Impact of Economic Performance and Monetary Policies on Credit Risk in Kenya's Banking Sector

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DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the Research Project contains no material previously published or written by another person except where due reference is made in the Research Project itself.

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This Research Project has been submitted for examination with my approval as the Supervisor.

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Abstract.

The paper investigates the influence of Economic performance and monetary policies on Credit risk in Kenya's banking sector. By employing a panel data regression spanning from 2007 to 2024, this research assesses the nature of the relationship between the set of macroeconomic indicators and monetary policy tools against measures of credit risk. Specifically, GDP growth rate, unemployment, and core inflation as macroeconomic variables, while Kenya Central Bank's rate (CBR) and money supply growth rate stand in for the monetary policy actions. Nonperforming loans serve as a proxy for credit risk. Bank-specific factors have been included in the regression as they play a role in the credit risk of banks, these include Capital Adequacy Ratio (CAR) and Loan to Deposit Ratio (LDR). The study finds that stronger GDP growth is associated with lower credit risk, while higher unemployment levels significantly increase the likelihood of non-performing loans. In contrast, core inflation and changes in the CBR show no significant direct impact on credit risk. An expansion in the money supply, though negatively related to credit risk, does not have a statistically significant effect, suggesting its influence is indirect and may depend on broader economic conditions.

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CHAPTER ONE:

INTRODUCTION

1.1 Background of the study

The function of the central bank in assuring macroeconomic stability cannot be thought of without monetary policy, especially in the maintenance of price stability and safeguarding of the financial system. Through changing the money supply and setting interest rates, the central bank's monetary policies influence the financial market (Bernanke & Blinder, 1992).

Credit risk refers to the probability of loss arising from non-payment by a debtor; hence, it is considered a core concern by banks since it directly affects the stability and financial health of the bank (Simiyu & Kisaka 2014). In this research, credit risk will be represented through NPLs that make the banks lose existing loans due to credit failures.

The transmission of monetary policy through credit markets works to a great extent to relate or link the banking sector with the real economy. A shift in lending terms can easily make borrowers particularly vulnerable since an increase in interest rates burdens the economy greatly when the balance sheets are fragile. (Bernanke, Gertler, & Gilchrist, 1999).

The credit channel mechanism of monetary policy has a significant impact on the efficiency of the financial markets and, therefore, how they meet the needs of both the borrower and lender. This study uses the Central Bank's interest rate and the money supply growth as a variable representing the monetary policy since these variables have a direct impact on the decisions of people and various businesses to borrow and lend within a particular country.

1.1.1 Economic Performance Indicators

GDP growth rate at market prices is the percentage change in Gross Domestic Product from one period to another. It's the rate by which the aggregate monetary value of all final goods and services produced within a country increases or decreases over time, adjusting for price inflation and market prices. Higher GDP growth rates typically indicate a robust economy, which can lead to lower credit risk as businesses and consumers are more likely to repay loans. (Mankiw, 2019).

Unemployment refers to the situation where individuals who are actively seeking work are unable to find employment. It is a key economic indicator that reflects the health of an economy. High unemployment levels are closely linked to the reduced ability of an individual to meet financial obligations, including loan repayments. Job losses often lead to decreased household income, making it challenging for borrowers to honor debt commitments. This, in turn, increases the likelihood of loan defaults, impacting the profitability and stability of financial institutions. For example, during the 2008 global financial crisis, rising unemployment significantly contributed to increased systemic risks in the financial system (Mishkin, 2019).

Inflation is a measure of how fast the general price level of goods and services is rising; thus, it causes purchasing power erosion. Core inflation, which excludes some volatile items like food and energy, gives a clearer picture of the long-term trend regarding inflation. It, desirably, should be low and stable because it sets a very conducive economic environment and reduces significantly the risks of loan defaults (Blanchard, 2017).

1.1.2 Financial health and risk management practices.

The Loan-to-Deposit Ratio (LDR) expresses the percentage of deposits that a bank lends out. This ratio is significant in determining the liquidity position of a bank and, consequently, the policies of its lending.

A high LDR could be an indication of overaggressive lending policies; therefore, in case of bad management of loans, this would increase credit risk (Athanasoglou, & Delis, 2006).

Conversely, a low LDR might signal that a bank is simply holding too much liquidity, which would lower its potential revenue but also offer some protection from risk.

The Capital Adequacy Ratio (CAR) indicates a bank's capital relative to its risk-weighted assets. The ratio evaluates whether a bank is very capable of absorbing losses and remaining stable. A high CAR would reflect that it is better placed to absorb losses from NPLs and other shocks to the bank's books because it has large amounts of capital available (Berger, 1995).

1.1.3 Kenya's banking sector.

In the Kenyan context, the nation's banking sector is the most mature, fastest-growing, and largest in East Africa. As Muriithi and Louw (2017) observe, it makes the country a regional financial hub. Notwithstanding this enviable position, it has been facing several severe challenges owing to global and domestic financial crises. Such as the 2007 Political Crisis, where the country saw large-scale political unrest, disrupting economic activity and investor confidence. To add to this, before this economy could recover fully, the impact of the Global Financial Crisis set in during 2007-2008.

The Kenyan government, to counter these impacts, applies an expansionary monetary policy in order to stabilize the economy. This is through the reduction of their interest rates by the Central Bank. Comprehending whether the stated policies are effective in cushioning the banking sector from credit risk is, therefore fundamental for the stability and strength of a banking system.

These crises have highlighted how vulnerable the sector is to exogenous shocks and exposed weaknesses in financial systems that heightened credit risk and the associated imperative for robust policy responses.

