector by banks (% of GDP)	-1.395*** (-3.31)
Exchange rates	0.348 (1.79)
Inflation rates	0.199 (1.05)
Unemployment rates	-3.641*** (-4.15)
Constant	61.18*** (5.02)
No. of observations: 350 **No. of Groups: 25** **R-Squared: within = 0.5453, between = 0.6581, overall = 0.5795** **Wald chi2(10): 421.83** **Prob > chi2: 0.000**	

* $p<0.05$, ** $p<0.01$, *** $p<0.001$

A 1% increase in deposit rates reduced credit risk by 101.6% and is statistically significant at 0.01 level of significance. Return on assets, domestic credit and unemployment rates also reduced credit risk in the Kenyan banks, with a 1% increase in these variables, reducing credit risks by 2.2%, 1.4% and 3.6% respectively. Notably however, real interest rate was not statistically significant when considered together with micro variables.

4.5 Discussion of Research Findings

Fixed effects model was used to evaluate micro variables in this study, having done a Hausman test to choose the best model between the former and Random effect model. Micro determinants were evaluated and the results showed that the most influential variables on credit risk were deposit rates, management efficiency and return on assets in that order. From the results on table 4, deposit rates are seen to affect credit risk in a great way such that if the deposit rate increase by 1%, the credit risk would reduce by 260.3%. Deposit rate is a ratio of total interest on total deposits. Therefore, if deposit rates increase, total deposits should decrease and an increase in interest.

The macro variables were tested on a random effect model where the results showed that Real interest rates, Domestic credit to private sector and unemployment rates were the most influential variables. Interest rates showed a positive relationship with credit risks whereby a 1% increase in interest rate implied a 0.447% increase in credit risk. In domestic credit to private sector by banks, a 1% increase resulted to a decrease of 2% in credit risk. This outcome has been realized before by Warue, (2013) who employed pooled (unbalanced) panel and fixed effect panel models using panel econometrics approach to find out that interest rates were both positive and significant in affecting NPL in commercial banks. From this study, there is a 5.6% decrease in credit risk when unemployment rates increase by 1%.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the conclusion and recommendations of the study, a review of the objectives that were to be met and reviewed and a summary of the findings are discussed.

5.2 Summary of Findings

Exchange rate, inflation rates, GDP growth rates, bank size, bank ownership and management efficiency were not found to be important factors in explaining credit risks in the banking sector of Kenya. The most important variables were deposit rates, return on assets, domestic credit to the private sector and unemployment rates.

This study identifies deposit rates, as one of the important factors in explaining credit risks in the country. A 1% rise in the deposit rates, reduces the level of credit risks by more than 100%. Depost rates were measured as a ratio of total interest expenses with total deposits, as such, when the deposit rates are rising it implies the total deposits are falling. From the theoretical review, as Fisher (1933) points out, the reduction of deposits results to a downfall in the price levels. This results to a fall in the net worth of a business, thus causing bankruptcies which results to the concerns of running the business at a loss. Subsequently, this causes a reduction of output in trade and employment of labor as well. These cycles contribute to disturbances in the rates of interest and a decrease in the value of money. Ganic (2012) also found that deposit rates have significant positive impact on credit risk for the Banking Sector of Bosnia and Herzegovina.

Unemployment rates were found to have a negative relationship with credit risks of the country. This implies, a rise in the unemployment rates contributed to a decline in credit risks. Perhaps this

is a reflection that majority of credit takers from banks are those employed people, and as the number of employed people reduces, credit risks also reduces.

In analyzing macro determinants alone, interest rates were found to have a positive relationship with credit risks. This conforms to a study conducted by Warue (2013) who found out that lending interest rates were both positive and significant in affecting non-performing loans in commercial banks in Kenya.

Return on assets was also found to be an important variable in explaining credit risks in Kenya. The results also conform to that of Goldlewski (2004) who by using return on assets as a performance indicator showed that the impact of banks' profitability is negative on the level of NPL ratio.

5.3 Conclusions

The objective of this study was to evaluate some of the main variables that explain credit risk in the Kenyan banking sector. The study divided the variables into micro and macro variables. Among the micro variables under study were; bank ownership, bank size, deposit rates, management efficiency and return on assets, while macro variables were real interest rates, GDP growth rates, inflation rates, exchange rates, domestic credit to the private sector, and unemployment rates.

