

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI

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THE EFFECTS OF MACROECONOMIC FACTORS ON CREDIT RISK: EVIDENCE FROM
COMMERCIAL BANKS IN GHANA

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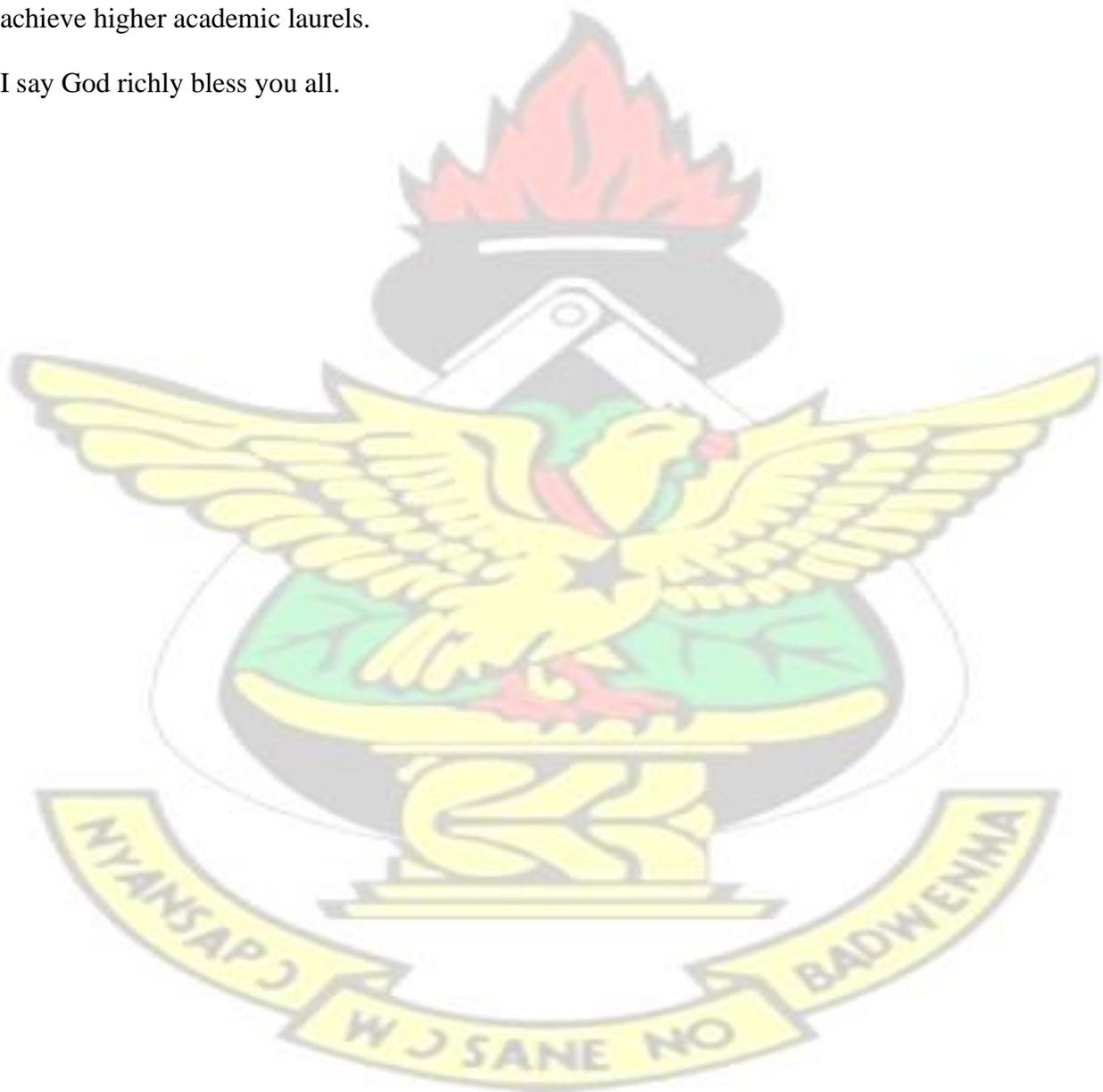
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DEDICATION

I dedicate this work to Almighty God for his mercies and provisions throughout my study in Kwame Nkrumah University of Science and Technology. Another sincere dedication goes out to my husband Pastor Isaac Yanney, my children Abotare Yanney and Obatan Yanney and finally my parent Sarah Kwashie for their love, sacrifices, support and prayers throughout my quest to achieve higher academic laurels.

I say God richly bless you all.



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ABSTRACT

The banking industry is recognized as being crucial to the growth an economy. This industry nevertheless, is susceptible to macroeconomic uncertainty, which raises the credit risk for commercial banks. The research main aim is to examine the effects of macroeconomic variables on credit risk of banks in Ghana. The study design is quantitative in nature and employs the experimental research strategy to establish causality. The study makes use of secondary data sourced from Bank of Ghana and Ghana Statistical Services on macro specific data whiles firm specific data is sourced from the selected banks financial statements. A sample size of 17 universal banks out of a population of 23 was determined using the purposive sampling technique across a seven-year period from 2015 to 2021. The study is grounded on theories like the financial theory also known as financial instability hypothesis, agency theory and the theory of asymmetric information. The results of the study indicated that exchange rate, unemployment rate, GDP and monetary policy rate are inversely related to credit risk. Moreover, for inflation the association is negative with credit risk. The findings of the study points to the fact that macroeconomic factors have a strong ability to predict the probability of default. The study recommends that the Central Bank of Ghana should also take on a more regulatory and proactive role by ensuring that banks have adequate provisions for bad loans, likewise Ghanaian banks should set up a limited lending policy by raising the value and quantity of loan collateral.

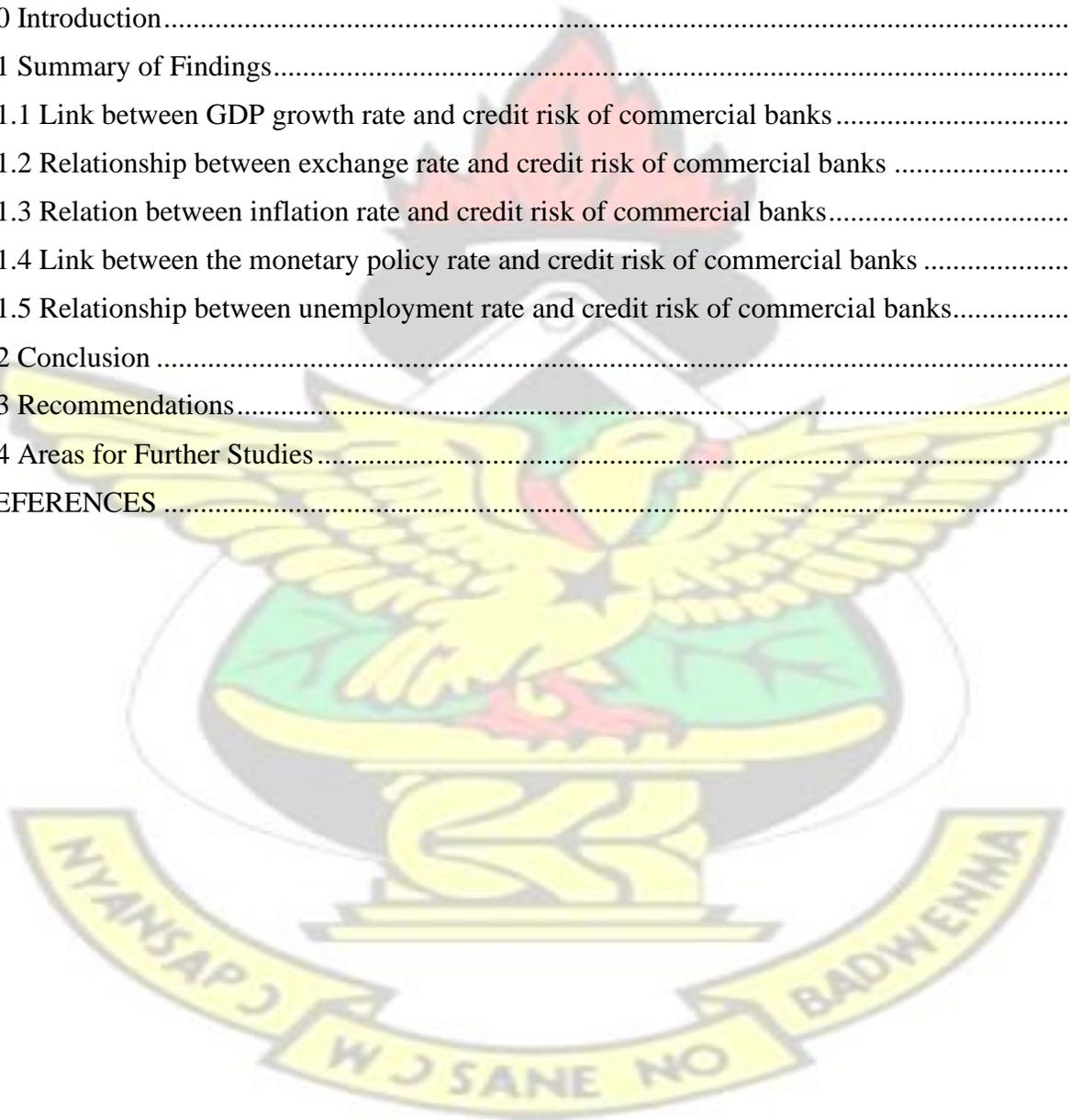
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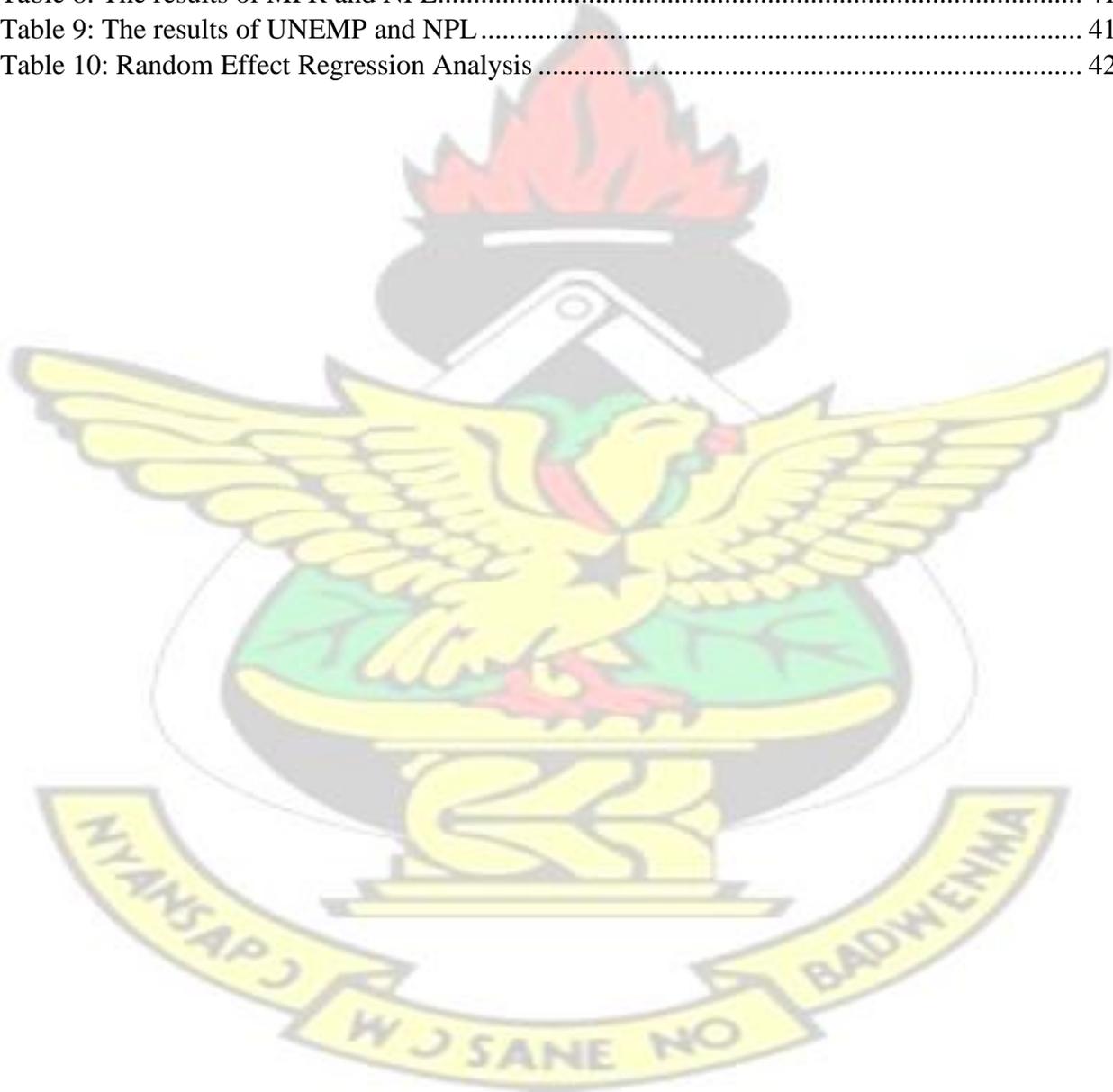
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ABBREVIATIONS

