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TOPIC

BANK'S EFFICIENCY AND NON-PERFORMING LOANS IN COMMERCIAL BANKS IN GHANA

BY

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DECLARATION

I hereby declare that this submission is my own work towards the Degree in Masters of Business Administration (MBA) and that, to the best of my knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any other degree of the University, except where due acknowledgement has been made in the text.

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LIST OF ABBREVIATIONS

BOG ---------- Bank of Ghana

CAP ---------- Capitalization

CCC ---------- Cheque Codeline Clearing

DEA ---------- Data Envelopment Analysis

EFF ---------- Efficiency

GDP ---------- Gross Domestic Product

GDPG ---------- Gross domestic product growth rate

GMM ---------- General Moment Method

IFRS ---------- International Financial Reporting Standards

IMF ---------- International Monetary Fund

INF ---------- Inflation rate

LLP ---------- Loan loss provisions

NPL ---------- Non-performing loans

REM ---------- Random effect model

ROA ---------- Return on assets

ROE ---------- Return on equity

ABSTRACT

Banks efficiency and non-performing loans are very important for banks operational efficiency, stability and monetary expansion. Banks play an important role in credit payments scheme plus the spread of fiscal policy. The main objective of the study is to investigate banks' efficiency and non-performing loans of commercial banks in Ghana. Specifically, the study set the following objectives. To find out what bank-specific and macroeconomic factors played in banks' efficiency and non-performing loans of Ghana's banking sector. To find out the determinants of banks efficiency in Ghana. To find out the effects of non-performing loans on banks efficiency of commercial banks in Ghana. The data used for the study were obtained from the annual reports of some selected Ghanaian commercial banks from 2010 to 2020. The records for these observations are balanced panel data of 13 banks in the entire span of the study of annual observations for nine years summing up to a total of 143 data observations within the period under study. This research in banks efficiency is very informative and necessary to regulators, policy makers and bank management after the sector has undergone the recent recapitalization. The results exhibited low efficiency of banks, which is a reflection of the high financial and operational costs. Based on the empirical evidence, the study concluded that non-performing loan and capital have negative effect on the efficiency of banks in Ghana. Bank size also has positive and significant effect on bank efficiency. Non-performing loans affect the valuations and profitability of banks. Lending interest rate are usually high in order to compensate for the high risk of borrowing. The study recommended that, management should implement policies and regulations that should provide screening of borrowers to reduce the moral hazard and adverse selection to reduce financial loss. Also, banks in Ghana should desist from aggressive lending to customers as a way of competing for customers to reduce the loan default.

CHAPTER ONE

INTRODUCTION

1.1 Background

The current domestic debt restructuring scheme had a negative impact on the banking industry. Ghana has asked the IMF for a US$3-billion bailout to support it improve macroeconomic stability as it now faces numerous fiscal and commercial difficulties. The first tranche of the three-billion-dollar IMF bailouts has been received, and its release plan has been laid out and authorized. By 2028, this will help reduce public debt from its current predicted level of 105 per cent of GDP to 55 per cent in present value terms, which is a more manageable level. IMF aid was reliant on Ghana reorganizing its public debt, both domestic and external, which in turn imposes the buy-in of creditors. This state was adopted by the decision-making panel of the fund. This infers that the reorganizing, such as an extension of settlement time, must be accepted by individuals who lent funds to the the government by purchasing bonds (Acheampong, 2023). Early in December 2022, the Ghanaian government launched an optional Internal Credit Exchange Programme (DDEP) as the first stage of the debt restructuring. It aims to swap existing local notes and bonds valued at GHS137.3 a billion dollars (US$11.45 billion or around 15% of 2021 GDP) owned by several local investors for a bundle of 12 (originally 4) new bonds with diverse maturity dates. Any state debt restructuring effort must receive approval from a necessary majority of debt holders (often 75% of debt holders) in order to amend the contract's essential financial parameters. As a result, minority investor groups were unable to object and halt the debt restructuring (Acheampong, 2023).

However, the program's subscription rate fell beneath fifty per cent, well below the government's 80% aim. The parameters given, according to bondholders, will cause them to lose money. If they

swap their present instruments, organizations like the Ghanaian Individual Bondholders Forum anticipate that they will lose 50% to 90% of their investment. The government had to three times extend the bond exchange's closing date because things got stalled. Owing to the following reasons, the Ghanaian government is having trouble getting local bondholders to accept the conditions it has offered: Investors had to deal with substantial losses, the government's "take it or leave it" policy, a lack of confidence in the government, and the absence of any feeling of burden sharing. Investors will lose, according to Dr. Yakubu Abdul-Salam, 62.40% of the bond's initial market value. According to the Ghanaian Individual Bondholders Forum, given the present rate of inflation, bondholders will lose around 88.2% of their assets. A number of bondholders declined to take part. The administration had before anticipated "overwhelming support for this exchange," but this was the opposite. The government of Ghana has so far declared three deadline extensions as it fails to meet the standard for the sector of a qualified majority. The authorities did not achieve its goal for the brand-new deadline of January 31, 2023 (Acheampong, 2023).

All banks in Ghana with government bonds subscribed to the Governments DDEP. This resulted in the banks impairing their bonds thus affecting their performance in their 2022 Financials. Most of the banks recorded losses there by reducing their capital base.

Also, banking sector as at end-April 2018 continued to be safe and sound regardless of some decline in some important fiscal indicators until early-January 2019, when the Bank of Ghana announced massive reforms in the banking sector. Industry wide, the banks were solvent and liquid; though symbols of weaknesses continued. Asset quality of some banks sustained to be a source of concern and worry. Efforts by the central Bank of Ghana to resolve these flaws were however predicted to increase the area’s performance in the short term and were expected to make sure that the banking zones were rigorous and proficient of effectively performing their parts in

supporting the development and growth of the economy. All the banks which were not able to meet the least capital requirement of GH¢400 million to address insolvency and other inherent vulnerabilities identified in the banking sector were merged and others folded up. Majority of the banks that were not able to meet the minimum investment prerequisite of the BOG directives were merged to form the Consolidated Bank of Ghana to protect depositors and customers. All these mergers and closures are as a result of high bad debts and inefficiency of the affected banks. This has raised major concern in the financial sector.

Most of the banks were in doubt as the next measures and directives that the Central bank would implement to affect the remaining banks. 23 recognized and accredited banks in Ghana's banking industry provide their clients with commercial and financial services (BOG, 2019). The widespread banking zone in Ghana contributes significantly to the mobilization of financial resources by lending money to different businesses and stakeholders. When compared to other corporate entities, a bank's success is determined by the amount of money it makes and the caliber of the assets it holds. Credits serve as the primary resource for financial institutions and constitute their fundamental assets since they provide the majority of their operating income. Although loan exposed monetary institutions (banks) to the highest level of hazard, bank risk may be amortized by thorough credit risk assessment, the creation of adequate reserves for dubious debt, and uncollectible accounts receivable. However, since the rate of defaults is much greater, the measures are insufficient.

Early 1988 saw a large financial sector transformation in Ghana as a consequence of globalization, the firm but steady enactment of fiscal services legislation, and the advancement of technological innovation. In 1983, programs for stability, structural fiscal adjustment, and monetary deregulation were implemented to support the World Bank and the IMF. The banking sector modifications were

intended to enhance the Ghanaian banking system's efficiency, competence, and performance to support commercial development and guarantee financial stability. The BoG has raised the required minimum capital for present financial firms (banks) and fresh entrants from GH 120 million to GH 400 million as part of the reforms to further grow, modernize, and consolidate the financial sector. The minimum capital requirement for the industry has been increased three times in the last ten years. First, in 2008, it was increased from GHC 7 million to GHC 16 million, then GHC 120 million was added in 2013. Economic advancements have a substantial effect on partisan developments, necessitating a political reaction to banks' need for reformation, modernization, and proper capitalization in order to function as efficient engines of economic transformation. The measures also attempted to lessen systemic stress and the spread of infection brought on by bank collapses.