A panel of 25 banks over a period of 13 years (2002-2015) was used for the analysis. Random effects and fixed effects models were used for the analysis. Among the important variables that were found to explain credit risks in the country were, deposit rates of banks, return on assets of the banks, domestic credit to the private sector, and unemployment rates. These variables explained at least 58% of the variations in credit risks of banks in the country. Literature also

supports these findings, with authors like (Ganic, 2012; Warue, 2013; Goldlewski, 2004) also identifying these variables as being important in explaining credit risk in banks.

5.4 Recommendations

Deposit rates have been found to be an important variable in reducing credit risks. Banks can invest more on attracting high deposit rates. However, this investment can be capital intensive since it would involve putting measures that can increase interest expenses on deposits.

Banks would need to engage in exercises such as restructuring to reduce operational cost in order to have a chance of adjusting deposit interest upwards. By doing so, deposit rates would increase and in turn lead to reduced level of credit risk.

5.5 Limitations of the Study

The variables used in this study explained 58% of the variations in credit risks, this implies 42% are explained by other variables not considered in the model. The level of this study might not be able to accommodate all the known variables.

Some of the variables which could have been incorporated posed a challenge for their data accessibility and collection. Having some of them would have created inconsistency since not all bank have the same operational procedures. Due to these complexities, the study was forced to constrain its variable with those that best fit the banks selected in our sample.

Considering the time available to complete this study, it was not possible to have a wide range of variables because of the necessity to gather all relevant data to analyze it accordingly. This would have taken much more time than allocated.

Therefore, it is true to say that this study in its capacity has tried to cover a wide selection of variable that explain credit risks in the Kenyan banks though not in totality. Perhaps this can present an opportunity for further future research.

5.6 Suggestions for Further Research

With the evolving diversity and complexity in the banking sector, there is new emergence of challenges which might need to be researched on and probably enlighten more on possible determinants of credit risk.

In addition, on a higher level, deeper study can be conducted on the same field by using a different definition of credit risks and including different variables than the ones used in this study to find out more about the credit risks in the country.

The opportunity to include more variables can be used on cases where the research is not time bound. That way, the study can explain up to 99% of the variations in credit risks.