BBWA	British Bank of West Africa
BCBS	Basel Committee on Banking Supervision
BSD	Banking Supervision Department
CEO	Chief Executive Officer
CFOs	Chief Financial Officers
ER	Exchange Rate
EU	European Union
FIH	Financial Instability Hypothesis
FINSAP	Financial Sector Adjustment Program
FINSSIP	Financial Sector Strategic Plan
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
INF	Inflation Rate
LR	Lending Rate
M2GDP	Money Supply to Gross Domestic Product
NPLR	Nonperforming Loans Rate
NPLs	Nonperforming Loans

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The banking industry is recognized as being crucial to the growth an economy. This industry nevertheless, is susceptible to macroeconomic uncertainty, which raises the credit risk for commercial banks. According to Touny & Shehab (2015), macroeconomic factors are the primary driver of systematic risk, which has an impact on whether loan default rates will rise or fall. Macroeconomic factors, more specifically, unfavorable economic conditions, low growth, high unemployment, high interest rates, and high inflation rates are thought to be significant contributors of bank failure and financial crises (Demirgüç-Kunt and Detragiache 1998; Kargi, 2014). Bank collapse may also develop as banks face liquidity or insolvency issues brought on by the increase in bad loans on their balance sheets. Credit risk, which is a major contributor to the economic downturn and a key indicator of financial fragility, accounts for the majority of bank risk (Dudian and Popa, 2013). This also demonstrates that the macroeconomic climate is crucial in determining credit risk.

Banks face a daunting task when it comes to accurately estimating whether a loan will be repaid in full or not which suggest that credit risk specifically default risk is associated with lending. Banks as a result employ a variety of internal strategies such as customer screening and loan stress testing to reduce loan default. Credit risk is defined according to The Basel Committee on Banking Supervision (BCBS) as the “likelihood of losing a part or the whole loan amount due to delayed or no payment”. Anderson (2013) defines credit risk as “the probability that a legally enforceable

contract may become worthless because the counterparty defaults and goes out of business". Saunders and Cornett (2011) define it as the risk that the anticipated cashflows from investments and loans that firms and individuals hold may not be fully paid. Banking supervision department (BSD) of Bank of Ghana mandates banks to segregate customer loans into performing and non-performing loans. Performing loans are current and other loans exceptionally mentioned (OLEM). Non-performing loans are low-quality, speculative, and risky.

It is unclear whether macroeconomic conditions have a positive or negative effect on banks' credit risk. On the plus side, Ozili (2019) found a positive association between nonperforming loans and private credit to GDP ratio. Laryea, Ntow-Gyamfi and Alu (2016) indicated that inflation is insignificant and positively related to NPLs. Ghosh (2015) discovered that public debt, unemployment and inflation rate significantly increases NPLs. Staehr and Uuskula (2020) suggested that inflation and debt rate are positively related to credit risk and a higher GDP reduces NPLs ratio. Arham et al (2020) study recorded a significant positive impact of real interest rate and unemployment rate on NPLs and a negative impact of inflation rate and external debt to GDP on NPLs. Al Masud and Hossain (2021) posit that macro factors, inflation, unemployment, GDP and real interest rate significantly positively impact credit risk as proxied by NPLs.

On the negative side, Ashraf and Butt (2019) revealed an inverse correlation of GDP growth rate and inflation rate on nonperforming loans. Beck, Jakubik and Piloiu (2015) found lending rates, inflation rate and real GDP growth rate as significant influencers of nonperforming loans. Umar and Sun (2018) suggested that macro factors interest rate, GDP, foreign exchange rate and inflation rate has a significant negative effect on NPLs. Kjosevski and Petkovski (2016) found that NPLs is

inversely correlated to credit to GDP ratio and GDP rate. Anita, Tasnova and Nawar (2022) indicated that GDP, money supply and inflation rate is significant and inversely linked with credit risk.

Ghana recently experienced banking problems which led to Bank of Ghana undertaking a financial sector clean up exercise in the year 2017 with the demise and licensing cancellation of nine (9) banks as credit risk (high non-performing loans) was cited as one of the root causes. According to the Bank of Ghana (2018), nonperforming loans (NPLs) in the industry rose from 11.3% in 2014 to 21.6% in 2017 depicting a 91.15% growth rate and a drastic fall in commercial bank profitability which alerted the regulator Bank of Ghana, to take drastic measures to save the industry from collapse through tightening licensing requirements for new entries, minimum capital requirement increment and the passage of the Depositors Protection Act, 2016 (Act 931). Based on the above facts, the study explores the effects of macroeconomic variables on bank credit risk in Ghana.

1.2 Problem Statement

The core function of banks in every economy is credit creation, yet because of this, they are exposed to credit risk. Low credit standards as well as less focus on variation in economic conditions continue to be the main cause of serious banking problems. These factors can also contribute to poor portfolio management and a decline in bank credit ratings. The majority of research on the macro factors influencing bank credit risk has been done in the advanced nations. This includes Staehr and Uuskula (2021) studied the macroeconomic indicators of nonperforming loans among EU countries. Umar and Sun (2018) investigated both micro and macroeconomic determinants of credit risk among Chinese banks. Koju et al. (2020) explored the macroeconomic

determinants of credit risk among high income nations. Carvalho et al. (2020) examined the macroeconomic determinants of credit risk from the Eurozone. For emerging and developing countries, Kjosevski (2016) looked at the macroeconomic effects and determinants on nonperforming loans from the Baltic states' context. Arham et al. (2020) in Asia examined the influence of macroeconomic indicators on nonperforming loans of banks from an emerging market perspective. Despite the fact that each study presented adds to the body of knowledge, the key findings from them are conflicting. Additionally, when it comes to firm-level studies, a country-specific perspective is crucial because developing nations, particularly African nations, differ greatly in terms of their political dynamics and economic systems. As a result, it is unlikely that findings can be generalized from one African nation to another. There haven't been many related empirical studies on the banking sector in Ghana, to the researcher's knowledge. Most of the studies in Ghana have focused on the effects of credit risk on bank financial performance incorporating both micro and macro determinants (Oduro, Aseidu and Gadzo, 2018; Laryea, Ntow-Gyamfi, and Azumah-Alu, 2016; Gadzo et al., 2019; Madugu et al., 2019; Amuakwa-Mensah and Marbuah, 2017). Therefore, by investigating the effects of macroeconomic variables on the credit risk of banks in Ghana, this study attempts to address this gap in the literature, which is relevant as this kind of empirical study is necessary for the supervision and regulation of the banking industry nonperforming loans levels.