According to Annor and Obeng (2017) as well as Altunbas, Carbo, Gardener, and Molyneux (2016), financial markets have a significant influence in the world economy. Once more, in 2008, a fiscal predicament contributed to bank financial unsteadiness. As a result, businesses throughout the world are using less leverage and long-term debt, which slows economic development. Furthermore, "market failures and policy distortions" convert long-term financing into short-term financing, which increases the risk borne by loan borrowers. Additionally, the purpose of finance is to move resources from parties who owns them to parties that require them. According to Kingu et al. (2018), Straub, Beck and Georgiadis (2014), Greenwood, Sanchez, and Wang (2013), Haldane, Brennan, and Madouros (2010), Philippon and Reshef (2013), and others, banks have the power to boost progress in two ways: first, by pleasing investors for the risks that they are subjected to, which encourages investors and savings, and second, if the assets are distributed in an efficient

manner, finance must lead to extra growth. As a result, the current economic downturn has raised concerns about the banking industry's financial viability (Philippon and Reshef, 2013).

For economic expansion and development, non-performing loans and effective banking are essential. Due to a more equitable provision of financial assets and stronger outlay to support economic evolution, the rivalry among banks had reduced fees and so increased their profitability. Due to lower overhead costs, improved overall bank governance, improved threat management, and support for innovative banking products and services, the efficient banking environment promotes financial institutions to expand extremely successfully (Alhassan, 2014; Denizer, Dinc, and Tarimcilar, 2000). Additionally, as banks compete with one another, their market power is diminished, financial services are priced cheaper, and this has an impact on the welfare of their clients. A bad debt is a loan facility with interest or principal outstanding for a specified time period. A loan is an advantage for banking institutions because interest costs and principal settlement generate a cash flow. Interest payments generate profits for banks. Banks' loans are bad debts if they are not paid for a particular period of time. If settlements of the loans delay for a shorter period, it becomes loan debt, a delayed payment (generally 90 days), the credits become bad debts (Asiama & Amoah, 2019).

Asset quality of some banks sustained to be a source of concern and worry. Efforts by the central Bank of Ghana to resolve these flaws were however predicted to increase the area's performance in the short term and were expected to make sure that the banking zone was rigorous and proficient of effectively performing its parts in supporting the growth and development of the economy. Most of the banks were in doubt as the next measures and directives that the Central bank would implement to affect the remaining banks. These are some of the reason why the researcher intends to investigate into the nonperforming loans and banks' efficiency in the universal bank in Ghana.

The findings of this research will be useful to all the stakeholders in the banking sector to know which banks are performing efficiently in the country.

1.2 Problem statement

In many low-income nations, particularly in Sub-Saharan Africa, there is concern that the state-dominated, ineffective, non-performing loans, and flimsy banking institutions constitute a significant barrier to economic progress (Amuakwa-mensah, 2015). The productive capacity of an economy is relevant to the effectiveness of banks. Nonperforming loans and banks' efficiency are very important for banks stability and monetary expansion. Financial institutions in Ghana play an important role in credit payments scheme plus the spread of fiscal strategy. The level of race in the banking zone is significant for the efficient production of financial facilities, for quality financial products and for modernization in the financial sector (Amuakwa-mensah, 2015). Moreover, banks' efficiency and nonperforming loans have a key influence on policy and fiscal steadiness. Improvement in banks' efficiency can reduce brokerage costs, which have a direct impact on the brokerage margin in the market. Improvement in banks' operational efficiency and reducing bad debts in the financial sector are significant prerequisites for further effective property distribution in the financial system.

The government has framed the program as an optional or free decision. However, there are no viable alternatives. However, if the turnaround is not handled carefully, it could have a significant impact on the local financial industry, which owns a significant portion of the bonds, and this could result in investors failing to make payments on loans and agreements within them and their banks. And this may end up increasing bad debt in the banking industry Any losses within the financial

sector then cascade into adverse effects on economic growth, poor efficiency employment and inequality (Acheampong, 2023).

Once banks effectively mobilize and distribute resources, it lessens the charges of wealth for industries and fast-tracks capital accumulation and output (Amoako-Boateng, 2017). Empirical analysis of nonperforming loans and banks' efficiency are very important conditions for the outline of new policies related to the financial market. This study will be beneficial to bank regulators, policy-makers and investors as it helps to understand how changes in governance can distress the efficiency of banks, non-performing loans, fiscal stability and bank performance. The relationship between the stability and efficiency of the various banking systems throughout the world has come under scrutiny by a number of policymakers and bank regulators. Studies on the effectiveness of universal banks in a few sub-Saharan African nations undertaken by (Adusei, 2018; Haniifah, 2015) show that efficiency in the banking sector enables a decrease in the disparities among lending and deposit rates. Therefore, raising the percentage of loan requests for industrial investment helps the domestic economy expand.

Due to the complexity of efficiency—which might take the form of technological productivity, efficiency in costs, revenue effectiveness allocative efficiency, operational efficiency, or scale efficiency—studies in this field vary. Furthermore, the majority of these research, including those by Adjei-Frimpong (2013) and Raphael (2013), show that a variety of factors affect how effective banking institutions are. These factors can be divided into features particular to banks, to industries, and to macroeconomic situations. (Raphael, 2013; Adjei-Frimpong, 2013). Adjei-Frimpong (2013) demonstrates that in Ghana, the ownership position of universal banks has an impact on the effectiveness of Ghanaian banks. To my knowledge, there has never been research done comparing the cost effectiveness of banks that have been put on the GSE and those that are

not. That is, no prior research on the factors influencing the performance of Ghana's universal bank and its non-performing loans has been conducted. Again, many revisions have not been directed on the connection between banks' operational efficiency and nonperforming loans in Ghana's financial sector and neither have dynamic techniques been used to evaluate the factors of banks' efficiency and nonperforming loans.

Availability to loanable funds is a major issue that plagues the major economic sectors of a developing nation like Ghana. A large number of strategic financial institutions have been set up to help solve this issue by providing loanable cash to support both the public and private sectors. However, quite a few of these financial companies experience difficulties as a result of the increase in the percentage of nonperforming loans (NPLs). For banks, this issue—the increase in the rate of NPLs—has led to the Ghana Commercial Bank's acquisition of Capital and UT Banks in the final quarter of 2017. Once more, the Central Banking Authority of Ghana merged five financial organizations into one bank in the second half of 2018 due to a variety of reasons. Since 2008, the Bank of Ghana has taken steps to shut more of these troublesome organizations, whether they are micro financing or deposit/savings banking organizations (Belnye, 2012). The severity of the effects of such fold-ups on investments, enterprises, and livelihoods cannot be overemphasized given the lack of deposit protection in Ghana (Boateng et al., 2016). Hence, this research adds to the existing knowledge by adding pragmatic sign to the prevailing works on banks' operational efficiency and non-performing loans in Ghana's banking industry.

1.3 Objectives of the Study

The main objective of the study is to investigate non-performing loans and banks' efficiency of universal banks in Ghana. Specifically, the study seeks:

1. To study the determinants of bank's efficiency in Ghana.
2. To determine the factors of non-performing loans and the role they play on bank-specific variables of Ghana's banking sector.
3. To determine the effects of non-performing loans on bank's efficiency of universal bank in Ghana.

1.4 Research Questions

The study try to answer the following questions:

1. What are the factors that contribute to bank's efficiency in Ghana?
2. What are the factors of non-performing loans and the role they play on bank-specific variables across Ghana's banks?
3. What are the effects of non-performing loans on bank's efficiency of universal bank in Ghana?

1.5 Significance of the study.

The results of the thesis will be of concern to bank directors, as they will learn about the effects of nonperforming loans and bank's efficiency and inspire them to take the essential measures to regulate the occurrence of non-performing loans. The Bank of Ghana can use the study's results to create regulations that control loan defaults in the country's banking industry while protecting the general welfare. The study will also allow monetary experts to comprehend the importance of the profit on assets to the nonperforming loan ratio and the nonperforming loans reporting ratio, letting them to deliver financial guidance to the banking sector and other stakeholders that is well-informed. The findings of this research will also contribute to the body of literature that supports theorized claims on the impact of loan defaults on the Ghanaian universal bank's profitability.