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APPENDIX 1: TREND OF CREDIT RISKS AMONG BANKS IN KENYA

Graphs by Banks
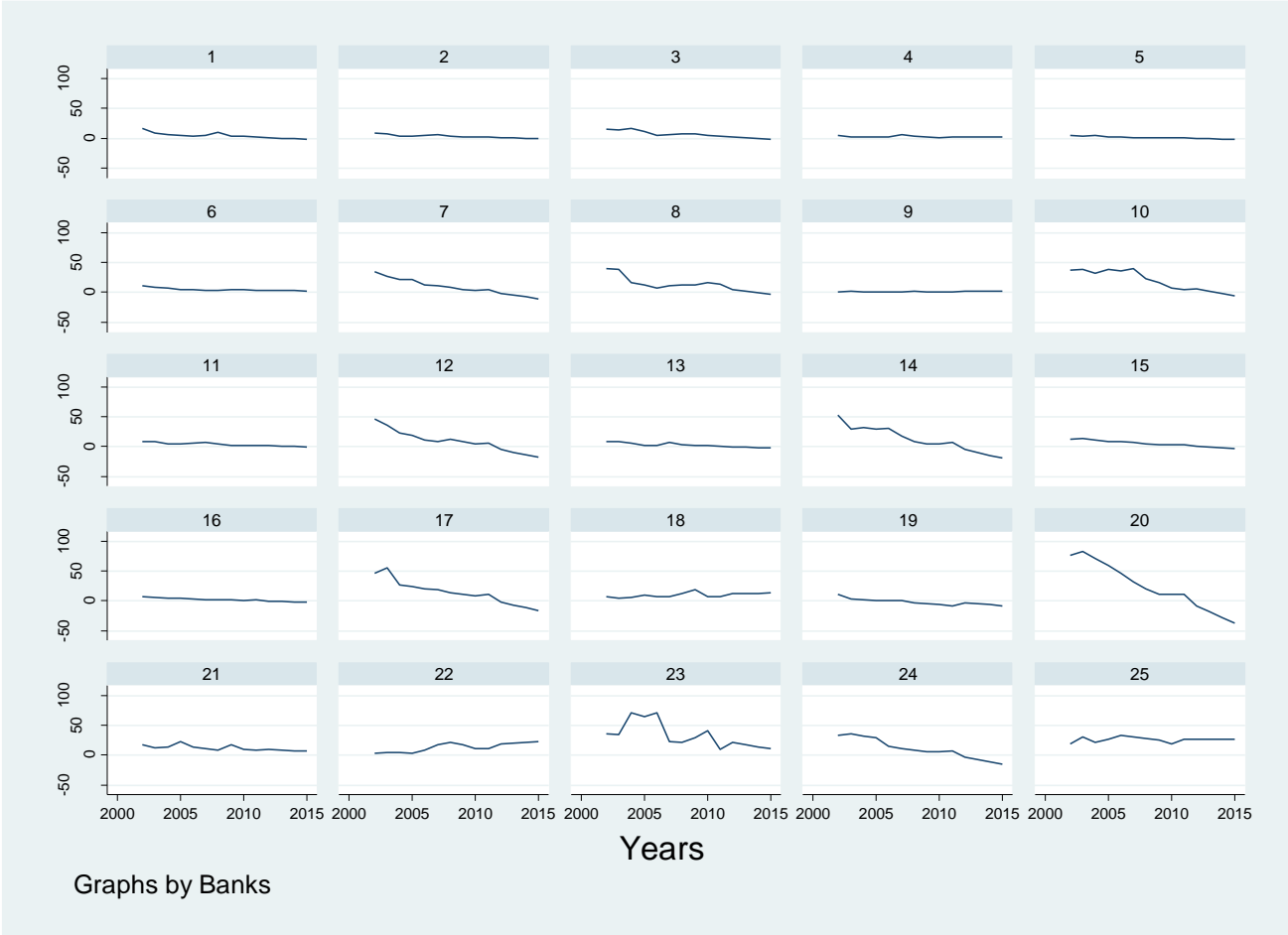
APPENDIX 2: LIST OF BANKS IN KENYA USED IN THE STUDY

1. Bank of Baroda. **2**. Bank of India. **3.** Barclays Bank. **4.** CFC bank. **5.** Citi Bank

6. Commercial bank of Africa. **7.** Co-operative Bank. **8.** Development Bank. **9.** DTB Bank.

10. Eco-bank. **11.** Equity Bank. **12.** Kenya Commercial Bank. **13.** I&M Bank.

14. National Bank of Kenya. **15.** NIC Bank. **16.** Standard Chartered Bank**. 17.** Consolidated

bank. **18.** Equatorial Bank. **19.** Victoria Bank**. 20.** Oriental Bank.

21. Credit Bank. **22.** Paramount Bank. **23.** Jamii Bora Bank. **24.** HCFK Bank. **25.** Dubai

Bank.