1.3 Objectives of the Study

The research's main aim is to examine the effects of macroeconomic variables on the credit risk of banks in Ghana. The research-specific objectives are stated as;

1. To explore the link between GDP growth rate and credit risk of commercial banks.

2. To examine the relationship between exchange rate and credit risk of commercial banks.
3. To assess the relation between inflation rate and credit risk of commercial banks.
4. To explore the link between monetary policy rate and credit risk of commercial banks.
5. To investigate the relationship between unemployment rate and credit risk of commercial banks.

1.4 Research Questions

1. What is the link between GDP growth rate and credit risk of commercial banks?
2. What is the relationship between exchange rate and credit risk of commercial banks?
3. What is the relation between inflation rate and credit risk of commercial banks?
4. What is the link between monetary policy rate and credit risk of commercial banks?
5. What is the relationship between unemployment rate and credit risk of commercial banks?

1.5 Significance of the Study

The study's findings will help close the knowledge gap that exists about the impact of Ghana's macroeconomic situation on banks' credit risk.

When assessing the financial health of banks, the CEOs, board of directors, CFOs, senior managers, and senior managers will be able to use the study to better understand how macroeconomic conditions affect credit risk.

The study's results will help risk managers and investors to make quick judgments on how to minimize or absorb risk in order to optimize returns.

The research community can use the findings of the study to expand their understanding of the areas that have already been discussed and further explore areas that has not been covered in this research.

The study's findings are significant for government, regulatory agencies, and commercial banks themselves on the policy level. Knowing precisely how macroeconomic factors affect credit risk and how to improve the banking sector through the formulation of macroprudential and fiscal policies will be helpful to regulators.

1.6 Brief Literature Review

The literature review is spilt into four distinct thematic areas starting with the conceptual review which defines the key concepts macroeconomic factors and credit risk used in the study followed next by the theoretical review, which examines theories like the financial theory also known as financial instability hypothesis, agency theory and the theory of asymmetric information. The empirical review follows, reviewing earlier literature in accordance with the study's objectives and finally the conceptual framework which diagrammatically captures the relationship among the study variables.

1.7 Brief Methodology

The study design is quantitative in nature and employs the experimental research strategy to establish causality. The study makes use of secondary data sourced from Bank of Ghana and Ghana Statistical Services on macro specific data whiles firm specific data is sourced from the selected banks financial statements. A sample size of 17 universal banks out of a population of 23 was determined using the purposive sampling technique across a seven-year period from 2015 to 2021,

which was based on the justification of data availability over the study time frame and being licensed by the regulator Bank of Ghana as of the year 2015. The study used the fixed and random effects regression approach to accomplish the research goals. The dependent variable, credit risk is measured by non-performing loans ratio and the macro-economic factors; inflation, GDP, exchange rate, unemployment rate and monetary policy rate as independent variables.

1.8 Organization of the Study

There are five chapters in the study. The first chapter begins with an introduction that covers the study's background, problem statement, objectives, and research questions, as well as the research's relevance, and scope. The second Chapter discusses the review of the relevant literature, and theories that serves as the study's foundation. The third Chapter describes the study's methodology and focuses on the population, sampling strategy, data gathering, and analysis. Chapter 4 discusses the study's data analysis after that the study's results, conclusions, and suggestions are compiled in chapter five.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter provides an appropriate literature review on the topic “*the effects of macroeconomic variables of credit risks of commercial banks in Ghana*”. The chapter is split into the following five (5) sections: Part 2.1 introduces the two key concepts of credit risk and macroeconomic determinants and defines them. The key theories underlying the study, namely the Asymmetric Information Theory, Financial Theory and the Agency Theory, are covered in part 2.2. The conceptual framework is described in part 2.4 after the empirical assessment of earlier studies based on the study objectives is addressed in part 2.3. Part 2.5 presents the chapter summary as a last item.

2.1 Conceptual Review

The two main constructs employed in the study, credit risk and macroeconomic determinants are explained in this section of the literature review.

2.1.1 Credit Risk

The increase in the rate of NPL is an international phenomenon that has been since the emergence of the global economic crisis. The slowdown in the economy and the borrower's declining financial stability as a result of excessive inflation, and currency depreciation are common factors that affect the borrower's declining creditworthiness and capacity to pay off obligations as agreed. The core function of banks in every economy is credit creation, yet because of this, they are exposed to

credit risk. Information asymmetry, moral hazard and adverse selection are the main sources of credit risk in the banking industry. Credit risk is defined according to The Basel Committee on Banking Supervision (BCBS) as the “likelihood of losing a part or the whole loan amount due to delayed or no payment”. Anderson (2013) defines credit risk as “the probability that a legally enforceable contract may become worthless because the counterparty defaults and goes out of business”. Saunders and Cornett (2011) define it as the risk that the anticipated cashflows from investments and loans that firms and individuals hold may not be fully paid.

Credit risk is one of the most important facets of risk management. Enhancing the overall quality of their bank portfolios is vital for banking institutions, especially those developing their own credit risk models. There are three different methods. Traditional models which are the first is built on comparing client-specific facts. The major objective of these models is to predict future client quality with accuracy. The use of models with option pricing constitutes the second strategy (also termed "structural models") which looks at a company's default in light of its worth and leverage. The reduced form model is the third type which uses bond price as an input to ascertain the probability of default and recovery.

Along with credit facility fees, commercial banks run the risk of losing all or a portion of the loans disbursed including facility charges. This will subsequently have an impact on the banks' capital and net income. As demonstrated by Baidoo and Akoto (2019), poor credit risk management hinders banks' capacity to conduct business, which can result in clients losing faith in the financial institution. To guarantee that loans given are repaid, management needs to implement sound and set rules for evaluating, approving and monitoring individual and institutional credit applications.

Every lender places a high priority on CRM since it is the basis for calculating the likelihood that a borrower will not make loan repayments or other contractual obligations. CRM seeks to measure the risk that a lender won't receive the main sum plus accrued interest due to them, which, if allowed to happen, will result in a loss and increase the cost of collecting the debt.

2.1.2 Macroeconomic Determinants

All variables that management has no direct control over, including as laws and regulations, macroeconomic conditions, advances in technology, and shifting consumer preferences, are referred to as macro factors or external determinants (Zainudin et al, 2018). Macro parameters used in this study are limited to GDP, inflation, interest rate, exchange and unemployment rate. It is unclear how inflation may affect the caliber of bank assets. Debt servicing is made simpler by lower real interest rates, which reduce the real value of outstanding debt. On the other hand, inflation can lower real earnings (when prices are stable) and / or cause the monetary authority to hike interest rates (Vo, 2018). Gross Domestic Product growth rate evaluates the overall economic output. The risk of default is lower in periods of economic than period of economic slowdown.

Through the balance sheet route, a major depreciation of the domestic currency could result in a big increase in nonperforming loans for nations with a relatively high proportion of private sector borrowing in foreign currencies (Espinoza and Prasad 2010). However, some research suggests to a favorable relationship between the exchange rate and NLPs, possibly as a result of larger exports brought on by increased export competitiveness boost the capacity of local businesses and households to pay back their debts (Klein 2013). The proportion of the workforce without a job is known as the unemployment rate. Rather than foretelling changes in economic conditions, it often

rises or decreases in response to them making it a lagging indicator. The unemployment rate is likely to increase when the economy is struggling and there are few open positions. It is reasonable to anticipate a decline in it when the economy is expanding healthily and there are plenty of available jobs. Bofondi and Ropele (2011) argue that there is a positive link between non-performing loans and unemployment rates due to the fact that borrowers' loan repayment issues get worse when unemployment rises.

2.2 Theoretical Literature Review

The relevant theories underpinning the study, namely the agency theory, the buffer theory of capital adequacy and the lemon theory have been explained below;

2.2.1 Agency Theory

The agency theory contends that bank management and stockholders have conflicting objectives. While managing the business in the best interests of the shareholders, managers are custodians of the operational structure. The agency theory disregards the importance of other parties. The fact that doing so seems to conflict with the interests of the shareholders means they are not entitled to any corporate benefits. Unfortunately, as a result of these conflicts of interest, the bank is required to pay agency fees. The idea asserts that potential conflicts of interest arise from principal-agent relationships between bank owners and debt holders in addition to agency fees. There is a higher credit risk between commercial banks and their debtors when shareholders participate in the funding of investments. Banks stand to gain significantly if these hazardous financial endeavors are successful. However, the bank alone is liable for the credit risk loss of such investments, which

affects its financial performance or causes it to forego undertaking projects that will boost net value.

2.2.2 The Asymmetric Information Theory

Akerlof first outlined the concept in his 1970 work "the market for lemons." According to Tupangiu (2017), information asymmetry—one of the tenets of the lemon theory—is defined as the interactions in which one agent has access to information while the other side does not. The theory asserts that it might be impossible to discern good borrowers from bad borrowers (Auronen, 2003), which could lead to issues with moral hazard and adverse selection. The phenomenon of adverse selection, or anti-selection, is apparent prior to signing the loan agreement while information asymmetry turns into an element of moral hazard once the credit agreement has been signed and credit has been granted. A borrower frequently understands their ability to repay a loan better than the lender.