1.6 Scope of the Study

The study was restricted to Ghanaian commercial banks that were open from 2010 to 2020. Since it is exceedingly challenging to obtain data before the year 2010, the choice of this study was motivated by the data's simple availability and accessibility.

1.7 Brief Methodology

The data used in the study were obtained from some selected Ghanaian commercial banks from 2010 to 2020. Banks without full coverage of the time period in their data were not included in the information. Panel data were used in the study. This methodology was used to investigate the relationship between nonperforming loans and commercial lending institutions in Ghana. Input, production, costs, and income were used to gauge efficiency. All commercial banks functioning in Ghana as of December 31, 2022 and registered with the Bank of Ghana comprised the study's target group. About 23 financial institutions were operating in Ghana, based on the Bank of Ghana (BoG, 2022). This section also included explanations of the numerous variables that were employed in this study to assess the multiple relationships. The following is a list of the variables that were used: The suggested framework of Berger and DeYoung (1997) was used to measure non-performing loans (NPLs) and evaluate the effectiveness of loan management. This research used the ratio of non-interest expenditure to total operating revenue to gauge bank efficiency (EFF). Personal expenditures and other non-interest operational expenses were the ratios used to assess the effectiveness of commercial banks. A larger ratio translates to more costs or, conversely, lesser efficiency. The operational income figures might be a concern. For instance, ratios soared for many banks during the economic recession as a result of trading losses in addition to non-interest losses. Similar to Berger and DeYoung (1997), the capitalisation of banks (CAP) was calculated as the overall equity over total assets. The capacity to absorb credit losses is measured

by the CAP variable. The research also makes use of macroeconomic indicators like hyperinflation and gross domestic product. The information was gathered from numerous bank websites, Bank of Ghana bulletins, and certified published accounts of Ghana's universal banks. To aid with the data collecting, a sheet for collecting information was also created. Before being entered into Stata and the statistical tools for the social sciences (SPSS) for analysis, the data was sorted and structured. To assess the relationship between the adverse impact of nonperforming loans on the efficiency of banks and vice versa, the researcher employed descriptive statistics including an average, the mean, deviations from average, and the granger-cause test. The study also assessed the dynamic generalized method of moments (system-GMM) which addressed the problem of endogeneity and the Random effect model.

1.8 Limitation of the study

The main obstacles that the researcher had to overcome were difficulties in acquiring the necessary data to carry out an insightful study. Due to delayed formation, mergers and acquisitions, and the closure of several banks throughout the years, data on some of the institutions was unavailable. This was quite difficult. Despite these restrictions, the researcher made the necessary efforts to get over these obstacles.

1.9 Organization of the study

There are five chapters in the research. The study's introduction, problem description, and objectives are all presented in chapter one. The second chapter reviewed the pertinent literature for the study and provided the theoretical foundation on which the research was built. While chapter four likewise concentrated on the review and discussions of the study findings, chapter three covered the methodology. The summary of findings, conclusions, and suggestions were discussed in Chapter 5.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

In this segment, numerous elementary concepts are developed to comprehend the framework of banking effectiveness and delinquency, as well as the relationship between operational effectiveness and delinquency. Therefore, this study attempts to give a summary of existing knowledge on the subject matter from Ghana, the sub-region and the world. It is worth noting literature evidence from developed countries, rising and emerging nations, and proof on cross nationsNumerous research have been conducted in recent years on banking efficiency (Staub et al., 2010). Numerous revisions use several econometric methodology and assessment techniques to determine the factors that affect bank efficiency. Earlier studies on bank efficiency were frequently conducted in advanced nations. On the other hand, the current comeback of financial and economic reforms in developing countries raises awareness of the significance of bank efficiency.

2.1 Conceptual Review

2.1.1 Background of Banks

The banking zone has a global impact on the economy through financial intermediation which is expected to create greater development. But there are features that can adversely affect the banking sector development such as the 2008 financial crisis (Amoako-Boateng, 2017; Haldane et al., 2010). Previous articles show that the quality of management and outside events related to efficiency, delinquency and capitalization are variables that greatly disturb banks (Alhassan and Tetteh, 2017; Fiordelisi et al., 2011). Banks are monetary institutions that offer financial services to persons, businesses and institutions. The paper focuses primarily on profitable banks that offer

services to customers, such as loans and overdrafts. Their purpose is to transfer assets from savers to borrowers (Adjei-Frimpong, 2013). The financial intermediaries lead to a reduction in risks, improved liquidity delivery and reduction of information irregularities (Amoako-Boateng, 2017; Van Der Westhuizen, 2013; Philippon and Reshef, 2013). The financial sector crisis of 2008 lead to a decrease in financial control and long-standing debt that influence economic growth. As indicated above, the financial zone has a significant impact on the business souks and the economy, so it is therefore essential to know the relationship between operating efficiency and delinquency, as this can cause an economic depression like the one we witnessed in recent times. The subsequent section will focus on the essential characteristics of banking effectiveness and non-performing loans (Benthem, 2017).

2.1.2 Banks Efficiency

After a wide works examination, operational proficiency is distinct as: the cost function that accepts that banks overstate profits, or vice versa, which is not for the purpose of increasing revenues, but to reduce charges for all stages of production (Berger and DeYoung, 1997). Financial institution is quite difficult to quantify (Alhassan, 2014; Berger & Humphrey, 1991), which therefore makes it difficult to choose the important banking variables that make up the products because banks do not burden explicit costs for the services they offer (Alhassan, 2014). Despite the challenge of measuring cost efficiency, the following section explores the potential factors that may affect banks' efficiency.

2.1.3 Efficiency in Banking

If the banking system is efficient, it doesn't always follow that it generates the greatest amount of output possible given the inputs available. The bank with the finest practices is the one that is

efficient (Reddy & Nirmala, 2013). In reality, in recent years, interest in bank efficiency and productivity has increased significantly. Berger and Humphrey (1991) conducted research into the productivity levels of more than 130 banks worldwide in a well-known and renowned scholastic study. In essence, determining the measurement of efficiency in banking requires understanding how banks combine the best possible collection of banking services with a certain set of inputs.

The capacity of banks to provide the best possible mix of investment services with an established range of inputs and available technology is measured by banking efficiency as a metric. In this sense, productivity and efficiency are connected ideas, and mentioning one denotes the existence of the other. Since a productive bank is one that operates efficiently, the terms efficiency and productivity were used interchangeably in the study for this thesis. Scale efficiency, which refers to the connection between level of output and normal cost; dimension effectiveness which refers to the interactions between the mean cost and production of expanded output varieties; and efficiency in operations, which is a broad concept frequently referred to as x-efficiency, that measures the deviation from the cost efficient border that represents the optimal cost structure, are some of the dimensions of efficiency that have been defined and studied in the banking industry.

2.1.4 Factors influencing banks' efficiency

Over the few decades a lot of empirical studies were carried out in the banking sector. One of the financial sectors studied is the issue of crime. Virtually all researchers show that the sources of institutional failures are linked to high levels of crime before bankruptcy and that measuring asset quality is an important indicator of insolvency (Zhang et al., 2016).

Secondly, the other area of study focuses on factors influencing efficiency and reveals a significant change of efficiency amongst similar banks. One of these is inefficiency i.e. organizations working

within their production capacity due to, for example, inter-agency encounter, administration hitches, inefficient operational costs, and other inefficiencies (Alhassan and Tetteh, 2017; Young, 1997; De Young, 1998). Inadequacies are valued at 20-25% of costs in a normal bank. For example, Berger and Humphrey (1991), find one of these inefficiencies. Their results conclude that the dispersion of banking costs is mainly due to ineptitudes relatively to the market influences such as variations in the cost of inputs-which is, people's money is needed to give to others, the scale of operations or the diversity of products. In the case of large banks, ineptitudes, which consist largely of inefficiencies in operational costs, such as labour costs and capital inputs (buildings, deposit/savings accounts, cash held by banks), rather than financial inefficiencies, which involve a financial cost (Amoako-Boateng, 2017).