APPENDIX 3: CREDIT RISK SPREAD AVERAGELY ON THE BANKS
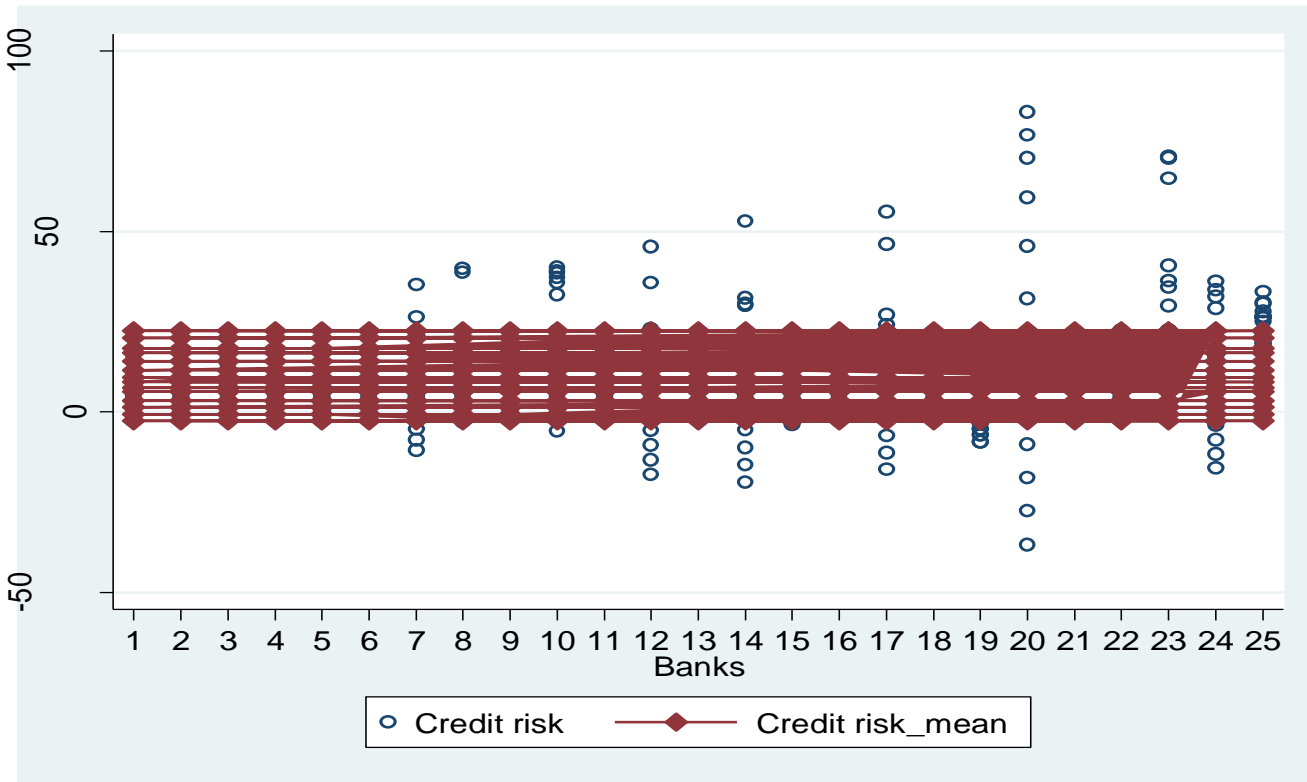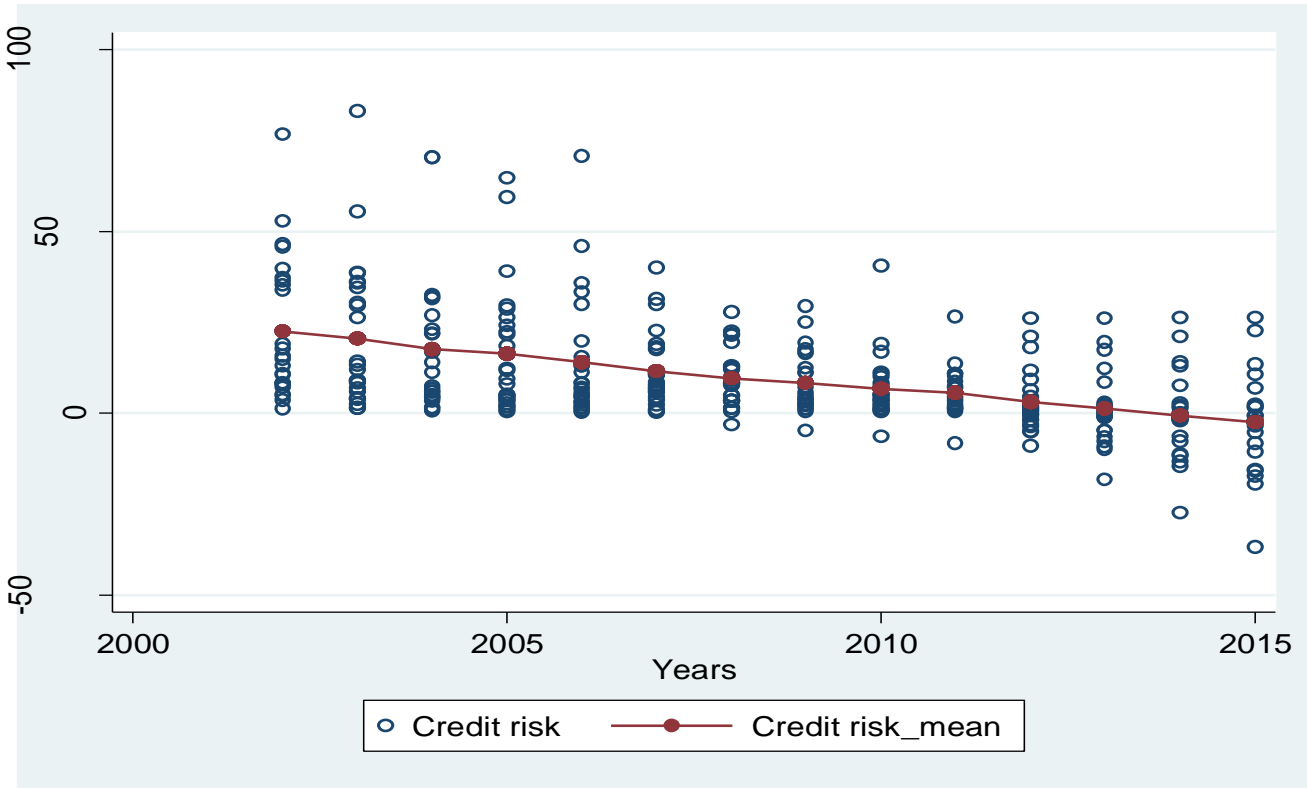
APPENDIX 4: HAUSMAN TESTS