A company's directors have a better understanding of the corporation's actual performance than the owners have. Given that one side to the financial arrangement has knowledge that is more or less accurate than the other, the information asymmetry looks to be a significant obstacle to investment funding. Banks, who serve as the financial middleman in charge of asset translation, need more information to evaluate the borrower before directing cash to them. Banks frequently experiences information asymmetry, which prevents them from knowing the caliber of loan applicants. Poor-quality borrowers attempt to market themselves as good-quality customers in a credit arrangement by withholding information. Additionally, riskier borrowers are seeking for loans and aren't concerned about loan payback because they are willing to accept a high interest

rate and rising facility costs which makes it a hurdle for banks to substantiate good from bad loan applicants (Stiglitz and Weiss, 1981). This places lenders at a significant disadvantage in terms of knowing as much as possible about the borrower, and when combined with the fact that borrowers with poor credit score are more likely to borrow than borrowers with good credit, lenders are more likely to choose borrowers with wobbly projects than borrowers with viable ones.

2.2.3 Financial Theory

Financial theory also known as financial instability hypothesis (FIH). The economist Hyman Minsky (1977) created the theory of financial instability and contended that because times of economic boom encouraged borrowers and lenders to act more recklessly, financial crises are intrinsic to capitalism. Financial bubbles and the ensuing collapses are the results of this overly optimistic mindset. As a result, capitalism is prone to swinging between stable and unstable financial times which means that the government must regulate this kind of market failure. After extended generally stable periods of prosperity, the worst and longest depressions tend to strike. This is partly due to agents rationally adjusting their expectations during prosperous periods and hence becoming more upbeat about potential future economic outcomes. Then, investors raise their leverage and rebalance their portfolios toward investments that were previously viewed as overly risky. Therefore, when a downturn inevitably happens, the financial crisis and the degree of default worsen.

Traditionally, bank loans have been backed by assets which means that lending is covered against any default. Banks are willing to lend huge loans but want smaller deposits. As asset prices grow as a result of more lending, confidence is further boosted. The theory also takes into account how

debt is validated and treats banking as a profit-seeking enterprise. According to Minsky, there are three different income-debt linkages for economic units: hedging, speculating, and Ponzi finance. If hedge financing predominates, the economy may well be an equilibrium-seeking and confining system. In contrast, the possibility that the economy is a "deviation-amplifying" system increases as speculative and Ponzi finance weight increases. Therefore, the FIH contends that during extended periods of prosperity, capitalist economies have a propensity to switch from a stable financial structure dominated by hedge funds to one that places a greater emphasis on speculative and Ponzi finance (unstable). The FIH is a model of a capitalist economy that produces business cycles of varying severity without the aid of exogenous shocks:

2.3 Empirical Review

The section critically reviews related empirical studies based on study objectives.

2.3.1 GDP Growth Rate and Credit Risk

Kuzucu and Kuzucu (2019) undertook a comparative study by exploring during the pre-an post-global financial crisis period the determinants of non-performing loans (NPLs) from developed economies as against emerging economies based on dynamic panel estimation. The sample selected for the study comprised 30 developed and 53 emerging economies over a fifteen-year period from 2001 to 2015. Based on the system and difference GMM estimation, the findings indicated that real GDP growth significantly influences the NPL ratio, while the link between NPLR and inflation is negative. Furthermore, the study posits that compared to macroeconomic factors, the fsfactors have a less explanatory influence when it comes to estimation of NPLs.

Koju, Koju and Wang (2020) examined the macroeconomic determinants of credit risk among high-income nations. Using a sample size of forty-nine (49) developed nations the study spanned a period of sixteen (16) years from 2000 to 2015 while employing the system GMM estimator. NPLs served as proxy for credit risk which is the dependent variable with the independent variable being macroeconomic indicators. The findings indicated an inverse link between GDP rate and NPLs.

Carvalho, Curto and Primor (2020) examined the macroeconomic determinants of credit risk among firms in the Eurozone. The study used eleven (11) European nations as sample size, with the study period covering from 2007 to 2017 yielding 534,835 firm year observations. Employing a multi-period discrete model, the study found an inverse relation between credit risk proxied by probability of default (PD) and GDP growth rate.

Radivojevic et al (2018) examined the non-performing loans determinants among emerging markets in Latin America. World Bank website served as the source of data collection over a sixteen year-period from 2000 to 2015. The dependent variable is NPLs with micro and macro variables as independent variables. Based on GMM system and difference technique the study findings suggested that NPLs is significantly influenced by GDP while inflation and unemployment rate did not have any statistically significant influence on NPLs.

Irina and Angela (2016) looked at the macroeconomic indicators on loan quality European nations. The study used bank data from 11 European countries over a study period of fourteen years from

2000 to 2014. The study results imply that the GDP rate, public debt, and unemployment rate have a significant influence on non-performing loans (NPLs). The effect of GDP on NPLs is negative.

Twum, et al (2021) examined how internal and external factors influence credit risk in banks from a Chinese perspective. Qualitative and quantitative designs were both employed with reliance on secondary data sources over a fourteen-year period from 2005 to 2018. Based on OLS regression, the study found credit risk and the GDP rate to be negatively related to each other. Again, inflation and interest rates, were positively linked to credit risk.

2.3.2 Exchange Rate and Credit Risk

Atanasijević and Božović (2016) assessed the influence of exchange rates on corporate loan default from the European context. The study was conducted over a five-year period from 2008 to 2012. The study results imply that whether the loan is in local or foreign currency, exchange rate depreciation is linked to a rise in the default rate.

Chaibi and Ftiti (2015) undertook a cross-country study to explore the credit risk determinants between Germany and France. The study spanned over a seven-year period from 2005 to 2011 with 133 German banks and 147 French banks adopted as the sample size. Based on the system GMM technique, the study found out that with the exception of inflation, macroeconomic variables such as unemployment rate, interest rate, GDP, exchange rate had a significant impact on NPLs of both countries.

Abusharbeh (2020) undertook an investigation on the determinants of credit risk from the Palestine perspective. The study covered a twelve-year period from 2007 to 2018 with the fixed and random effects estimate technique utilized. The Central Bureau of Statistics in Palestine served as the source from macroeconomic variables whiles from firm specific variables were sourced from the annual reports of six (6) sampled listed banks on the Palestine exchange. The findings suggested a positive impact of interest rate on NPLs implying that higher interest rate leads to credit defaults as borrowers' capacity to settle loans when they fall due reduces. Furthermore, macro variables, inflation rate, GDP rate and exchange rate had an insignificant effect on NPLs.

Castro (2013) assessed the macroeconomic determinants of bank credit risk from five European countries over the period 1997 –2011. The study concluded that the macroeconomic environment has a significant impact on the banking credit risk. The credit risk increases when GDP growth, decline and rises when the unemployment rate, and interest rate, increase. It is also positively impacted by an appreciation of the real exchange rate.

Anastasiou, Louri, and Tsionas (2019) studied the influence of NPLs of Euro banks in two distinct groups—core and periphery banks. The study timeframe covered a ten-year period from 2003 to 2013. According to the study findings, NPLs tend to rise as economic conditions deteriorate, such as when unemployment rises, taxes rise, and GDP slows. In the periphery, the tendency is much more pronounced. Furthermore, the study revealed a significant and positive association between NPL and net interest margin.

2.3.3 Inflation Rate and Credit Risk

Amuakwa-Mensah et al (2017) explored the driving forces behind NPLs in the Ghanaian banking industry. Vector autoregression (VAR) methodology and the system GMM estimator is employed. Twenty (20) Ghanaian banks was used as sample size with secondary data collected over fifteen (15) years from 1997 to 2011. The results showed that real GDP growth and exchange rate have a negative effect on NPLs, whereas the inflation rate and public debt have a positive effect.

Arham et al (2020) looked at whether macroeconomic indicators have an impact on NPLs among Asia countries. The study used banks from ten (10) Asian countries while also employing the panel regression. The findings indicated that interest rate and unemployment had a significant positive effect on NPLs. For inflation rate the impact was negative on NPLs.

Umar and Sun (2018) investigated the macroeconomic and industry-specific factors that influence NPLs for Chinese banks between the year 2005 and 2014. The study makes use of data from 197 Chinese banks, and the coefficients of independent variables have been measured using the system GMM estimation approach. NPLs in Chinese banks are significantly influenced by the inflation rate, GDP growth rate, effective interest rate and foreign exchange rate. Furthermore, listed and unlisted banks have different NPL factors.

Messai, and Gallali (2019) explored the macroeconomic determinants of credit risk based on the panel vector autoregressive (P-VAR) approach. The study relied on a sample of 18 European countries over a twelve-year period from 2000–2011. The macroeconomic variables utilized include stock price index, unemployment and inflation rate with credit risk proxied by NPL. The

study found NPL and inflation rate to be positive and significantly related to each other as inflation increases the interest rate on loans, which results in an increase in credit risk.

2.3.4 Monetary Rate and Credit Risk

Asiama and Amoah (2019) assessed the effects of monetary policy rate on the growth of NPLs from the Ghanaian context. Using the autoregressive distributed lag (ARDL) estimator, the study found no significant effect of monetary policy on NPLs in the short run. However, there was an existence of a statistically significant positive influence of monetary policy on NPLs growth in the long run. The study covered a seventeen-year period from the year 2000 to 2016.

Adeola and Ikpesu (2017) explored the macroeconomic factors of non-performing loans from the Nigerian perspective. Time series data over a ten-year period spanning from the year 2005 to 2014 was gathered on 25 sampled banks in Nigeria. NPL represents the dependent variable while macro factors GDP, inflation (INF), exchange rate (ER), lending rate (LR) and money supply to GDP (M2GDP) represent the independent variable. The findings also showed that whereas LR, M2GDP, and ER have a positive and significant connection with NPL, INF, and LR do not. Only three of the six macroeconomic factors considered in the study—LR, M2GDP, and ER—can be seen as determining NPL in Nigeria; GDPGR, INF, and ER, while having a positive association with NPL, do not impact or determine it.