Thirdly, other available literatures emphasize the effects of scale, i.e. economies of scale, on operational efficiency. Kovner, Vickery and Zhou (2015), study a sample of 2,810 banks in the United States between 2001 and 2012 and examine the correlation between economies of scale and operational productivity of banks. The outcome shows that banks holdings actually have lower functional costs on most non interest costs and then have upper efficiency ratios than other banks. The largest cost savings are calculated in labour employee wage, fixed resources, overheads and information technology and data processing. In addition, Saka et al. (2012), Shepherd (2015) examine a sample of 134 mergers in the US from 1990 and 2000 and find related proof of efficiency gains after large bank mergers.

In addition, Niepmann (2016) finds similar outcomes for 1,998 financial institutions in Germany; the research concludes that, there is enough indication that bank scale has an adverse influence on operating costs. In conclusion, this study aims to provide a broad impression of the most significant literature accessible on the elements that influence banks' efficiency. Based on the outcomes that

are obtained, delinquencies are considered to be the key substance for a bank's failure. In addition, the great inefficiency ratios propose that they can also describe why banks fail. The size of a bank openly affects efficiency, but there is no straight link to a bank's failure. This document therefore discusses load delinquencies and effectiveness in more detail in the following sections (Adusei, 2018).

2.2. Non-performing loans

A loan is in default when payments for principal and interest are 90-day or overt due, or when payment of 90-day or greater have been capitalized, refinanced, or traditionally delayed, or when payments are not more than ninety days past due but there are additional valid reasons to doubt that settlements will be made in full, according to Cucinelli (2015), who adopts the IMF's definition of arrears. This definition agrees with that given by (Ghosh, 2015). According to recent research, two variables—bank-specific (or indigenous) factors and country-specific (or exogenous) factors—are responsible for loan defaults. First, nonperforming loans are likely to be partial by macroeconomic factors, such as GDP growth and redundancy rates. Secondly, the specific characteristics of banks, such as the features of the finance sector and policy management options, also has an effect on the banking sector. These two areas are therefore significant to this document, which will be established in the following paragraphs. For some years now, banking efficiency and loans delinquencies are the subject of many studies (Staub, et al., 2010). Several researchers use different approaches to assess bank effectiveness as well as diverse econometric methods to find the elements that affect banks' efficiency and non-performing loans. Several studies in the past have been conducted to determine the effectiveness of banks in advanced countries but, the current improvement in the banking sector in the developing nations increases the alertness of the of bank effectiveness. This sector is organized into three main portions; proof on bank

effectiveness in advanced nations and in frontier and evolving nations all based on distinct country specific and cross-country studies.

2.2.1 Linking Banks' efficiency and Non-performing loans

A study by Berger and DeYoung (1997) indicates that NPLs, efficiency and capitalization are interrelated in numerous ways. Other research findings point out that banks that face possible failures have high ratios of nonperforming loans since bad loans and banks' efficiency are linked (Kingu, Macha and Gwahula, 2018; Bauer, et al., 1993). In addition, a study conducted by Cucinelli (2015), reveals a negative relation between efficiency and bad debts. According to a study by Berger and DeYoung (1997), inefficient banks may experience problems with bad debt due to management issues with cost monitoring, loan customers, and loan quality issues as a result of exogenous actions, such as the strengthening of economic growth, whereas NPLs are related with additional costs (e.g. observing, work out plans, shifted senior managerial focus). According to Asiama and Amoah (2019), there is a true connection between nonperforming loans and efficiency, which stresses the link between assets efficiency and asset quality through managerial excellence and the potential impact external events might have on efficiency. Additionally, efficiency is positively correlated with assessments of a bank's management quality, according to Alshebmi, Hassan and Adam (2020) and DeYoung (1998), who draw the conclusion that there is a connection between asset quality and supervision quality. Additionally, according to Laxmi, Ram, and Shouyang (2018), the environment can have an impact on NPLs. For instance, various accounting principles, regulations, and market settings are all variables that may have a significant impact.

Secondly, delinquency rates and capital adequacy, i.e. the ratios of capital to total assets, are considered the most common risks to banking efficiency in the various literatures (Asiama & Amoah, 2019). By explicitly including endogenous risks like delinquency in manufacturing or cost ratios, Cheng et al. (2014) demonstrate that such hazards are the most significant in efficiency calculations. These studies aim to manage additional NPL costs or underwritten and monitoring expenses that have an impact on loan quality. Thus, they show that loan defaults decrease performance and that there is a link between efficiency and banks' ability to service their debt. Additionally, they come to the conclusion that inefficient banks frequently have little capital ratio and high default rates. This study seeks to evaluate the association between the efficiency of costs and non-performing loans and to give a general overview of the variables affecting the cost efficacy of universal banks in Ghana in order to enhance the assessment of bank efficiency.

2.3 Theoretical Review

This article offers an overview of the pertinent ideas that explain how non-performing loans affect Ghanaian universal banks' capacity to make a profit. Theoretical assessments include discussions of Asymmetric Information Theory, Agency Theory, and Modern Portfolio Theory.

2.3.1 Agency Theory

Ross (1973), was the first researcher to expressly suggest that a theory of agency be constructed and to really begin its formation. Although the fundamental ideas underpinning these methods are similar, Ross (1973) is credited with developing the economic theory of agency and Mitnick (1973) with developing the institutional view of agency. In fact, the techniques' usage of associated ideas under several assumptions might be vigilant as complimentary. The agency hypothesis is becoming quite popular as a way to explain how profitable an organization is. The notion aims to

clarify the relationship between an organization's management and its owners, who are typically the people who own the organization's stock. According to the notion, there's an agency issue. A company's management is typically viewed as an agency hired by its shareholders to increase stakeholder value through strong financial performance. Therefore, the administration is required to work in the owners' top interests and improve the company's financial success.

However, the concept contends that managers who are also agents may engage in actions detrimental to the organization's owners in order to further their own interests. According to the notion, when this occurs, the organization's financial performance might easily decline. Therefore, shareholders have a variety of options for ensuring that management works in the best interests of the company. According to the principle, financial incentives may be used to encourage management to advance the business's goals. To compel management to fulfill its obligations, the owners may potentially threaten hostile takeover or other measures.

2.3.2 Asymmetric Information Theory

This notion is applicable in circumstances where knowledge is limited. When one side has different knowledge from the other, it occurs most frequently. Asymmetric information is a worry in financial markets when borrowing and lending are involved. In these marketplaces, the debtor is far more informed than the lender on his financial situation. Markets for Lemons by Akerlof (1970) was the first book to explain this theory in simple words. The research is the most significant one in the body of work on the financial implications of data (Mirrlees, 1997). Information access between those involved in the procedures of making fiscal choices is referred to as information asymmetry.

By boosting banks' knowledge of credit applicants, Pagaon and Jappelli (1993) show how information sharing lowers adverse selection. The notion of asymmetric information suggests that it could be challenging to discriminate between positive and negative borrowers, which could result in concerns with moral hazard and adverse selection. According to the notion, in a market, a party that has more knowledge about an item to be traded than another party (in this example, the lender) is in a better position to negotiate the best conditions for the transaction (Khan, 2020). According to Amuakwa-mensah (2015), moral hazards and adverse selection cause a considerable buildup of bad loans in banks. Managers of universal banks may be more knowledgeable than other stakeholders about the implications of loan defaults on their financial performance. In this scenario, they could omit disclosing non-performing loans or utilize allowances for liabilities on non-performing loans as a way to bolster profits.