1.2 Statement of the problem.

Existing literature shows that macroeconomic factors impact credit risk differently across banking systems. For instance, Lin (2016) found that Islamic banks are more resilient during crises, influenced mainly by unemployment and money supply, while conventional banks are affected by all macroeconomic variables. As shown before, although such studies—like many others—can add value to the issues of monetary policy and economic performance in a particular country, their findings cannot be generalized to every country. This research aims to fill this gap by estimating how economic performance and monetary policy impact credit risk in the banking sector of Kenya.

We use panel data regression to analyze the relationships between non-performing loans (NPLs) and macroeconomic variables—inclusion variables like Gross Domestic Product (GDP), unemployment, and inflation, along with monetary policy tools such as money supply growth and interest rates. This model was enriched with bank-specific variables, such as the loan-to-deposit ratio (LDR) andcapital adequacy ratio (CAR) to provide a more comprehensive view of the factors influencing credit risk.

In Kenya, the banking sector is particularly crucial due to its dominance in the financial system and its significant influence on economic development. By focusing on the banking sector, this study can provide valuable insights into how economic performance and monetary policies directly affect credit risk. This analysis is essential for developing effective policies to manage credit risk and ensure financial stability in Kenya.

1.3 Research Objectives.

Main objectives

Determine the overall effect of economic performance and monetary policy on credit risk in Kenya's banking sector.

Specific objectives

1. Examining the influence of monetary policy changes on credit risk in Kenyan banks.
2. To assess the relationship between economic performance indicators on credit risk in Kenya’s banking sector.

1.4 Research Questions.

1. What is the relationship between economic performance indicators and credit risk in Kenya's banking sector?
2. How do changes in monetary policy influence credit risk in Kenyan banks?
3. What is the overall effect of economic performance and monetary policy on credit risk in Kenya's banking sector?
4. Which economic factors significantly impact credit risk in Kenyan banks?
5. What recommendations can be made for improving credit risk management based on the analysis of economic performance and monetary policy?

1.5 Significance of research.

While several studies have examined the impact of monetary policy on credit risk worldwide, relatively few have focused on Kenya. This study aims to fill this gap by contributing its in-depth analysis, unique to the economic, political, and social conditions in the case of Kenya.

In furtherance, this research will also be useful to bank executives and managers since they make decisions regarding the adoption of risk management practices and investment strategies. Once they understand the relationship between changes in monetary policy and economic performance, on the one hand, with credit risk, on the other hand, they can improve their managing techniques of loan portfolios.

These findings of the study will, therefore, be useful in guiding the formulation of internal policies related to the credit approval process, loan pricing, and risk mitigation techniques in many banks. For example, during periods when the economy is highly volatile, banks may focus more on collateral requirements or diversify their loan portfolios.

In the next chapter, we present an overview of existing literature on this topic and elaborate on how the findings of this study will add to the body of knowledge. It describes the selected variables and the purpose behind the choice of variables. We shall see in Chapter 3 how these variables correlate with one another using regression and trend analysis.

The results, therefore, help in making conclusions on how the Kenyan banking system responds to the macroeconomic variables that were tested.

CHAPTER TWO

LITERATURE REVIEW.

2.1 Introduction

Credit risk, defined as the potential loss due to a debtor's non-payment of a loan or other line of credit, is a critical concern for banks as it directly impacts their financial health and stability (Simiyu & Kisaka, 2014). Elevated levels of credit risk increase the level of provisions for loan losses and raise nonperforming loans, which have direct implications for capital adequacy ratios and cast a shadow over the solvency and stability of banks. It is for that matter that understanding the determinants of credit risk shall be very important in effective risk management and the development of robust financial systems.

This literature review relates macroeconomic factors, monetary policies, and credit risk in the banking sector with a special focus on Kenya. The objective of the review is to identify key variables that influence credit risk and point out gaps that exist within the available literature to form a basis for further research.

2.2 Theoretical Framework

2.2.1 Theories Underpinning Non-Performing Loans.

Hyman Minsky's "Financial Instability Hypothesis" (1974) offers a framework for understanding the dynamics of financial crises. This theory posits that during periods of economic prosperity, corporate cash flows often exceed debt repayment needs, leading to speculative fervor. Eventually, this results in borrowers taking on more debt than their revenues can support, triggering a financial crisis. During such speculative booms, credit becomes scarce as banks and lenders restrict lending even to creditworthy companies, causing economic contraction.

Fofack (2005) conducted a study that found that economic downturns lead to an increase in NPLs as borrowers struggle to meet their financial obligations. This highlights the relationship between macroeconomic conditions and credit risk in the banking sector, and underscores the importance of the banking sector as a barometer

for credit risk, particularly in developing economies like Kenya, where banks are the primary lenders.

2.2.1 Monetary Policy Transmission Mechanism

The East Africa Currency Board (EACB), which oversaw post-independence monetary policy for Kenya, Uganda, and Tanzania, was disbanded in 1966, leading to the establishment of the Central Bank of Kenya (CBK) through the Central Bank Act (CAP 481) with a mandate to carry out all central banking functions (Kinyua, 2001). Following this transition, monetary policy in Kenya shifted to employing direct controls, with a focus on domestic credit as the key target, while the minimum reserve requirement for commercial banks' deposit liabilities was set at 12.5% in 1969 (Kinyua, 2001).

According to Mishkin (2007), central banks influence the real economy by adjusting interest rates and controlling the money supply. The credit channel mechanism, discussed by Bernanke, Gertler, and Gilchrist (1999), emphasizes how changes in monetary policy affect borrowers' ability to repay loans, impacting credit risk.

Monetary policy plays a crucial role in influencing credit risk in the banking sector. Expansionary monetary policy, characterized by lower interest rates and increased money supply, aims to stimulate economic activity by making borrowing more affordable. This section reviews key studies that explore this relationship:

These studies suggest that lower interest rates, a feature of expansionary monetary policy, reduce the cost of borrowing, leading to increased loan demand and potentially lower credit risk as economic conditions improve.