Mahrous, Samak and Abdelsalam (2020) explored the influence of monetary policy on credit risk among firms in MENA countries. Based on a sample size of 15 states panel data was collated over a twenty (20) year period from the year 1997 to 2017. NPL serves as proxy for credit risk which

is the dependent variable while macroeconomic factors as independent variables. Based on the linear GMM estimator the study results present a positive and significant link between monetary policy and credit risk a threshold of 6.3 implying that at a higher monetary policy rate credit risk is also bound to be higher. Moreover, for GDP and inflation rate, the effect on NPL is a negative effect.

2.3.5 Unemployment Rate and Credit Risk

Lee and Rosenkranz (2020) in Asia investigated the macroeconomic conditions and its linkage with NPLs. Additional evidence for the feedback effects of NPLs on the real economy and financial variables comes from a panel vector autoregression (VAR) analysis of the macro financial consequences of NPLs show that a rising NPL ratio lowers GDP growth, reduces credit availability, and raises the unemployment rate. The study selected 165 banks from 17 nations in Asia with annual data gathered over a twenty (20) year period from 1995 to 2014.

Kjosevski and Petkovski (2017) analyzed the determinants and macroeconomic effects of NPLs in the Baltic States. 27 sampled banks were utilized with data collated over a ten-year period from 2005 to 2014 while adopting the difference GMM estimator. The study findings demonstrated a significant and negative link between GDP and NPLs. Again, a positive relation was recorded between inflation rate and NPL same with unemployment rate and NPLs.

Messai and Jouini (2013) based on a sample of 135 European banks, empirically investigated the factors that contribute to nonperforming loans. The study concentrated on the banks associated with the nation's most severely impacted by the 2008 financial crisis, namely Greece, Spain and

Italy. The researchers selected particular bank variables and macroeconomic indicators as drivers of subprime loans based on prior studies. Findings suggested that the relationship between non-performing loans and the unemployment rate, inflation rate, and loan loss provisions is positive. The GDP growth rate is significantly negatively impacted by these loan default.

Anastasiou, Louri, and Tsionas (2019) looked at the non-performing loans (NPLs) among Euro banks from the year 2003 to 2013. The findings proposed that NPLs tend to rise as economic conditions deteriorate, such as when unemployment rises, taxes rise, and GDP slows. In the periphery, the tendency is much more pronounced. Negative correlation exists between credit size and NPLs. Furthermore, interest rate margins and NPLs are negatively related.

Kumar et al (2018) in Fiji explored the NPLs determinants from a small nation perspective. The study used the entire Fiji banking industry which is made of five (5) banks and two (2) no-banks firms covering a fourteen-year period from 2000 to 2013 based on the OLS regression. The study found a negative and statistically significant link between NPL and the unemployment rate.

Messai, and Gallali (2019) explored the macroeconomic determinants of credit risk based on the panel vector autoregressive (P-VAR) approach. The study relied on a sample of 18 European countries over a twelve-year period from 2000–2011. The macroeconomic variables utilized include stock price index, unemployment and inflation rate with credit risk proxied by NPL. The study found NPL and unemployment rate to be positively related to each other. unemployment and the stock price index.

Table 1 Summarized empirical literature review on credit risk and macroeconomic factors

Authors	Method	Research focus	Summary of the findings
Kuzucu and Kuzucu (2019)	30 developed and 53 emerging economies system and difference GMM estimation 2001-2015	comparative study on the determinants of NPLs during the pre- and post-global financial crisis period	The results showed that real GDP growth significantly influences NPL ratio, while the link between NPLR and inflation is negative
Koju, Koju and Wang (2020)	System GMM estimator analysis forty-nine (49) developed nations covering 2000-2015	examined the macroeconomic determinants of credit risk among high-income nations	The findings indicated an inverse link between GDP rate and NPLs.
Carvalho, Curto and Primor (2020)	Multi-period discrete model 11 sampled European nations covering 2007-2017	examined the macroeconomic determinants of credit risk among firms in the Eurozone.	Results indicated an inverse relation between credit risk proxied by the probability of default (PD) and GDP growth rate
Radivojevic et al (2018)	GMM system and difference technique covering 2000-2015	examined the non-performing loans determinants among emerging markets in Latin America	The study results revealed that NPLs is significantly influenced by GDP whiles inflation and unemployment rate did not have any statistically significant influence on NPLs
Irina and Angela (2016)	11 sampled European nations covering 2000-2014	looked at the macroeconomic indicators on loan quality European nations	The study results imply that GDP rate, public debts and unemployment rate has a significant influence on NPLs. The effect of GDP on NPLs is negative
Atanasijević and Božović (2016)	Serbian banks covering 2008 – 2012	assessed the influence of exchange rate on corporate loan default from the European context	The study results implied that whether the loan is in local or foreign currency, exchange rate depreciation is linked to a rise in the default rate
Chaibi and Ftiti (2015)	system GMM technique 147 French banks covering 2005-2011	undertook a cross country study to explore the credit risk determinants between Germany and France	The study found out that with the exception of inflation, macroeconomic variables such as unemployment rate, interest

			rate, GDP, exchange rate had a significant impact on NPLs of both countries.
Abusharbeh (2020)	6 sampled banks Covering 2001-2007	investigation on the determinants of credit risk from the Palestine perspective	The findings suggested a positive impact of interest rate on NPLs
Castro (2013)	Pakistan System GMM 5 European countries Covering 1997-2011	assessed the macroeconomic determinants of bank credit risk	The study concluded that the macroeconomic environment has a significant impact on the banking credit risk
Anastasiou, Louri, and Tsionas (2019)	Fixed effects and two-stage least squares regression Covering 2003-2013	examined the NPLs of euro area banks in two separate groups of core and periphery euro area banks	The study found the relationship between interest rate and NPLs to be negative
Amuakwa-Mensah et al (2017)	Vector autoregression (VAR) methodology and the system GMM estimator 20 banks Covering 1997-2011	explored the driving forces behind NPLs in the Ghanaian banking industry	The results showed that real GDP growth and exchange rate have a negative effect on NPLs, whereas the inflation rate and public debt have a positive effect
Arham et al (2020)	Ten (10) Asian countries panel regression	looked at whether macroeconomic indicators have an impact on NPLs among Asia countries	The findings indicated that interest rate and unemployment had a significant positive effect on NPLs. For inflation rate the impact was negative on NPLs.
Umar and Sun (2018)	system GMM estimation approach 197 Chinese banks covering 2005-2014	investigated the macroeconomic and industry-specific factors that influence NPLs for Chinese banks	The study found a strong and positive relationship between liquidity and sustainable growth rate
Asiama and Amoah (2019)	autoregressive distributed lag (ARDL) estimator covering 2000-2016	assessed the effects of monetary policy rate on the growth of NPLs from the Ghanaian context	The study found no significant effect of monetary policy on NPLs in the short run. However, there was an existence of a statistically significant positive influence of monetary policy on NPLs growth in the long run

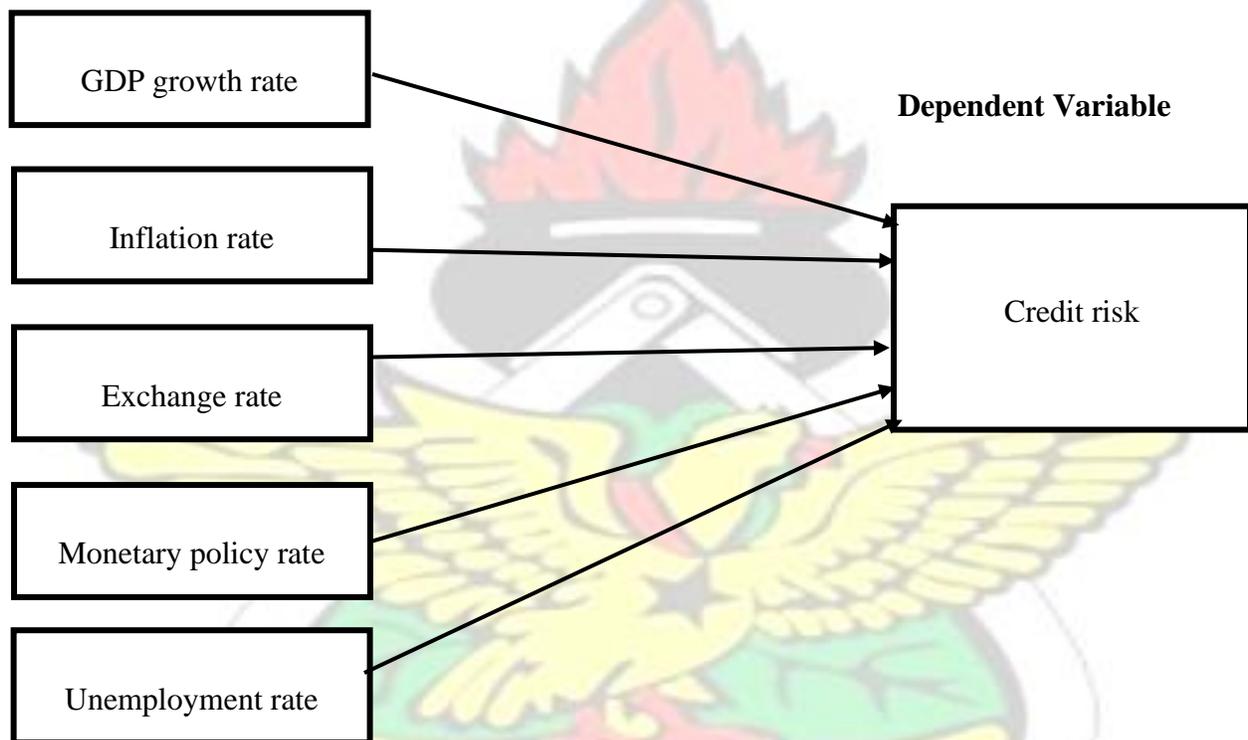
Adeola and Ikpesu (2017)	25 sampled banks covering 2005-2014	explored the macroeconomic factors of non-performing loans from the Nigerian perspective	The findings also showed that whereas LR, M2GDP, and UR have a positive and significant connection with NPL, INF, ER, and LR do not
Mahrous, Samak and Abdelsalam (2020)	sample size of 15 states covering 1997-2017 linear GMM estimator	explored the influence of monetary policy on credit risk among firms in MENA countries	The study results present a positive and significant link between monetary policy and credit risk a threshold of 6.3
Lee and Rosenkranz (2020)	165 banks from 17 nations covering 1995-2014 panel vector autoregression (VAR) analysis	investigated the macroeconomic conditions and its linkage with NPLs	The results showed that a rising NPL ratio lowers GDP growth, reduces credit availability, and raises the unemployment rate
Kjosevski and Petkovski (2017)	difference GMM estimator covering 2005-2014 27 sampled banks	analyzed the determinants and macroeconomic effects of NPLs in the Baltic States	The study findings demonstrated a significant and negative link between GDP and NPLs
Messai, and Gallali (2019)	panel vector autoregressive (P-VAR) approach 18 European countries covering 2000-2011	explored the macroeconomic determinants of credit risk	The study found NPL and inflation rate to be positive and significantly related
Twum, et al (2021)	OLS regression covering 2005-2018	examined how internal and external factors influence credit risk in banks from a Chinese perspective.	The study found credit risk and the GDP rate to be negatively related
Messai and Jouini (2013)	135 European banks System GMM estimator	investigated the factors that contribute to nonperforming loans	Findings suggested that the relationship between non-performing loans and the unemployment rate, inflation rate, and loan loss provisions is positive
Kumar et al (2018)	OLS regression 5 banks covering 2000-2013	explored the NPLs determinants from a small nation perspective	The study found a negative and statistically significant link between NPL and unemployment rate