2.4 Empirical Review

2.4.1 Determinants of Banks' Efficiency

There are many studies in advance on the determinants of banks' efficiency. A study by Sherman and Gold (1985) applies the data envelopment analysis (DEA) technique to study 14 branches of US investments institutions to ascertain their efficiency level. The study adopts the production method with input variables as labour, workplace and supply costs and output variables as 17 forms of contacts process by the banks' divisions. The study finds out that 8 branches work efficiently with 4 being inefficient. A related study conducted by Altunbas *et al.* (2016) examines 35 banks' branches of a major Canadian chartered bank. The researcher also uses the DEA technique but adopts the intermediation method using 6 input variables as telephone and stationery expenses, quality of customer service space ranking, marketing activity ranking, total annual rent, authorized full-time employees, and number of online terminals such as number of loan applications, account

openings, number of transactions, retail account openings. The writer concludes that 24 are relatively efficient out of the 35 branches. Fofack (2005) used labor, capital, and cash from clients as input factors and loan revenue and other business activity as output variables in a research to examine the efficiency of 143 Japanese universal banks in 1990. According to the author's research, scale efficiency is approximately 0.9844 and the mean level of pure technical effectiveness is 0.8645, indicating that pure technical inefficiency is the main cause of total technical inefficiency. Rising returns to scale are mostly to blame for the extent of inefficiency, according to the author. The effect of scale efficiency on bank size is favorable but negligible. The DEA technique is used in a recent research by Adjei-Frimpong (2013) to determine the revenue and cost efficacy of Japanese banks for the years 2000–2006. They conclude that there is an improvement in efficiency since 2001. The study also find out that, City and Trust banks are more cost and revenue efficient than the regional banks. However, compared to banks in other developed nations, Japanese banks are less lucrative.

Yeh (1996) uses financial ratio analysis and IDEA in a larger context to assess the effectiveness of 6 financial firms (banks) in Taiwan from 1981 to 1989. Total loans, non-interest revenue, and interest revenue are used as production variables, whereas non-interest expenditures, total deposits, and interest expenditures are used as input variables. According to the author's findings, banks with high DEA scores had higher ratios for capital adequacy, resource utilization, and profits and lower ratios for financial leverage and liquidity. The author then concludes that there is a link between the estimated efficacies and the actual fiscal working decisions made by banks. Similar to this, Yeh (1998) uses the DEA approach together with financial ratios analysis to evaluate the effectiveness of 34 financial organizations (banks). They use four productivity variables—credits, interest in investments revenue, non-interest income, and bank properties—as well as the

following 2 input variables: number of employees recruited and interest outflow. According to their findings, Fifteen out of the 34, universal banks are effective. Additionally, the study reveals that private banks handle their resources more skillfully than public ones. However, according to Chiu, Chen, and Bai (2011), the results of the DEA technique do not agree with those discovered through the use of financial ratios. The financial liberalization has had a favorable impact on Taiwanese banking efficiency, according to a recent research by Chen (2001).

The DEA technique is used by Resti (1997) to assess a group of 270 Italian banks from 1988 to 1992. The author uses advances, savings, and non-interest income as production factors while adopting the intermediation method and using wealth and labor as input variables. Despite significant disparities in the efficiency ratings, the study finds no gain in efficiency. The outcome also shows a strong correlation between efficiency and the quality of assets. Another research of Italian banks conducted between 1993 and 1996, following the implementation of the EU's 1992 Sole Market Programme, by Girardone, Molyneux, and Gardener (2004) reveals an enhancement in the total cost and productivity of banks in Italy. It looks at the main variables influencing the cost effectiveness of Italian banks and discovers proof that there is no correlation between bank efficiency and size. Additionally, in line with the results of (Benthem, 2017), the cost efficiency of Italian banks is favorably correlated with capital strength but adversely correlated with the volume of non-performing loans.

Additionally, banks with more branches countrywide became more effective. However, their data also suggest that the degree of efficiency of banks in Korea is not significantly affected by financial liberalization, if at all. The effectiveness of the Malaysian banking industry is investigated using the DEA technique in a research by Zaini et al. (2017). The study looks at the impact of the 1997 Asian financial crisis. The Malaysian banking sector has a high level of inefficiency, which is

especially prominent in the period after the Asian financial crisis, according to the authors. The DEA approach was used in a research by Saka et al. (2012) to evaluate the effectiveness of universal banks in Greek. The findings indicate that external banks are more technologically proficient than local banks. The writer uses the Tobit analysis with scientific and efficiency of scale as dependent variables to study the factors that influence efficiency. The findings suggest that Greek universal banks are more effective when they have more capitalization and lending activity. The results were similar with (Karim, Chan, and Hassan, 2010), which found that loan activity had a favorable and significant impact on bank efficiency. According to the author, capital is important and positively correlated with bank productivity. As a result, banks with enough capital are more effective from a technical and operational perspective. The study's findings are congruent with those of Karim, Chan, and Hassan (2010) on Turkey and Casu, Girardone, and Molyneux (2006) on Italy and US banks in this context. Berger and De Young (1997) employ the Granger-causality technique, a dynamic approach, to evaluate the temporal correlations between loans, cost efficiency, and assets for a group of U.S. universal banks from 1985 and 1994. This is in contrast to the expanding body of work on static efficiency. The authors discover that improvements in bad debt are followed by declines in cost efficiency, and that increases in non-performing loans are preceded by decreases in cost efficiency, showing that there are temporal correlations between debt quality and cost efficiency that run in both directions.

A research by Zhang et al. (2016) examines the impact of economic reform on the effectiveness of Turkish universal banks based on evidence from developing nations. The research uses the DEA approach and observes an improvement in efficiency. The findings indicate a 10% average gain in technological efficiency between 1981 and 1990. Another study finding suggests that banks' technical efficacy declined during the study period. Additionally, the Turkish banking industry's

sheer technological inefficiency is the major cause of inefficiency. Intriguingly, the findings also demonstrate that, in terms of both overall as well as pure technical efficiency scores, state-owned financial institutions were more effective than privately held banks in 1990. On the other hand, state banks were shown to be more subject to allocative inefficiency. The two-stage strategy, according to Greenwood et al. (2013), produces skewed findings because the model computed at the first phase is improperly described. The difference in efficiency score by either the one-stage or two-stage estimate approach is, however, small, according to Dasmani (2010) and Alhassan and Tetteh (2017) who employ the two-stage estimation technique.

Additionally, Ayadi, Aigner, Lovell, and Schmidt (1998) use the DEA approach to assess the performance of eleven Nigerian banks from 1991 to 1994. Additionally, the study uses an intermediary method with total loans, interest revenue, and non-interest revenue as input factors, and interest paid on savings, total costs, and overall deposits as output variables. According to the survey, banks that have been in business for a while are generally efficient. The primary issue of banks, according to the researchers, is inadequate management, which they ascribe to low loan quality, high credit risk, liquidity risk, and their failure to produce capital internally. According to Havrychyk (2006), who used the DEA technique to examine the efficiency of the Polish banking industry from 1997 to 2001, banks worldwide are more cost-efficient than local banks, which is the opposite of what was previously anticipated. Using the Tobit regression model, the author also investigates the elements that influence effectiveness and discovered that, in Poland, the association between bank size and efficiency was favorable.