3a. Hausman Test for Micro Determinants of credit risks

	—— Coefficients ——			
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	fixed	random	Difference	S.E.
depr	-260.2945	-234.4753	-25.81926	8.574506
mngt	-8.166736	-4.476059	-3.690677	3.003265
roaa	-2.875201	-2.757158	-.1180433	.0727622

```
                   b = consistent under Ho and Ha; obtained from xtreg
        B = inconsistent under Ha, efficient under Ho; obtained from xtreg

   Test:  Ho:  difference in coefficients not systematic

           chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                   =        10.70
         Prob>chi2 =       0.0134
```

3b. Hausman Test for Macro Determinants of credit risks

	—— Coefficients ——			
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	fixed	random	Difference	S.E.
rint	.3770769	.3770769	-1.50e-13	.
domesticccr~b	-1.94424	-1.94424	6.46e-13	.
exch	.3544305	.3544305	-3.59e-13	.
inflationc~l	.224521	.224521	-2.25e-13	.
unemployme~r	-5.346975	-5.346975	-7.17e-13	.

```
                   b = consistent under Ho and Ha; obtained from xtreg
        B = inconsistent under Ha, efficient under Ho; obtained from xtreg

   Test:  Ho:  difference in coefficients not systematic

           chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                   =         0.00
         Prob>chi2 =       1.0000
         (V_b-V_B is not positive definite)
```

3c. Hausman Test for Micro and Macro Determinants of credit risks

| | ── Coefficients ── | | | |
| | (b) | (B) | (b-B) | sqrt(diag(V_b-V_B)) |
	fixed	random	Difference	S.E.
depr	-110.5976	-96.96168	-13.63595	14.86647
mngt	-4.537464	1.219176	-5.75664	2.692297
roaa	-2.364272	-2.231004	-.1332679	.0686505
rint	.1395561	.1325141	.007042	.
domesticcr~b	-1.291399	-1.295081	.0036816	.
exch	.2972803	.2922669	.0050134	.
inflationc~l	.0637884	.0553743	.0084141	.
unemployme~r	-3.303593	-3.259395	-.0441982	.1330268

```
                  b = consistent under Ho and Ha; obtained from xtreg
         B = inconsistent under Ha, efficient under Ho; obtained from xtreg


   Test:  Ho:  difference in coefficients not systematic

             chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                     =         5.20
          Prob>chi2 =      0.7363
          (V_b-V_B is not positive definite)
```