The Central Bank of Kenya has responded to economic crises by loosening monetary policy, which involves reducing interest rates and increasing the money supply. These measures are intended to release resources that can be channeled into the real sector to finance economic recovery. Expansionary monetary policy typically leads to lower credit risk as it encourages borrowing and investment, thus supporting economic growth.

2.2.2 Measures of credit risk

The ratio of NPLs to assets is an indicator of banks' lack of asset quality and financial soundness. Non-performing loans are typically those that are overdue for more than 90-days or in default. In the case of the current financial turmoil, a high ratio may indicate that banks are not healthy since they have significant exposure to the origins of the problem. In Kenya, the NPL/assets ratio decreased from a high of 23.27% in 2000 to a low of 4.02% in 2008, an indication that the banking system's asset quality and overall health had improved.

The Loan-to-Deposit Ratio (LDR) measures the proportion of a bank's deposits that are used for lending. This metric is critical as it reflects the liquidity position and lending practices of a bank. A high LDR may indicate aggressive lending strategies, suggesting a bank is issuing more loans relative to its deposits. Thus, potentially increasing credit risk if loans are not well-managed (Athanasoglou, Brissimis, & Delis, 2006). Conversely, a low LDR might signal that a bank is holding excess liquidity, this conservative lending practice also means the bank is missing out on potential lending opportunities which could limit revenue opportunities but also mitigate risk.

According to the Basel Committee on Banking Supervision, 2010, capital adequacy ratio (CAR) is defined as a measure of a bank's capital, expressed as a percentage of its risk-weighted assets. It is a key determinant in the assessment of bank's ability to absorb potential losses, thus protecting depositors and promoting the stability and efficiency of financial systems by ensuring that banks have sufficient capital to absorb a reasonable amount of loss.

2.3 Empirical evidence on the relationship between macroeconomic factors and credit risk.

Several empirical studies have examined the relationship between macroeconomic factors and credit risk in various contexts. FitzGerald (2006) highlighted the role of Economic growth, measured by GDP, in reducing credit risk. This shows that during periods of robust economic growth, the probability of default decreases, and banks experience lower levels of non-performing loans, illustrating a negative correlation

between Economic Growth and Credit Risk. This also emphasizes the importance of sound economic policies in fostering a stable banking environment.

Inflation affects borrowers' repayment capacity by influencing interest rates and the real value of debt. High inflation can erode borrowers' purchasing power, increasing the risk of default. Valahzaghard (2012), analyzing the banking system in Iran, found no significant relationship between inflation, employment rates, unemployment, and credit risk but noted a significant relationship between the stock index and credit risk, highlighting the variability in how different macroeconomic factors impact credit risk across different banking systems and Economic environments.

Exchange rate volatility can impact credit risk, especially in countries with significant foreign currency-denominated debt. Lin (2016) compared the impact of macroeconomic factors on credit risk in Islamic and conventional banks in Indonesia, finding that Islamic banks are more resilient during economic crises, with only exchange rates and money supply significantly affecting credit risk, while conventional banks were influenced by all macroeconomic variables.

These studies collectively highlight the importance of understanding macroeconomic influences on credit risk and underscore the need for banks to adopt comprehensive risk management frameworks that incorporate macroeconomic monitoring and forecasting to mitigate potential losses from borrower defaults.

In the Kenyan context, a study by Beatrice Njeru Warue (2013), investigates the relationship between non-performing loans (NPLs) and various bank-specific factors compared with high-interest rates, to analyze which factors have the greatest impact on the Kenyan banking sector. The study identifies a positive relationship between lending interest rates and NPL levels, particularly in larger banks, highlighting the risk posed by high interest rates. The study concluded that bank-specific factors, such as return on assets (ROA) and ownership structures, have a more significant impact on NPL performance than interest rates in an economy, emphasizing the importance of internal management in mitigating credit risk (Warue, 2013).

2.4 Kenya's Banking Sector and Economic Crises

The Kenyan banking sector has faced numerous challenges due to economic crises, which have heightened credit risk.

For instance, post-election violence that arose in 2007 in Kenya was politically triggered by the post-election violence following the disputed outcome of the presidential and parliamentary general elections held in December 2007. Since the introduction of multi-party democracy in 1991, political party formations in Kenya have been based on ethnic backgrounds, leading to voting patterns that often align along ethnic lines. This ethnic-based political alignment fueled tensions and violence when election results were contested, significantly disrupting economic activities and investor confidence. Were, M. (2019).

Additionally, before the economy could fully recover from the effects of the violence, the spillover effects of the Global Financial Crisis of 2007-2008 seeped into Kenya, manifesting through reduced foreign direct investment and remittances. The government and the Central Bank implemented policies to cushion the economy, such as lowering interest rates and providing liquidity to the banking sector, ensuring that credit continued to flow to businesses and consumers despite the global downturn (AfDB, 2019).

According to CBK net NPLs as a share of total loans declined from 2.9% in March 2008 to 2.2% in November 2008. However, proof of an increase in the ratio can be seen in CBK's September 2009 Monthly Economic Review, where the ratio of net NPL to gross loans increased from 3.4% in August 2008 to 3.7% in August 2009. This correlation is an indicator that macroeconomic policies influence credit risk in Kenya.

2.5 Empirical Studies Specific to Kenya

While global studies provide valuable insights, it is crucial to examine empirical research specifically focused on Kenya to understand the unique dynamics at play.

Muriithi and Louw (2017) highlighted the significant challenges faced by Kenyan banks, notably high levels of non-performing loans (NPLs) and issues related to

capital adequacy. Their study underscores the necessity for robust risk management practices and effective policy responses to mitigate credit risk.