Using both the Bayesian stochastic frontier and the DEA techniques, Tabak, Craveiro, and Cajueiro (2011) examined the performance of the Brazilian banking sector throughout the post-privatization era from 2000–2007 and found that larger banks were more effective than smaller

banks. The results indicate that Brazil has inferior cost effectiveness, with a mean score of 0.66. Their findings indicate a favorable impact of bank capitalisation on efficiency with regard to the factors influencing bank performance based on a static model. Additionally, the study discovers no connection between bad loans and efficiency in banks. For similar period 2000–2007, a research by Staub et al. (2010) calculated cost, technical, and allocative efficiency for Brazilian banks. The DEA approach was used by the authors to determine how effective Brazilian banks were. Instead of allocative inefficiency, technological inefficiency is mostly blamed for the inefficiency in Brazilian banks. According to the authors, a greater technical inefficiency shows that Brazilian bank managers choose the right input mix given the price, but they use fewer inputs. For some banks, this could be a result of high interest costs, high capital costs, high labor costs, or low production. However, between the years 2003 and 2007, technological efficiency outperformed allocative efficiency. Non-performing loans have an impact on allocative efficiency, the study finds. However, the study found that loan defaults had a negligible and inverse link to the technical and financial efficiency of banks after examining the factors affecting bank efficiency using a dynamic system GMM estimator. The size and capitalization of the bank had no discernible impact on technical and financial efficiency. Additionally, the persistence effect's (the delayed efficiency's) coefficient is positive and substantial.

Again, data from different nations demonstrates that prior research that evaluated the European banking sectors using the DEA method were successful (Straub et al., 2014). The authors assess the 1990 banking performance of three nations, namely Finland, Norway, and Sweden. The study employed labor and capital as input factors with the DEA approach, while the number of branches, the overall loans to other banks, and the sum of deposits from other banks served as the study's

output variables. According to their findings, Swedish banks were generally more effective than Norwegian or Finnish banks.

A comparative examination of the development of the technical effectiveness of general banks in Pakistan and India from 1988 to 1998 is also provided by Ataullah and Le (2004). To evaluate technical efficiency, the authors employed two different input-output specifications and DEA methodologies. The research divides technical efficiency into two sections: scale efficiency and pure technical efficiency. The research demonstrates minimal increase in efficiency until 1995 and reveals little proof of technical efficiency in the banking sectors of both Pakistan and India during the time. poor scale efficiency is mostly to blame for the poor overall technological efficiencies in both nations. Furthermore, the analysis of the connection between size of bank and technical efficiency reveals that larger banks outperform smaller banks. Nevertheless, this disparity gets smaller with time. The results also demonstrate that banks are somewhat more effective at producing earning assets than at producing revenue. This is explained by the high percentage of non-performing loans.

Kablan (2010) examines the degree and factors of bank cost efficiency spanning 1998 to 2002 using 137 universal banking institutions from 29 African republics. The study discovers that banks use stochastic frontier analysis to be cost-effective. According to the author's analysis of dynamic systems using the generalized technique of moments, there is a bad correlation between the efficiency of the bank and nonperforming loans. Additionally, bank efficiency is inversely correlated with bank capitalisation and statistically significant.

Additionally, bank efficiency is inversely correlated with bank capitalization and statistically significant.

For a period of five years, from 1999 to 2005, Turk-Ariss (2010) used 821 financial institutions in 60 developing nations from five distinct regions: Africa, South and East Asia and Eastern Europe and Central Asian countries, the Americas. The author's goal was to determine how having more market power would affect banks' stability and efficiency. The author reveals that there is evidence of a large inverse association between market dominance of banks and cost effectiveness as well as a significant inverse relationship between market power and overall bank stability. Theoretical foundations of the efficiency notion employed in this study were put out by authors like Färe and Grosskopf in 1985. Later on, Berger and Humphrey (1997) give a wealth of literature on the idea of productivity and efficiency. Optimizing value through economics of scale, scope, outputs mix synergy, and management efficiency are just a few examples of what efficiency might entail. To produce greater output from a given combination of inputs would be the benchmark for an efficient company. Since then, the emphasis has turned to the financial sector with a focus on examining the profitability of banks (Alkhazaleh & Almsafir, 2014). Initially, efficiency was measured in respect to different industries of the real economy.

A static concurrent equation approach (Seemingly Unrelated Regression method) is used in a recent study by Altunbas et al. (2016) to examine the link between capital, loan provisions, and cost inefficiencies on banks that operated in 15 European nations between 1992 and 2000. In contrast to (Williams, 2004), the analysis finds that cost effectiveness and risk-taking by banks are inversely correlated. Capitalization and bank size both have a favorable effect on cost inefficiency. Their different findings might be the result of different estimating techniques. Additionally, it is crucial to note that the Altunbas et al. (2016) study does not take the fluctuating character of capital and credit risks into consideration. In a recent research, Fiordelisi et al. (2011) evaluated the causal link between cost effectiveness, risk, and capital using universal banks from 26 European Union

nations between 1995 and 2007. The authors discover that rising capital levels came before rising cost effectiveness and vice versa. Cost effectiveness is also a negative Granger-cause of bank risk.

The majority of static panel data methods have been employed in prior research on bank efficiency to study bank efficiency drivers. However, certain financial techniques exhibit dynamic shifts over time and exclude dynamic data aspects, which can result in significant misspecification biases in estimates and conclusionsStaub et al. (2010) assert that banks that do well one year often repeat their success the next year. Additionally, endogeneity of certain of the regressors, including lagged efficiency, credit risk, and bank capital, was not taken into consideration in the experiments. The necessity to incorporate lagging efficiency, however, is gradually becoming more apparent (Alhassan, 2014; Yakubu et al., 2017).

2.4.2 Determinants of Non-performing Loans

The research splits the main causes of NPLs into macroeconomic, bank-specific, and debt crisis-related variables. The theoretical cycle of business theories with an apparent role for financial intermediaries serve as the foundation for NPLs and their linkages with macroeconomic performances (Amoako-Boateng, 2017). It stands to reason that disparities in monetary legislation and direction have an impact on banks' behavior and risk supervision strategies, which are crucial in understanding cross national variations in NPLs. The balance sheets of debtors and their capability to pay their obligation are intimately impacted by the macroeconomic condition. As a result, negative financial tremors combined with high capital costs and poor interest limits are known to contribute to NPLs (Niepmann, 2016). The buildup of NPLs is primarily ascribed to a variety of issues, including the economic slump, macroeconomic instability, worsening of terms of trade, high interest rates, an excessive dependence on excessively expensive interbank

borrowings, and moral hazard, according to Kingu, Macha, and Gwahula (2018). Another element that is thought to contribute to NPLs is abrupt market fluctuations. As a result, any abrupt market shift might alter the amount of money that people can borrow and repay through loans (Amuakwa-mensah, 2015).

Furthermore, Altunbas et al. (2016) found that the credit crunch is defined by a surplus of demand for loans that arose in August 1997 when they used both micro and macro panel data analysis to explore the occurrence of an economic downturn in Indonesia following the crisis. Altunbas et al. (2016) also look at how loan supply relates to actual lending ability, lending rates, real production, bank capital ratio, and NPLs. Their findings reveal that the impact coefficients on NPLs are negative and significant showing that the availability of bank credit decreases as the NPL situation worsens. Furthermore, according to Kroszner (2012), bank crises and NPLs are tightly related. According to Greenidge and Grosvenor (2010), the size of NPLs is a crucial factor in the beginning and development of monetary and banking crises. Furthermore, NPLs are frequently linked to failure and economic meltdowns in the developed as well as developing nations, according to Adusei (2018), who also claims that they are commonly employed by lending institutions as a gauge of asset quality. According to Reinhart and Rogoff (2010), NPLs can be used to identify the beginning of a financial crisis. NPLs continue to be a major issue for both global and local authorities, despite continued attempts to rein in bank lending operations (Boudriga, Taktak, and Jellouli, 2009). Haniifah (2015) draws a link between lending and the reasons why banks collapse. According to Amuakwa-mensah (2015), a bank fails because there is a lack of trustworthy financial data on borrowers that can be used to determine their creditworthiness. Controlling NPLs is crucial for the financial climate of the economy as well as the performance of each individual bank (Reddy & Nirmala, 2013). The literature suggests that ineffective management and bank

practices are to blame for NPLs (Alshebmi, Hassan, and Adam, 2020; Altunbas et al., 2000). They claim that managers in the majority of financial institutions dealing with the NPL issue use subpar monitoring and control procedures in addition to failing to effectively underwrite loans.