2.4 Conceptual Framework

The conceptual framework methodically outlines the key variables used throughout the research investigation in a diagrammatic manner.

Figure 2.1 Conceptual Framework

Independent Variables



Source: Author's Construct (2022)

2.5 Chapter Summary

The key concepts credit risk and macroeconomic determinants have been discussed in this chapter. The theoretical review includes asymmetric information theory and agency theory as well as an empirical review of related works and conceptual framework diagrammatically presenting the link among the study variables that have been covered in this chapter.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

The research methodology used to explore "the macroeconomic determinants of credit risk" is discussed in this chapter. The chapter is broken up into five sections, with the first section discussing study design. The research population is the subject of the second section. The third talks about the sample and the method of sampling. The fourth section examines the sources and types of data. The analysis of the data, model estimate, and variable definition are covered in the fifth section. The chapter summary is the final section.

3.1 Research Design

This is referred to as the strategy the researcher selects to rationally and convincingly combine the several study variables so as to guarantee success in addressing the research topic. It serves as a guide for data collection, evaluation, and analysis. (Labaree, 2009). The study uses a quantitative strategy based on the research topic since it uses numbers that are quantifiably analyzed using statistical methods in accordance with related studies (Mahrous, Samak and Abdelsalam, 2020; Abusharbeh, 2020). Additionally, this study adopts the experimental research techniques to identify causality (Saunders et al., 2007).

3.2 Population of the Study

The total population of the study includes all 23 universal banks—listed and unlisted—that are actively doing business in Ghana. (BOG banking industry report, 2021).

3.3 Sample Size and Sampling Technique

Over a seven-year period from 2015 to 2021, this study examined seventeen (17) universal banks from a pool of 23 banks currently doing business in Ghana. The explanation for the sample size assumes that banks should have financial data and be operational over the study period. In accordance with comparable studies Castro (2013) and Klein (2013), a purposeful sampling strategy was used to choose the banks for the research.

3.4 Data Collection

Data was collected from secondary sources, with firm-specific information coming from the yearly final accounts of the chosen banks and macro information coming from global data and Bank of Ghana website over a seven-year period from 2015 to 2021. The numerical data collected from the data source was coded using Microsoft Excel 2018 according to the variables used in the study.

3.5 Profile of Sampled Banks

Access Bank; In 2009, the bank penetrated the Ghanaian banking sector to provide financial banking services. It changed its name to Access Bank Ghana Plc when it got listed on the Ghana Stock Exchange (GSE) in 2016. This made it the first Nigerian bank to accomplish the milestone of being listed on the Ghanaian stock market.

ADB Bank: The Ghana Act of Parliament established the bank as a state-owned institution to serve the financing requirements of the argic industry. It was formerly known as the Agricultural Credit and Co-operative Bank and is currently listed on the Ghanaian stock market.

ABSA Bank: Formerly known as Barclays Bank of Ghana, the colonial bank was first established in 1917. In 1925, it merged with two other banks to become Barclays bank. Barclays Africa Group changed its name to Absa Group Limited in 2018; in Ghana, the change was finalized as Absa Bank Ghana Limited in 2020.

Bank of Africa: The bank's adventure began in the year 1982 in Mali. The BMCE bank of Morocco assumed majority control of the Bank of Africa Group in 2010. The bank began operations in Ghana in the year 2011 after receiving a universal banking license from the Bank of Ghana.

Cal Bank Ghana: The bank begun operations in the year 1990. It received a operational license from the regulator, BoG in 2004 to conduct banking business in Ghana. It is currently listed and trades with the symbol CAL on the stock exchange of Ghana.

Ecobank Ghana: The bank was founded in 1990 and is currently active in 32 nations. Additionally, the bank is listed and trades with the symbol EBG the GSE. The bank is a member of Pan-African Ecobank and it purchased all of Trust bank shares in the year 2011.

First Atlantic Bank: The Bank began operations as a commercial bank in 1995, focusing mostly on Accra with its headquarters at Ridge. It received universal bank status in 2011 from the Bank

of Ghana. In order to comply with new capital requirements imposed by the Bank of Ghana, First Atlantic Bank amalgamated with Energy Bank Ghana in with a merged name First Atlantic Bank (Ghana) Limited.

Fidelity Bank: A Ghanaian locally owned private bank is a locally owned bank that was founded and granted a license to operate as a universally licensed commercial bank by the Bank of Ghana in 2006. The bank's central office is located in Accra's Ridge Towers, and it now has more than 75 branches.

GCB bank: The bank was originally founded in 1953 as the Bank of the Gold Coast before changing its name to Ghana Commercial Bank in 1957 after Ghana won independence. Up until 1966, the Ghanaian government owned the bank 100 percent. After that, it started to sell up its shares, and currently owns 21.4% of the company. Additionally, the bank is listed on Ghana Stock Exchange.

Guaranty Bank Ghana: The bank is owned by its parent company Guaranty Trust Bank Plc, one of the domestic owned banks in Nigeria. It was founded in Ghana in 2004 and granted a license to conduct commercial banking operations by the Bank of Ghana in 2006.

Prudential Bank (PBL): A domestically and privately held commercial bank. The Bank of Ghana granted the bank a universal banking license when it was established in 1993. PBL Properties, PBL Securities and PBL Stockbrokers are three wholly owned subsidiaries of Prudential Bank.

Republic Bank Ghana Limited: was established in 1990, and the Bank of Ghana granted it a banking license in 1994. It operated as a non-bank financial institution until 2003, when it received a universal banking license. It was formally called HFC Bank. It is listed on the GSE and was the first in Ghana to issue corporate bonds and the first to establish a unit trust in 1991.

Stanbic Bank Ghana Limited: A subsidiary of The Standard Bank of South Africa Limited, the bank was founded in Accra in 1999. The bank is not listed on the GSE and is owned by foreigners. In order to offer banking services in Ghana, the Bank of Ghana has granted Stanbic bank a banking license.

Société Générale Ghana: established in 1975, the parent company of the bank is SG Financial Services Holding. The bank was formerly known as SG-SSB Limited. The bank's head office is in Accra, and it is currently listed on the Ghana Stock Exchange (GSE).

Standard Chartered Bank Ghana: The bank opened its doors in 1896 as the first and oldest bank in Ghana. The bank served as the Central Bank of the Gold Coast from before the country's independence until 1953 under the name Bank of British West Africa. The bank went public on the Ghana Stock Exchange in 1991, trading under the ticker SCB.

Universal Merchant Bank: In 1972 the bank opened its doors to Ghanaians as a merchant bank. After acquiring a Universal Banking License in 2005, UMB, as it is known, has 36 branches spread all across Ghana.

Zenith Bank Ghana: The bank was incorporated and given a universal banking license by the Bank of Ghana in 2005. Zenith Bank Plc is the parent company of the bank with the majority stake. The bank offers both commercial and retail financial services across its thirty-seven (37) branches in Ghana.

3.6 Model Specification

According to Brooks (2014), panel data approach is used if the research involves time-series, cross-sectional or a mix of the two. Fixed effects estimation is used for this research.

Following Abusharbeh (2020) and Mahrous, Samak and Abdelsalam (2020), the researcher constructs a model to assess the effects macroeconomic factors on credit risk of banks in Ghana stated as follows;

$$NPL_{it} = \beta_0 + \beta_1 GDP_{it} + \beta_2 INF_{it} + \beta_3 EXCH_{it} + \beta_4 MPR_{it} + \beta_5 UNEM_{it} + e_{it}$$

β_0 = is the constant

it = the number of banks as i and the time as t .

β_1 to β_4 = The explanatory variables as stated in the variable description table 1

e_{it} is the error term.