Similarly, the study by Simiyu and Kisaka (2014) identified significant challenges for microfinance institutions (MFIs) in Kenya, including strict operational regulations from the Central Bank of Kenya and the absence of specific government policies to govern their operations. These highlight systemic issues that affect the effectiveness and sustainability of credit risk management in MFIs.

Strict regulations can limit operational flexibility, while the lack of government policies can lead to inconsistencies and gaps in the regulatory framework, making it difficult for MFIs to operate efficiently. Furthermore, loan recovery being a major challenge underscores the importance of robust credit risk management practices and supportive regulatory environments to enhance the stability and growth of the microfinance sector in Kenya.

Understanding these challenges helps contextualize the broader economic and policy environment in which Kenyan MFIs operate, providing a comprehensive view of the factors influencing credit risk and the banking sector's stability.

2.6 Research Gaps

Despite the robust research on macroeconomic policy and credit risk, there are still gaps in this field that my research aims to fill. Many studies focus on global trends or specific regions, leaving a gap in understanding how macroeconomic factors impact Kenya's banking sector specifically.

This country-specific analysis is crucial as it provides insights tailored to Kenya's unique economic environment and regulatory framework.

CHAPTER THREE

METHODOLOGY

3.1 Research Design

This study employed a quantitative research design, utilizing panel data regression analysis to investigate the impact of economic performance and monetary policy on credit risk in Kenya's banking sector from 2007 to 2024.

The analysis was conducted using STATA, a statistical software, to ensure robust and accurate results.

A quantitative research design was found to be more appropriate because it allows for the objective measurement and statistical analysis of numerical data, providing clear and precise insights into the relationships between economic performance, monetary policy, and credit risk. This approach ensures the robustness and generalizability of the findings, essential for making informed policy and banking decisions.

3.2 Sampling Design

The target population in this research included 33 commercial banks operating in Kenya from 2007 to 2024. This encompassed locally and foreign-owned banks, as well as small, medium, and large banks operating across Kenya.

The study covered a time frame from 2007 to 2024, and the sample contained annual data for each bank over these 17 years. This approach enabled a longitudinal analysis, capturing the effect of economic performance and monetary policy over time.

3.3 Definition of Variables

INDEPENDENT VARIABLES		Description	Supporting evidence	Scale
Gross domestic Price growth at market prices.	GDP	The percentage change in GDP from one period to another. GDP growth rate indicates the rate at which a country's economy is expanding or contracting over time.	Yiping Qu (2008) Mankiw, N. G. (2019)	Percentage (%)
Unemployment	UNEMP	Unemployment refers to the situation where individuals who are actively seeking work are unable to find employment. It is a key economic indicator that reflects the health of an economy.	International economics: Theory and policy (11th ed.). Pearson Education	Nominal
Core Inflation	CoreInf	A general increase in prices of commodities. Core inflation excludes volatile items such as food and energy prices, providing a more stable indication of long-term inflation trends.	Michael F. Bryan (1997) Joseph T. Salerno (1987)	Percentage (%)
Money Supply Growth Rate	MonSup	Money supply refers to the total amount of money and other liquid assets circulating in the economy at a particular time.	Mishkin, F. S., & Eakins, S. G. (2016)	Percentage (%)
Central Bank interest rate.	CBR	This is the cost of capital in an economy/reward for investments. The CBR is the benchmark interest rate.	Zicchino (2005), Rose Ngugi(2000, 2001, 2003)	Percentage (%)
Loan-to-Deposit Ratio	LDR	The proportion of a bank's loans that's is funded by deposits. A higher ratio suggests more loans are funded by deposits, potentially leading to liquidity issues.	Basel Committee on Banking Supervision (2010)	Ratio

Capital Adequacy Ratio	CAR	The ratio of a bank's capital to its risk-weighted assets ensures that the bank can absorb a reasonable amount of loss and complies with statutory capital requirements.	Vives, X. (2016)	Ratio
DEPENDENT VARIABLE				
Non-Performing Loan	NPL	The ratio of non-performing loans to total loans, indicates the level of credit risk.	Literature on NPL and credit risk management	Ratio

3.4 Data Collection.

The sources of my economic Performance Indicators, including Data on GDP at market prices, unemployment, and core inflation, were sourced from the Kenya National Bureau of Statistics (KNBS) and the World Bank.

Information on the monetary policy variables of the Central Bank's rate and money supply was obtained from the Central Bank of Kenya (CBK).

Non-performing loans (NPLs) data were collected from annual reports of Kenyan Banks listed on the NSE.

This data was collected yearly from 2007 to 2024 to provide a more granular analysis of the relationships between the variables. This period offers a more detailed insight into the dynamics of credit risk.

3.5 Model Specification

The panel data regression model will be specified as follows:

$$NPL_{it}=\beta_0+\beta_1 GDP_{it}+\beta_2 UNEMP_{it}+\beta_3 CoreInfl_{it}+\beta_4 CBR_{it}+\beta_5 MonSupp_{it}+\beta_6 LDR_{it}+\beta_7 CAR_{it}+\epsilon_{it}$$

Where:

- NPL_{it} : Non-performing loan ratio for bank i at time t,
- GDP_{it} : Gross Domestic Product at market prices for time t,
- $UNEMP_{it}$: Unemployment for time t,
- $CoreInfl_{it}$: Core inflation rate for time t,
- CBR_{it} :Central Bank rate for time t,
- $MonSupp_{it}$: Money supply for time t,
- LDR_{it} : Loan deposit ratio for bank i at time t,
- CAR_{it} : Capital adequacy ratio for bank i at time t
- ϵ_{it} : Error term.

3.5.1 Appropriate model selection.

When analyzing panel data, researchers must carefully choose the most suitable regression model to accurately capture the relationships between variables while accounting for individual-specific effects. There were three basic models commonly used, and each model has its assumptions and applications.