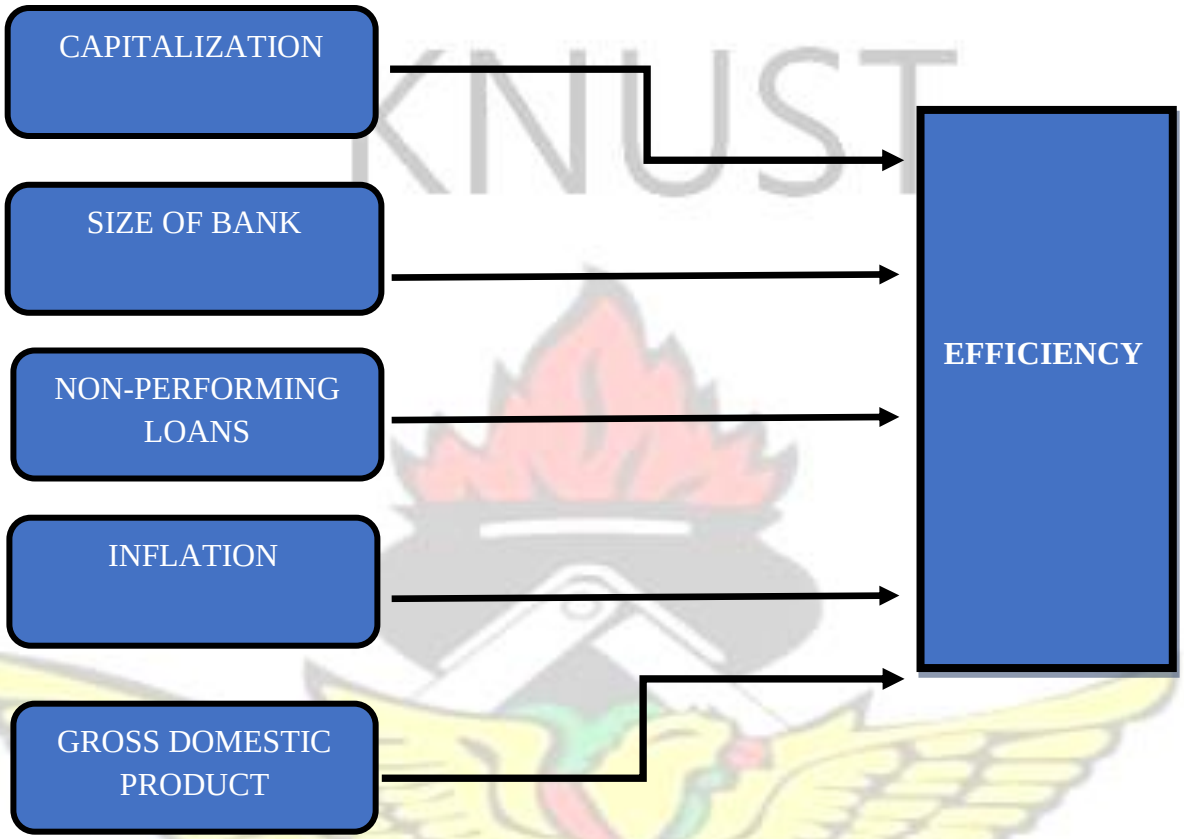
In most cases, the development of a credit culture occurs when debtors take out huge loans not because doing so is financially prudent for them, but rather because they observe others doing so, which results in defaulted debts. Khan (2020) claims that Keeton examined the effects of credit expansion and loan default in the USA using data from 1982 to 1996 using a vector auto regression model. According to the study, there is a significant link between loans and assets with reduced value. He also points out that in some US areas, increased loan losses are a result of fast credit expansion, which is associated with laxer credit criteria. Loans that are past due for over ninety days or that do not accumulate interest are considered delinquent, according to him.

After analyzing the unpredictability of the Argentine Banking system between 1993 and 1996, Amuakwa-mensah (2015) discovers that Bercoff, Giovanni, and Grimard (2002) also give evidence that is similar to that of the USA. Tan and Floros (2013), among other academics, examine the connection between NPLs and the ownership layout of universal banks. Hu et al. (2006) analyze this link using panel datasets from Taiwan that span the years 1996 through 1999. In their analysis, they demonstrate that banks with larger government ownership record fewer non-performing loans. They also highlight how bank size is adversely correlated with NPLs, but diversity may not be a factor. Zhang et al.'s (2016) use of a non-parametric method with the warnings suggested for predictable approaches that do not provide interpretations on function definition for bank management is highly fascinating. At various points, he estimates the makeup of issue loans using a data envelop analysis (DEA). Amuakwa-mensah (2015) claims that although the amount of NPLs might fluctuate from year to year, individual choices and natural occurrences

(such as natural catastrophes, declines in discretionary income, and unanticipated increases in particular products, etc.) mostly cause predictable levels of NPLs. Companies frequently pass on the cost of these safeguards and insurance to consumers by incorporating a surcharge for the threat in the interest paid on the loans made. Based on the literature review, it is clear that there are few researches on the factors that influence NPLs in Ghana's banking sector. This study, by looking into the issue, addresses this knowledge gap. This study specifically looks at the factors that influence NPLs for a pool sample of twelve financial institutions and sub samples of big and small banks. This helps us when developing policies that are unique to small and big banks.

2.5 Conceptual Framework

A model is described as an assumption generated from a certain circumstance. A conceptual framework's main objective is to define concepts that are important to a particular subject and show how they relate to one another. The purpose of this study is to determine the impact of various macroeconomic and bank-specific variables on the effectiveness of Ghana's universal banks' operating processes. This research uses the ratio of non-interest expenditure to total operating revenue to gauge bank efficiency (EFF). Personal expenditures and other non-interest running expenses are the ratios used to assess the operational effectiveness of universal banks. Bank size, non-performing loans, capitalization, gross national product, and inflation product are the main factors considered in this analysis for the universal banks in Ghana. The dependent variable in the research is the efficiency of the banks, while the independent variables are bank size, bad loans, capitalization, gross domestic product, and inflation rate. The graph below illustrates this.



Author's Conceptual Framework, 2023

Figure 2. 1: Conceptual Framework

CHAPTER ITHREE

METHODOLOGY

3.0 Introduction

This chapter delves with the research design, the data employed in the research and the estimation technique of the fixed effect regression estimator for the static panel and the two-step system generalized method of moment (GMM) estimator for dynamic panel models.

3.1 Research design

A method for describing how data was gathered and then analyzed is known as research design. Typically, this is done with the goal of responding to a specific research topic (Creswell 2009). This study employs a descriptive research methodology since it focuses on specific actions on one variable as a result of another (Kothari, 2005). This type of design is suitable for determining the effectiveness of banks and the amount of non-performing loans in Ghanaian commercial banks. Once more, it examines how non-performing loans affect the effectiveness of Ghana's commercial banks. Since the study collected data across an eleven-year span, it utilized a cross-sectional design. A cross-sectional research, according to Kothari (2005), illustrates the traits that exist within a group or any other connection that exists among the variables.

3.2 Data

Data utilized in the study covers Ghanaian commercial banks between 2010 and 2020. Banks without data for the whole time period were not included in the information. Throughout the time, there were only a small number of mergers, acquisitions, and closures. The data were checked for inconsistencies, reporting outliers, and errors. Additionally, the years when both output and input variables had zero values or were missing values were also noted. According to those guidelines,

the pattern of records for those observations are balanced panel data of 13 banks over the course of the study, with annual observations totaling 143 data observations over the course of the study, accounting for more than 91% of financial institution property during the period under consideration. A balanced panel of data was chosen to access during the process of the investigation. The information was entirely derived from the yearly financial reports of a few chosen Ghanaian commercial banks. The annual reports might also be found on the different websites of Ghanaian banks and the Ghanaian central bank. The same accounting standards, known as the International Financial Reporting Standards, or IFRS, were utilized by all institutions included in the study. Additionally, the World Bank and the International Monetary Fund provided the macroeconomic data. The list of banks employed in this investigation may be found in the appendix. State-owned banks, domestic retail banks, and international banks are among them. In Ghana, a bank is considered to be foreign-owned if more than 50% of its assets are owned outside. Efficiency was employed by the researcher as the dependent variable, whereas bank capitalization, bank size, non-performing loans, inflation rate, and gross domestic products served as the study's independent factors.