3.7 Data Analysis

The Stationary test and the robustness check is used to make sure there is no autocorrelation. According to Sekaran (2006), the null hypothesis is rejected if the p-value is less than 5% and accepted if it is greater than 5%. Additionally, the Hausman test and the Breusch–Pagan LM is run to look for endogeneity. Accept the null hypothesis since there is no endogeneity problem if the

result probability is greater than 10%; otherwise, reject it. The use of panel data methodology, according to Baltagi (2008), can eliminate unobserved heterogeneity that may be brought on by firm differences. The STATA analysis program is used to check whether the model fits the panel data reasonably.

3.8 Justification of Variables

This section elaborates on how the study variables has been proxied and used by authors in prior studies.

3.8.1 Credit Risk

The NPL ratio is one of the key indicators of bank loan quality and credit risk. A low NPLR is implied by better asset quality, fewer bad loans, and low expected credit loss provisioning. Ekikci and Poyraz, (2019), Hosen and Muhari (2019), Siddique et al (2020), Gadzo, et al., (2019), Afriyie and Akotey (2013), Hunjra et al. (2020) are similar studies that have utilized the NPL ratio.

3.8.2 Macroeconomic Determinants

Inflation rate (INF): The trend toward escalating prices for goods and services is shown by inflation. Additionally, it displays the purchasing power of a currency. NPLs and inflation rate may have either a positive or negative relationship. Higher inflation lowers a loan's real value and increases borrowers' capacity to pay off their debt. However, growing inflation also lowers the borrowers' actual income and worsens their capacity to pay down their loan. (Al-Homaidi et al., 2018; Amuakwa-Mensah, 2017; Batten and Vo, 2019; Arham et al., 2020).

Gross Domestic Product Growth Rate (GDP): This parameter evaluates the overall economic output. The risk of default is lower in periods of economic than period of economic slowdown. (Al-Homaidi et al., 2018; Kuzucu and Kuzucu, 2019; Radivojevic et al., 2018).

Exchange rate (EXCH): the effect of the exchange rate on NPLs is mixed repercussions. The study utilizes the annual change in the Cedi against the US dollar. If a customer has a significant amount of lending in foreign currencies, exchange rate depreciation could significantly impact its ability to service its debt. On the other hand, an exchange rate appreciation can help borrowers with foreign-currency receipts, including export businesses, be better able to repay their loans. In light of this, the correlation between the exchange rate and NPLs might either be positive or negative. (Beck et al., 2015; Klein 2013; Nkusu, 2011; Atanasijević and Božović, 2016; Castro, 2013).

Unemployment rate (UNEMP): The ratio of the labor force that is jobless to the overall labor force is used as proxy for unemployment. Borrowers' loan repayment issues get worse when unemployment rises. The researcher anticipates that unemployment and NPLs will be positively related. (Nkusu 2011; Lee and Rosenkranz, 2020; Kjosevski and Petkovski, 2017).

Monetary policy rate (MPR): Is the main lending rate of the central bank, BoG. The rate influences the interest rate charged by commercial banks when they make loans available to their customers. (Mahrous, Samak and Abdelsalam, 2020; Asiana and Amoah, 2019; Vo and Nguyen, 2014;

Table 2 Variable Description and Measurement

Variable	Symbol	Proxy	Sign
Dependent Variable			
Non-performing loans	NPLs	Nonperforming loans over gross loans	
Independent Variable			
Exchange rate	EXCH	Change in Cedi to Dollar	(+/-)
Monetary policy rate	MPR	Annual rate as stated by BoG	(+/-)
Inflation	INF	Consumer price index (CPI)	(+/-)
Unemployment rate	UNEM	Annual rate of labor force without jobs but are available to work	(+)
Gross domestic product	GDP	Year-on- year GDP rate	(-)

3.9 Chapter Summary

This chapter has detailed every step of how the study was carried out. Research design, sampling, data sources, model specification, variable descriptions, and measurement are all specifically covered in this chapter. The study has also specifically described the order of data collection and analysis. Additionally, the diverse sources of every measurement tool have been covered.

CHAPTER FOUR

RESULTS AND DISCUSSION OF FINDINGS

4.1 Introduction

This chapter of the study explored the connection between the dependent and the independent variables of the study. Overall, the researcher tailored the work to be able to ascertain the influence of the selected macro-economic variables on the banks NPLs. Also given and addressed are correlation and descriptive statistics.

4.2 Descriptive Statistics

Table 2 below depicts the descriptive statistics of the variables used in the study.

Table 3: Descriptive Statistics

Variables	N	Mean	Std. Dev.	Min	Max
NPL	119	0.164	0.108	0.010	0.615
GDP	119	0.046	0.024	0.010	0.081
INF	119	0.117	0.039	0.071	0.175
EXCH	119	4.933	0.787	3.795	6.010
MPR	119	0.191	0.045	0.145	0.260
UNEMP	119	0.049	0.085	0.042	0.068

From table 3 above, credit risk as represented by NPL obtained a mean of 0.164 with a standard deviation of 0.108. The difference in the average NPL rate was accounts by a maximum rate of 0.615 and a minimum rate of 0.01. This implies that over the period under consideration, the

average NPL was 16.4%, which represent less than 17% of the loans issued by the participating banks. However, the NPL raised up to more than 60% which is detrimental to any financial institution.

For the independent variables, GDP obtained an average gross domestic product of 4.6% over the period under consideration. Its height performance couldn't exceed 10% margin by reporting only 8.1% and its worse performance at 1%. Inflation rate however reported an average rate of 11.7% with a maximum rate at 17.5% and its lowest rate at 7.1%.

For the exchange rate, reported an average of 4.933 with a standard deviation of 0.787. The disparity in the results was realized by the minimum value of 3.795 and maximum value of 6.010.

For the MPR, the average results realized was 19.1% which indicated that over the period under review, the BOG lending rate was at an average of 19.1%. However, this increased to a maximum of 26% and a minimum of 4.2%.

For the period under consideration, unemployment rate was 4.9% with a minimum rate of 4.2% but a maximum of 6.8%. This implies that over the period considered for the study unemployment rate was at 4.9% but reported a maximum of 6.8% and minimum of 4.2%.

4.3 Pairwise Correlation Matrix

Table 4 below depicts the correlation matrix for the variables used in the study. The correlation is used to determine the relationships among the variable for the study as well as whether the relationships are significant or not. The significance of the relationships was determine using p critical values of 0.05.

Table 4: Pairwise correlation matrix

	NPL	GDP	INF	EXCH	MPR	UNEMP
NPL	1.000					
GDP	0.063	1.000				
INF	0.1667	-0.3747*	1.0000			
EXCH	-0.189*	0.410	-0.7804*	1.0000		
MPR	0.1713	-0.1726	0.9227*	-0.9328*	1.0000	
UNEMP	0.216	-0.5901*	0.7804*	-0.6008*	0.7450*	1.0000

*p< 0.05

From table 4 above, the results posted an insignificant correlation coefficient between NPL and the macroeconomic variables with the exception of exchange rate. Specifically, it revealed a significant negative relationship between NPL and exchange rate ($r=-0.189^*$). It however showed an insignificant positive relationship between NPL and GDP (0.063), an insignificant positive relationship between NPL and INF (0.1667), an insignificant positive relationship between NPL and MPR (0.1713), as well as a significant positive relationship between NPL and UNEMP (0.216).

4.4 Regression Analysis

4.4.1 Test for choosing pooled OLS and FE (F-test)

Hypothesis:

H_0 : the pooled OLS is appropriate

H_a : FE model is appropriate

F-test that $u_i=0$: F (16, 97) =7.86 Prob> F=0.0000

Since the p-value is not more than 5% we accept the alternate hypothesis and reject the null hypothesis. The fixed effect model is, therefore, fitting than the pooled OLS.

4.4.2 Test for choosing between fixed effect and random effect (Hausman test)

The hypothesis put forward is as shown below

H₀: FE model is appropriate

H_a: RE model is Appropriate

Test: H₀: difference in coefficients not systematic

$$\begin{aligned}\chi^2(2) &= (b-B)'[(V_b-V_B)^{-1}](b-B) \\ &= 0.00 \\ \text{Prob}>\chi^2 &= 1.000\end{aligned}$$

4.4.3 Test for choosing between pooled OLS and random effect (Breusch –Pagan LM test)

When testing for random effects the following hypothesis is used

H₀: the pooled OLS is suitable

H_a: RE model is suitable

Breusch and Pagan Lagrangian multiplier test for random effect

Test: Var(u)=0

Chibar2=86.46

Prob>chibar2=0.0000

Since the p-value is less than 5% we accept the alternate hypothesis and reject the null hypothesis. The RE model is therefore appropriate than the pooled OLS model. The random effect model is therefore selected to estimate the Ghana's macroeconomic variables on credit risk

4.5 The link between NPL and GDP

The table 5 presents the connection between GDP and credit risk as proxied by NPL

Table 5: The results of GDP and NPL

Variables	Coefficient	Standard Error	T	P>[t]
GDP	0.0274	0.3010	0.09	0.927
_Constant	0.1633	0.0241	6.78	0.000
Wald chi2(1) = 0.01		Prob> chi2 = 0.9274		

From table 5 above, the results of the study showed that GDP has an insignificant positive coefficient on NPL. This therefore suggest that an increase in GDP will lead to an increase in NPL position by 0.0274.

4.6 The link between NPL and INF

The table 6 presents the connection between inflation (INF) and credit risk as proxied by NPL

Table 6: The results of INF and NPL

Variables	Coefficient	Standard Error	T	P>[t]
INF	0.4645	0.1858	2.50	0.012
_Constant	0.1104	0.0292	3.78	0.000
Wald chi2(1) = 6.25		Prob> chi2 = 0.0124		

Table 6 above depicted that there is a significant positive influence of INF on NPL. This was realized by a coefficient of 0.4645 and p-value below the p-critical value of 0.05. In essence, when inflation rates increase, it will lead to a corresponding increase in NPL of banks by 0.4645 and this rate is highly significant.