The Pooled OLS model carries the assumption that there are no individual factors that could influence the dependent variable. That is, it takes the whole dataset as a large cross-section and considers no differences between the different individual entities. This model is very simple but perhaps missing major individual-specific effects. (Wooldridge, 2010)

The Fixed Effects model controls for all time-invariant individual differences in the regression. In this model, one assumes that the effects of the individual are correlated with the independent variables and, thus, focuses on the within-entity variation over time (Hsiao, 2003).

The random effects model works with the assumption that there is no correlation between the individual-specific effects and the independent variables. This model captures the differences across entities as random and folds them into the error term,

providing more efficient estimates (Greene, 2012). The random effects model is especially useful in these regards when individual effects are thought by researchers to be randomly distributed and not biasedly systematic in their effects on the estimates of the independent variables.

Another test that could be carried out is the Breusch-Pagan Lagrange Multiplier (LM) test where the random effects model was compared with the pooled OLS model. The null hypothesis was that variance of the random effects is zero, implying that the data can be modeled using a pooled OLS approach. Our p-value was found to be less than 0.05, thus we rejected the null hypothesis. Suggesting that there are significant individual-specific effects, and concluded that a random effects model is more appropriate. On the other hand, if the p-value was high, a pooled OLS model would have been preferred. (Breusch & Pagan, 1980).

A Hausman test was conducted to select between Fixed Effects and Random Effects. This test determined if the Random Effects estimator was consistent. Our null hypothesis stated that the preferred model was the random effects model, assuming individual-specific effects were uncorrelated with the independent variables. Conversely, the alternative hypothesis suggested that the Fixed effects model was more suitable due to the correlation between individual effects and the predictors (Hausman 1978).

Conducting these tests gave a guideline on the most appropriate model to be used in this research. This was the Random Effects model.

3.6 Diagnostic Tests

- Stationarity: This was to ensure the reliability of the regression results. Non-stationary data could lead to spurious regression results. The Fisher-type test for stationarity was employed as it was able to combine the results of individual unit root tests across cross-sectional units using a meta-analysis approach. Therefore making it a powerful and flexible method.

- Multicollinearity**:** Multicollinearity occurs when independent variables are highly correlated, thus distorting the results of the regression. The Variance Inflation Factor (VIF) was used to detect this. (O'Brien, 2007).

- Heteroscedasticity**:** Breusch-Pagan test was employed to test for heteroscedasticity. This occurs when the variance of the error terms is not constant across observations. Leading to inefficient estimates and biased standard errors, which affect hypothesis testing (Breusch & Pagan, 1980).

- Cross-sectional independence occurs when observations within a specific period are not correlated. The Pesaran test, formally known as the Cross-Sectional Dependence (CD) test, was the statistical test used to determine whether the residuals of a regression model are cross-sectionally independent.

CHAPTER 4

RESULTS AND ANALYSIS

4.1 Introduction.

This chapter presents the empirical results of analyzing the impact of economic performance and monetary policies on credit risk in Kenya's banking sector using panel data from 2007 to 2024. It outlines the econometric methodology, including diagnostic tests and the final random effects model, and interprets the key findings with a focus on coefficient significance and implications.

4.2 Descriptive Statistics.

Out of 585 observations, the summary statistics highlight these key characteristics:

Table 1: Summary of descriptive statistics

Variable	Mean	Std.Dev (Overall)	Std. Dev. (Between)	Std.Dev. (Within)	Min	Max
NPL Ratio	0.100	0.0986	0.0832	0.0421	0.000	0.9056
GDP Growth Rate	0.1526	0.1072	0.1011	0.0452	0.0466	0.5542
Unemployment	0.0350	0.0115	0.0093	0.0052	0.0262	0.0569
Inflation (INFL)	0.0882	0.0506	0.0448	0.0207	0.0396	0.2624
Central Bank Rate	0.1270	0.0320	0.0294	0.0157	0.0700	0.1800
Money Supply	0.1330	0.0394	0.0347	0.0148	0.0560	0.2120
Loan-to-Deposit Ratio (LDR)	0.7609	0.2762	0.2513	0.1158	0.0000	2.6724
Capital Adequacy Ratio (CAR)	0.1619	0.1481	0.1397	0.0425	0.0090	3.2067

The dataset consists of 585 observations from 33 commercial banks operating in Kenya between 2007 and 2024.

The descriptive statistics provide insights into the variability of key variables across banks (between firms) and over time within individual banks (within firms).

The overall standard deviation captures the total variability in the data, combining differences across banks and over time. Breaking this down, the between standard deviation measures cross-sectional variability, highlighting how variables differ across banks.

For instance, the Loan-to-Deposit Ratio (LDR) exhibits higher between-bank variability, reflecting differing liquidity and risk management practices across institutions. Similarly, the Capital Adequacy Ratio (CAR) shows notable between-bank differences, suggesting variations in capital structures and regulatory responses among Kenyan banks.

On the other hand, the within standard deviation reflects time-series variability, illustrating changes in variables within individual banks over the years. Variables such as unemployment and the Central Bank Rate (CBR) display relatively low within-bank variability, indicating more stable macroeconomic conditions over time. Conversely, the Non-Performing Loan (NPL) ratio demonstrates notable within-bank changes, reflecting shifts in credit risk management and loan performance during the study period.

By distinguishing between and within variability, the analysis captures the dynamic interplay of macroeconomic performance, monetary policy, and bank-specific factors. This dual perspective enhances the study's ability to assess how these factors influence credit risk in Kenya's banking sector over time and across different institutions.

4.3 Diagnostic Tests.

4.3.1 Stationarity Tests.

The Fisher-type unit root test was applied to verify stationarity: With a 5% significance level (p-value < 0.05). The results were as follows:

Table 2: Fisher-type unit root test results.