4.7 The link between NPL and EXCH

The table 7 presents the connection between exchange rate (EXCH) and credit risk as proxied by NPL.

Table 7: The results of EXCH and NPL

Variables	Coefficient	Standard Error	T	P>[t]
EXCH	-0.0261	0.0091	-2.86	0.004
_Constant	0.2935	0.0491	5.97	0.000
Wald chi2(1) = 8.18		Prob> chi2 = 0.0042		

The findings in table 7 above however showed that an insignificant negative influence of exchange rate on NPL. This was evidence by a coefficient of -0.0261 and p-value of 0.004.

4.8 The link between NPL and MPR

The table 8 presents the connection between monetary policy rate (MPR) and credit risk as proxied by NPL.

Table 8: The results of MPR and NPL

Variables	Coefficient	Standard Error	T	P>[t]
MPR	0.4073	0.1582	2.57	0.010
_Constant	0.0869	0.0360	2.41	0.016

Wald chi2(1) = 6.62 Prob> chi2 = 0.0101

The result as realized in table 8 above showed a significant coefficient between MPR and NPL. The results suggested that in increase in MPR will lead to corresponding rise in NPL by 0.4073 points. This implies that there is a significant positive influence of MPR on NPL among banks in Ghana.

4.9 The link between NPL and UNEMP

The table 9 presents the connection between unemployment rate (UNEMP) and credit risk as proxied by NPL.

Table 9: The results of UNEMP and NPL

Variables	Coefficient	Standard Error	T	P>[t]
UNEMP	0.2748	0.8734	0.31	0.753
_Constant	0.1511	0.0471	3.21	0.001

Wald chi2(1) = 0.10 Prob> chi2 = 0.7530

From table 9 above, the findings showed that UNEMP has an insignificant positive influence on NPL. This was realized by a coefficient of 0.2748 and p-value of 0.753. This implies that in increase in UNEMP rate will increase the banks' NPL position by 0.2748 points.

4.10 The link between NPL and Macroeconomic factors

Table 10: Random Effect Regression Analysis

Regressor	(1) NPL	(2) NPL	(3) NPL	(4) NPL	(5) NPL
GDP	0.0274 (0.927)	0.3504 (0.266)	0.1714 (0.637)	0.2231 (0.540)	-0.5353 (0.242)
INF		0.5481 (0.006)	0.2407 (0.514)	0.9226 (0.156)	0.6985 (0.273)
EXCH			-0.0168 (0.322)	-0.0508 (0.108)	-0.0367 (0.240)
MPR				-1.114 (0.204)	-0.1425 (0.878)
UNEMP					-4.5923 (0.009)
constant	0.1633* (0.000)	0.0845* (0.024)	0.2116 (0.113)	0.5103* (0.05)	0.5414 (0.039)
<i>N</i>	119	119	119	119	119
<i>Prob>F</i>	0.9274	0.0235	0.0370	0.0379	0.0035
<i>Wald chi2(2)</i>	0.01	7.50	8.49	10.15	17.58

The co-efficient of Gross Domestic Product (GDP) was negative and has a statistically insignificant relationship with Non-performing Loans (NPL), ($\beta = -0.535$ and $p = 0.242$). This implies that a unit increase in GDP leads to 0.535 decrease in NPL. This result supported previous studies by Twum, et al (2021), Koju, Koju, and Wang (2020), as well as Carvalho, Curto and Primor (2020), but however contradicted the earlier dispositions by Radivojevic et al (2018) and Kuzucu and Kuzucu (2019) which suggested a positive significant influence of GDP on NPLs.

The results however posted a positive but statistically insignificant coefficient between Inflation (INF) and NPL, ($\beta = 0.698$ and $p = 0.273$). The implication on these results indicates that an increase in inflation leads to a corresponding rise in NPL by 0.637-unit points. This supported Amuakwa-Mensah et al (2017), Messai, and Gallali (2019) but however contradicted Arham et al (2020) and Umar and Sun (2018) assertions that Inflation has significant positive influence on NPLs.

Table 4 also showed that Exchange Rate (EXCH) revealed a negative but an insignificant coefficient with NPL ($\beta = -0.036$ and $p = 0.240$). The findings of the study showed that a rise in exchange rate position worsens the NPL by 0.036. This finding contradicted Abusharbeh (2020), Anastasiou, Louri, and Tsionas (2016), Chaibi and Ftiti (2015) assertions that positive impact of exchange rate on NPLs. But however, supported Atanasijević and Božović (2016) exchange rate has negative influence on NPLs.

Furthermore, the study reported a negative coefficient between Monetary Policy Rate (MPR) and NPL in the model, with the coefficient of MPR at -0.143. These results suggested that there is a negative association between MPR and NPL. This translates as a unit increase MPR leads to 0.143 decreases in NPL. This finding was inconsistent with earlier assertion by Mahrous, Samak and Abdelsalam (2020) that there is positive and significant link between monetary policy and NPLs. But this study's findings were however in contradiction to Adeola and Ikpesu (2017) and Asiama and Amoah (2019) that MPR has positive influence on NPLs.

Again, the results from table four above showed that Unemployment rate (UNEMP) registered a negative but a statistically significant coefficient with NPL ($\beta = -4.592$ and $p = 0.009$). The results of the study suggested that a decrease in the UNEMP by 4.592 will lead to an increase in NPL by 4.592 which is in line with Kumar et al (2018). The findings for this study was unsimilar to existings assertions by Lee and Rosenkranz (2020), Kjosevski and Petkovski (2017), as well as Messai, and Gallali (2019) that a rising NPL increases Unemployment rate.



CHAPTER 5

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter defined the summary of findings, conclusions and recommendations in line with the influence of macroeconomic variables on non-performing loans. This chapter is therefore separated into four sections, namely the summary of the research findings, the conclusions of the study, followed by recommendations and finally with areas for further research.

5.1 Summary of Findings

The researcher of this paper examined the influence of macroeconomic variables on credit risk of banks in Ghana. To achieve this objective, the researcher collected data from the seventeen universal banks selected over a seven-year period from 2015 to 2021. This enables the researcher to examine the gathered data using the descriptive and inferential statistics. The results of the study are expanded below:

5.1.1 Link between GDP growth rate and credit risk of commercial banks

Following the analysis of the data, the findings showed that GDP growth rate has negative influence on NPL. The implications for this indicated that in times when the economy is growing at a negative rate (falling) it causes the NPL to rise. Thus, the fall in GDP growth puts pressure on lenders thereby inhibiting their ability to fulfil their obligations with the banks.

5.1.2 Relationship between exchange rate and credit risk of commercial banks

The findings of the study also suggested that exchange rate has a negative influence on NPLs. The implication for such findings also suggests that a rising in exchange rate puts pressure on debtors to settle their indebtedness. And a rising NPL position is detrimental to the overall performance of the banks. Similarly, when exchange rate of the economic falls, it provides the debtors with the capacity to settle their obligations.

5.1.3 Relation between inflation rate and credit risk of commercial banks

The results of the study showed that an increase in inflation rate causes the NPL's of the banks to increase, and the vice-versa is also true. This phenomenon is known as a positive influence of inflation on NPLs. Thus, under the current circumstance, rising NPLs can be attributed to the poor economic conditions, specifically the continuous rise in inflation rate.

5.1.4 Link between monetary policy rate and credit risk of commercial banks

The results of the study showed that MPR has negative influence on NPLs. The implication from this finding indicates that the lending rate at which these universal banks issue out loans are high and thus makes it impossible for the customers to service their debts whilst also paying their principals. This suggests that as the banks' lending rate increase the portion of the debts issued likely to go bad is high.

5.1.5 Relationship between unemployment rate and credit risk of commercial banks

For the unemployment rate, the study showed a significant negative influence on NPLs. This only goes to points that the rising level of unemployment experiencing in the economy has a detrimental impact on the ability for customers to meet their obligations.

5.2 Conclusion

The research main aim is to examine the effects of macroeconomic variables on credit risk of banks in Ghana. The study design is quantitative in nature and employs the experimental research strategy to establish causality. The study makes use of secondary data sourced from Bank of Ghana and Ghana Statistical Services on macro specific data while firm specific data is sourced from the selected banks financial statements. A sample size of 17 universal banks out of a population of 23 was determined using the purposive sampling technique across a seven-year period from 2015 to 2021. The study is grounded on theories like the financial theory also known as financial instability hypothesis, agency theory and the theory of asymmetric information. The results of the study indicated that exchange rate, unemployment rate, GDP and monetary policy rate are inversely related to credit risk. Moreover, for inflation the association is negative with credit risk. The findings of the study points to the fact that macroeconomic factors have a strong ability to predict the probability of default.

5.3 Recommendations

Policy setters such as the Bank of Ghana should look at its monetary policies and credit default control policies as this will aid in reducing NPLs. The Central Bank of Ghana should also take on

a more regulatory and proactive role by ensuring that banks have adequate provisions for bad loans.

To prevent bad credit quality, Ghanaian banks should set up a limited lending policy by raising the value and quantity of loan collateral. Likewise, banks should keep the lending rate as low as feasible to ensure that payback is simple and reasonable for loan holders.

Loan managers should therefore appropriately determine a borrower's capacity to pay back the loan. It has been proven that risk identification and measurement are the most crucial elements of credit management, thus more time and effort should be put into determining how much risk borrowers add to bank loan portfolios.

5.4 Areas for Further Studies

Future research is advised to focus on cross-national comparisons, replication of the study in other part of the world, and various business categories such microfinance, savings and loans, and other financial institutions. To determine whether the same or different results will be obtained, the researcher advises other researchers to use alternative methodological approaches, and estimating procedures.

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