Variable	Stationarity Tests	Statistic	p-value
NPL Ratio	Inverse chi-squared (P)	136.3870	0.0000
	Inverse normal (Z)	-2.8130	0.0025
	Inverse logit t (L*)	-3.6103	0.0002
	Modified inv. chi-squared (Pm)	6.1264	0.0000
GDP	Inverse chi-squared (P)	212.0718	0.0000
	Inverse normal (Z)	-8.1686	0.0000
	Inverse logit t (L*)	-9.8338	0.0000
	Modified inv. chi-squared (Pm)	12.7139	0.0000
Unemployment	Inverse chi-squared (P)	31.9376	0.9999
	Inverse normal (Z)	1.7029	0.9557
	Inverse logit t (L*)	1.5089	0.9334
	Modified inv. chi-squared (Pm)	-2.9648	0.9985
Inflation	Inverse chi-squared (P)	145.7899	0.0000
	Inverse normal (Z)	-6.0022	0.0000
	Inverse logit t (L*)	-6.3595	0.0000
	Modified inv. chi-squared (Pm)	6.9448	0.0000
CBR	Inverse chi-squared (P)	34.7034	0.9995
	Inverse normal (Z)	1.8060	0.9645
	Inverse logit t (L*)	1.6464	0.9492
	Modified inv. chi-squared (Pm)	-2.7240	0.9968
Money Supply	Inverse chi-squared (P)	158.6609	0.0000
	Inverse normal (Z)	-7.4772	0.0000
	Inverse logit t (L*)	-7.2494	0.0000
	Modified inv. chi-squared (Pm)	8.0651	0.0000
CAR	Inverse chi-squared (P)	85.0915	0.0570
	Inverse normal (Z)	-1.6672	0.0477
	Inverse logit t (L*)	-1.5942	0.0564
	Modified inv. chi-squared (Pm)	1.6617	0.0483

LDR	Inverse chi-squared (P)	176.3693	0.0000
	Inverse normal (Z)	-3.9778	0.0000
	Inverse logit t (L*)	-6.3282	0.0000
	Modified inv. chi-squared (Pm)	9.6064	0.0000

A variable is said to be stationary if at least one of the reported p-values from the test statistics is less than the value of significance (0.05). Stationarity can be observed in NPL ratio, GDP, Inflation, unemployment, CAR and LDR.

Non-stationarity was observed in Unemployment and Central Bank Rate (CBR), requiring further differencing. The lagged differences were calculated at t-1 ($D\_UNEMP = UNEMP_t - UNEMP_{(t-1)}$) and ($D\_CBR = CBR_t - CBR_{(t-1)}$). to address stationarity concerns. Both transformations ensured that the variables became stationary, as confirmed through unit root tests.

4.3.2 Multicollinearity.

Table 3: Variance Inflation factor table

vif

Variable	VIF	1/VIF
D_unenmp	**1.13**	**0.881185**
INFL	**1.10**	**0.909386**
GDP	**1.09**	**0.916070**
CAR	**1.04**	**0.957338**
Moneysupp	**1.03**	**0.968473**
LDR	**1.02**	**0.979920**
D_cbr	**1.00**	**0.998770**
Mean VIF	**1.06**	

Variance Inflation Factor (VIF) values were calculated: All VIFs were below 1.20, with a mean VIF of 1.06, indicating no significant multicollinearity among the independent variables.

4.3.3 Heteroskedasticity.

Table 4: Chi-squared Values for the Breusch Pagan

```
Breusch-Pagan/Cook-Weisberg test for heteroskedasticity
Assumption: Normal error terms
Variable: Fitted values of NPL_Ratio

H0: Constant variance

    chi2(1) =   3.27
Prob > chi2 = 0.0707
```

The Breusch-Pagan/Cook-Weisberg test yielded a p-value of 0.0707, indicating no evidence of heteroskedasticity.

4.3.4 Cross-Sectional Dependence.

Table 5: Chi-squared value for Pesaran's test for cross-sectional

```
Random-effects GLS regression                   Number of obs     =       552
Group variable: FirmID                          Number of groups  =        33

R-squared:                                      Obs per group:
     Within  = 0.0860                                         min =        13
     Between = 0.1121                                         avg =      16.7
     Overall = 0.0845                                         max =        17

                                                Wald chi2(7)      =     50.76
corr(u_i, X) = 0 (assumed)                      Prob > chi2       =    0.0000
```

NPL_Ratio	Coefficient	Std. err.	z	P>|z|	[95% conf.	interval]
GDP	-.0558988	.0293415	-1.91	0.057	-.1134071	.0016094
D_unenmp	4.728081	.9950305	4.75	0.000	2.777857	6.678305
INFL	.0107426	.0600009	0.18	0.858	-.1068571	.1283422
D_cbr	.0237131	.1507186	0.16	0.875	-.27169	.3191161
Moneysupp	-.1418509	.0748769	-1.89	0.058	-.288607	.0049051
LDR	.0360782	.0161362	2.24	0.025	.0044519	.0677045
CAR	.0353414	.0221386	1.60	0.110	-.0080495	.0787324
_cons	.0810854	.0198053	4.09	0.000	.0422677	.1199031
sigma_u	.04505739					
sigma_e	.06881184					
rho	.30008824	(fraction of variance due to u_i)				

Pesaran's test for cross-sectional dependence produced a p-value < 0.05, confirming significant dependence among cross-sectional units.

To account for this dependence and ensure robust standard errors, the final model was estimated using Driscoll-Kraay standard errors, which adjust for heteroskedasticity and autocorrelation across panel units.

4.4 Model Selection.

4.4.1 Random Effects and Pooled OLS.

The Breusch and Pagan Lagrangian multiplier (LM) test was carried out to determine the appropriate model between the pooled OLS and random effects model.

Table 6: Chi-squared values of Breusch Pagan LM test

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

        NPL_Ratio[FirmID,t] = Xb + u[FirmID] + e[FirmID,t]

        Estimated results:
                         |       Var     SD = sqrt(Var)
                ---------+------------------------------
                NPL_Ratio |   .0073908         .08597
                        e |   .0047351        .0688118
                        u |   .0020302        .0450574

        Test: Var(u) = 0
                                  chibar2(01) =   392.49
                               Prob > chibar2 =   0.0000
```

Since the p-value is 0 < 0.05, it indicates significant entity effects, suggesting that random effects may be more suitable than pooled OLS.

4.4.2 Fixed Effect and Random Effect.

Table 7: Results of the Hausman Test

```
                 ---- Coefficients ----
                 |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
                 |   fe_model     re_model       Difference       Std. err.
-----------------+------------------------------------------------------------
             GDP |  -.0557561    -.0558988        .0001427        .0010947
         D_unenmp |   4.768062     4.728081        .0399803        .0404863
             INFL |   .0123857     .0107426        .0016432        .0015161
            D_cbr |   .0246101     .0237131        .0008971        .0026868
        Moneysupp |  -.1468748    -.1418509       -.0050239        .0022721
              LDR |   .0287325     .0360782       -.0073458        .0063967
              CAR |   .0349044     .0353414        -.000437        .0032542
------------------------------------------------------------------------------
                    b = Consistent under H0 and Ha; obtained from xtreg.
     B = Inconsistent under Ha, efficient under H0; obtained from xtreg.

Test of H0: Difference in coefficients not systematic

    chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
            =   7.69
Prob > chi2 = 0.2619
```

The Hausman test (p-value = 0.2619) which is greater than 0.05 suggests failing to reject the null hypothesis, indicating no systematic difference between the Fixed Effects and Random Effects models.

Therefore, we can proceed with the Random Effects model, as it is more efficient than the Fixed Effects model when the null hypothesis is not rejected

4.5 Regression Results.

Table 8: Random effects GLS regression

```
Regression with Driscoll-Kraay standard errors   Number of obs      =       552
Method: Random-effects GLS regression            Number of groups   =        33
Group variable (i): FirmID                       Wald chi2(7)       =    160.17
maximum lag: 2                                   Prob > chi2        =    0.0000
corr(u_i, Xb) = 0 (assumed)                      overall R-squared  =    0.0845
```

NPL_Ratio	Coefficient	Drisc/Kraay std. err.	t	P>|t|	[95% conf.	interval]
GDP	-.0558988	.027605	-2.02	0.060	-.1144187	.0026211
D_unenmp	4.728081	1.814676	2.61	0.019	.8811392	8.575024
INFL	.0107426	.0741096	0.14	0.887	-.1463628	.1678479
D_cbr	.0237131	.125161	0.19	0.852	-.2416164	.2890425
Moneysupp	-.1418509	.0902697	-1.57	0.136	-.3332142	.0495124
LDR	.0360782	.0322272	1.12	0.279	-.0322403	.1043968
CAR	.0353414	.0162997	2.17	0.046	.0007877	.0698952
_cons	.0810854	.0358622	2.26	0.038	.005061	.1571099
sigma_u	.04505739					
sigma_e	.06881184					
rho	.30008824	(fraction of variance due to u_i)				

4.5.1 Interpretation of the Random Effects Model.

The Random Effects (RE) model employed in this study provides valuable insights into the factors influencing credit risk in Kenya's banking sector. However, before interpreting the results, it is essential to assess the model's performance and validity.

The RE model was selected following the Breusch-Pagan Lagrange Multiplier test, which favored it over the Pooled OLS model. This test confirmed the presence of significant panel-specific effects, making a panel data model necessary.

Additionally, the Hausman test yielded a p-value greater than 0.05, indicating no systematic differences between the Random Effects and Fixed Effects models, thereby justifying the use of the RE model due to its efficiency in estimating time-invariant variables.

While the model's **R^2** value is low, this should not be interpreted as a fundamental weakness of the research. In panel data models, a low R^2 often reflects the fact that not all random variables associated with the dependent variable (credit risk) are included in the model. This is common in econometric studies, particularly those dealing with complex, multi-dimensional outcomes like non-performing loans (NPL).

The Multiple linear regression model is revealed as:

$$NPL_{it} = 0.0811 - 0.0559GDP_{it} + 4.7281D\_UNEMP_{it} + 0.0107CoreInfl_{it} + 0.0237CBR_{it} - 0.1419MonSupp_{it} + 0.0361\ LDR_{it} + 0.0353CAR_{it} + \epsilon_{it}$$

The p-values provide a measure of statistical significance for the relationship between variables in this model:

GDP Growth: p-value of -0.06 indicates a marginally significant negative relationship with the NPL ratio.

Unemployment (D_UNEMP, p = 0.019), illustrates a significant positive relationship with the NPL ratio.

Inflation and CBR both have p>0.1. This indicates an insignificant relationship, suggesting no strong direct impact on credit risk in this model.

Money Supply (p = -0.136). This is a negative but statistically insignificant relationship, implying that increased money supply might indirectly reduce credit risk but not strongly enough to draw definitive conclusions.

Loan-to-Deposit Ratio with a p-value of 0.279 illustrates its positive but insignificant relationship with the NPL ratio, suggesting that higher loan-to-deposit ratios do not strongly affect credit risk in this dataset.

Capital Adequacy Ratio (CAR, p = 0.046). A significant positive relationship may reflect that banks with higher CARs have more room to engage in riskier lending.

The inclusion of the error term reflects unobservable factors that influence the NPL ratio but are not captured by the specified independent variables. These could include managerial efficiency, industry-specific shocks, or policy interventions not accounted for in the model. Retaining the error term ensures that the model adequately explains the variance in credit risk.

With these results in mind, the first objective was to examine the influence of monetary policy changes on credit risk. The results revealed that while monetary policy is essential for macroeconomic stability, its direct influence on credit risk may be limited during the study period. However, the analysis indicated a negative but statistically insignificant relationship between money supply and the NPL ratio. This finding implies that expansionary monetary policies, by improving liquidity, might reduce financial strain on borrowers and indirectly enhance loan performance. These results highlight the complexity of monetary policy's role in shaping credit risk and underscore the need for further research to explore its indirect effects on the banking sector.

The second objective assessed the relationship between economic performance and credit risk. The findings confirmed that economic performance significantly influences the NPL ratio. GDP growth reduced credit risk by enhancing borrowers' repayment capacity, while rising unemployment increased it, reflecting the financial strain on households and businesses during economic downturns. These findings emphasize the importance of economic stability in mitigating credit risk.

Finally, the third objective explored the combined effect of economic performance and monetary policy on credit risk. Economic performance, particularly GDP growth and unemployment, had a more pronounced impact than monetary policy variables, which showed limited direct effects. However, monetary policy's indirect influence cannot be dismissed. Together, these findings underscore the need for integrated economic and monetary policies to address credit risk in Kenya's banking sector.

CHAPTER 5

DISCUSSIONS AND CONCLUSIONS

5.1 Introduction

This chapter provides a detailed discussion of the results obtained in the analysis. The findings are contextualized within the broader literature and the specific dynamics of Kenya's economy.

5.2 Discussion of Findings

The study aimed to assess the impact of economic performance and monetary policies on credit risk, as measured by the Non-Performing Loan (NPL) Ratio. The results provide significant insights:

GDP Growth:

The marginally significant negative relationship between GDP growth and the NPL ratio ($p = 0.060$) aligns with FitzGerald (2006), who found that economic growth reduces credit risk by improving borrowers' repayment capacity. As the economy grows, household and business incomes rise, enabling timely debt servicing and reducing defaults. This emphasizes the importance of robust economic policies to sustain GDP growth and foster a stable financial system.

Unemployment (D_Unemp):

A significant positive relationship was found between unemployment and the NPL ratio ($p = 0.019$). This result supports the hypothesis that higher unemployment leads to increased credit risk, aligning with the findings of Simiyu and Kisaka (2014), who noted that adverse macroeconomic conditions, such as high unemployment, increase credit risk. Unemployment constrains borrowers' ability to meet loan obligations, highlighting the need for policies that promote job creation and economic stability to reduce systemic risk in the banking sector.

Inflation (INFL) and Changes in Central Bank Rate (D_CBR):

Neither inflation nor changes in the Central Bank Rate showed significant effects on the NPL ratio ($p > 0.1$). While inflation theoretically impacts loan performance

through its effect on real incomes and borrowing costs, the lack of significance in this study suggests that other factors, such as the structure of Kenya's banking sector or inflationary expectations, may mediate this relationship. The lack of significance for inflation and CBR ($p > 0.1$) is consistent with Valahzaghard (2012), who found that inflation's impact on credit risk varies across banking systems and macroeconomic environments.

Money Supply:

Though the relationship between money supply and NPL ratio was negative, it was not statistically significant ($p = 0.136$). This reflects the complex role of liquidity in the economy. Expansionary monetary policy, which increases money supply, can reduce credit risk by improving borrowing conditions (Bernanke & Mihov, 1998). However, the findings suggest that the effect is not strong enough to draw definitive conclusions in the Kenyan context.

Loan-to-Deposit Ratio (LDR):

A positive but insignificant relationship ($p = 0.279$) was observed between LDR and NPL ratio. This indicates that higher LDR does not strongly affect credit risk in the dataset, possibly due to variations in banks' risk management practices. As noted by Athanasoglou, Brissimis, and Delis (2006). While aggressive lending can increase credit risk, well-managed institutions may mitigate this through prudent risk assessment.

Capital Adequacy Ratio (CAR):

The study found a significant positive relationship between CAR and the NPL ratio ($p = 0.046$). This counterintuitive finding could indicate that banks with higher CAR tend to hold more risky loans, leveraging their capital buffers to support higher risk exposure. This aligns with findings from Muriithi and Louw (2017), who observed that Kenyan banks with higher CARs often take on more risks as a form of leverage. This underscores the importance of effective regulatory oversight to balance financial stability with growth.

5.3 Implications

These findings have several implications for stakeholders in Kenya's banking sector:

Policy Interventions: Policymakers should prioritize strategies that enhance GDP growth and reduce unemployment, as these factors significantly impact credit risk. Employment-generation programs and economic reforms can help stabilize credit markets.

Banking Regulations: Regulators should closely monitor banks with high capital adequacy ratios to ensure prudent risk management practices, as higher CAR may encourage riskier lending.

Macroeconomic Stability: While inflation and monetary policy changes were not significant predictors of credit risk, maintaining macroeconomic stability remains essential for fostering a healthy lending environment.

Bank-Specific Strategies: Banks should continue to refine their risk management practices, focusing on internal factors such as loan portfolio quality and customer financial health, to minimize exposure to credit risk.

5.4 Conclusion & Recommendation

This study underscores the critical role of macroeconomic performance and monetary policy in shaping credit risk in Kenya's banking sector. While economic growth and unemployment significantly affect the NPL ratio, other variables like inflation and monetary policy changes have limited direct impact. Additionally, the positive association between CAR and NPL ratio suggests a need for further investigation into bank-specific practices.

Future research could explore these relationships using more granular data or alternative measures of credit risk. Policymakers and practitioners alike must remain vigilant to the dynamic interplay between macroeconomic factors and banking sector performance to ensure a resilient financial system.

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