3.3 Empirical Models

3.3.1 Static Panel Model of Banks' Efficiency

The static panel model which determines the bank-specific and macroeconomic factors that affect banks' efficiency is shown in equation 3.1

$$EFF_{it} = \alpha_1 CAP_{it} + \alpha_2 SIZE_{it} + \alpha_3 NPL_{it} + \alpha_4 INF_{it} + \alpha_5 GDP_{it} + \eta_i + \mu_{it} \quad (3.1)$$

$$NPL_{it} = \alpha_1 CAP_{it} + \alpha_2 SIZE_{it} + \alpha_3 EFF_{it} + \alpha_4 INF_{it} + \alpha_5 GDP_{it} + \eta_i + \mu_{it} \quad (3.2)$$

Where

i = bank and t denotes time

α = parameter to be measured,

η_i = bank specific-effect,

μ_{it}= error term,

EFF_{It} = bank efficiency,

CAP_{it} = Capitalization is calculated by dividing total equity by total assets.

$SIZE_{it}$ = natural logarithm total assets,

NPL_{it} = Non-performing loan ratios,

$GDPG_{it}$ = gross domestic product

INF_{it} = inflation rate.

In this model, all the explanatory variables are assumed to be strictly exogenous.

3.3.2 Dynamic Panel Model of Banks' Operational Efficiency

In order to reflect the changing nature of bank efficiency, a dynamic approach was taken by incorporating one-year lag efficiency among the explanatory factors. This study aims to determine if bank efficiency seems to endure as time passes in the banking industry of Ghana. The banks that are more successful in one year likely to continue being effective in the next year, claims Alhassan (2014). Adusei (2018) contends, on the other hand, that the one-year delayed efficiency shows a buildup of knowledge and technology endowment that may help banks create greater output with

their inputs by responding to the financial changes relatively rapidly. The efficiency of the prior year and the current year have a considerable and favorable link, according to research by Alhassan (2014) and Staub et al. (2010). Furthermore, several early banking research (Berger and Humphrey, 1991; Amuakwa-mensah, 2015) attest to the durability of efficiency over time. The addition of a lag dependent variable makes it more difficult to estimate the model since it relates with an error term even when there is no correlation between the error terms (Alhassan, 2014).

In addition, bank capitalization and provision for loan loss were regarded as endogenous factors centered on the banking literature. This is because the estimations of the coefficients are biased when such opposite causality in efficiency formulae is not taken into account. The examination of the outcomes is further complicated by this.

Following the method of Alhassan (2014) the dynamic panel model specification of banks' efficiency factors in Ghana is given in equation 3.2

$$EFF_{it} = \beta_1 EFF_{it-1} + \beta_2 CAP_{it} + \beta_3 SIZE_{it} + \beta_4 NPL_{it} + \beta_5 INF_{it} + \beta_6 GDP_{it} + \eta_i + \gamma_t + \mu_{it} \text{.....(3.3)}$$

$$NPL_{it} = \beta_1 NPL_{it-1} + \beta_2 EFF_{it} + \beta_3 SIZE_{it} + \beta_4 CAP_{it} + \beta_5 INF_{it} + \beta_6 GDP_{it} + \eta_i + \gamma_t + \mu_{it} \text{.....(3.4)}$$

Where

i = denotes bank and t represents time

β = parameters to be assessed,

η_i = bank specific-effect,

γ_t = is the time effect

μ_{it} = is the error term

EFF_{It} = bank efficiency

EFF_{it-1} = One-year lagged bank efficiency,

CAP_{it} = capitalization, and is measured as total equity over total assets,

$SIZE_{it}$ = natural logarithm total assets,

NPL_{it} = Non-performing loan ratios,

$GDPG_{it}$ = gross domestic product,

INF_{it} = inflation rate

In this work, two strategies are used to estimate the dynamic model utilizing the system GMM, ensuring that the amount of instruments is fewer rather than equal the total amount of groups. Instead of using all of the accessible lagged for the variables that are endogenous (for level and difference equations), the first strategy employs fewer lags as instruments. Additionally, in order to reduce the number of instruments, the study used the "collapsing instruments" approach, which involves constraining all yearly moment conditions to the same value. Without collapsing the instruments, each variable in the normal instrument matrix creates a separate column for each time interval and lag applicable to that time period. However, collapsing the instruments condenses the parameter set into a single column to reduce the

By employing these techniques, we may significantly reduce the proliferation of instruments and prevent the over-identification of endogenous variables, resulting in estimates that are more accurate. Because the study only includes 13 banks, reducing the proliferation of instruments is essential to identifying the models (Jallab, 2013). The lagged dependent variable's second and third lags, as well as the instruments reserve for loan losses and capitalization, are also used in this study.

3.4 Variables Description and Measurements

This section of the research describes the factors and methods for measuring the variables that were used to determine how efficient banks are. These factors were divided into macroeconomic and bank-specific categories.

3.4.1 Bank-Specific Factors

The bank specific variables considered were size, credit risk and bank capitalization.

3.4.2 Bank Size

To examine its impact on banks' efficiency, the normal logarithm of entire assets is captured for each bank size. Knowing what size maximizes bank efficiency is crucial. According to certain experts, bank size has a highly favorable effect on how effective banks are (Zhang & Jiang, 2018). However, other research also reveal a considerably adverse relationship between bank size and efficiency. Others have noted that the size of the bank has no bearing on performance, according to Alhassan and Tetteh (2017).

3.4.3 Credit Risk

The ratio of total loans to loan loss provisions represents the credit risk. This variable is included to account for variations in bank efficiency brought on by variations in credit risks. This is significant since bank failures are thought to be most frequently caused by weak asset quality (or increased credit risk). Asset quality is measured by the ratio of provision for loan loss to total loan. Greater loan loss provisions as a percentage of total loans indicate lower asset quality and higher credit risk for banks. According to earlier research, banks that take on more risk are less effective (Ataullah et al., 2016). While Staub et al. (2010) found no significant link between the provision for loan loss and efficiency, Altunbas et al. (2016) discovered one.

3.4.4 Bank Capitalization

An explanation of bank capitalization is the ratio of shareholders' equity to total assets. Small capital ratios often indicate increased risk, which raises borrowing rates. Because of this, efficiency is probably higher in banks with stronger capitalization, and a positive link is thus anticipated. The findings on the impact of bank capital requirements on bank efficiency, however, are conflicting. According to several research, banks with greater capital ratios are more productive (Amoako-Boateng, 2017). The study by Altunbas et al. (2016), on the contrary hand, reveals a bad association. It is possible that financial capital effects costs via its source of funding might be linked to a negative connection. Therefore, a capital raising strategy that entails more expenses than accepting deposits might result in a poor correlation between bank efficiency and capitalization. Altunbas et al. (2016) likewise attest to the negative correlation between bank capitalization and efficiencies, while Staub et al. (2010) find little to no effect of capital on efficiency.

3.4.5 Macroeconomic Factors

In order to take the effect of economic circumstances on banks' efficiency into consideration, the GDP growth rate and inflation rate are used. This is true because the quality of the assets held by banks is likely to be impacted by macroeconomic expansions (Soedarmono, Greenidge, and Grosvenor, 2011).

3.4.6 Gross Domestic Product Growth Rate

It's feasible that quicker GDP growth has a positive effect on banks' effectiveness. This is due to the fact that economic growth aids in the expansion of the banking sector since stronger GDP growth has a favorable impact on the demand for and the supply of financial services, as well as

perhaps improving bank efficiency and asset quality. However, during recessions, as GDP growth slows, lending quality tends to worsen and the default rate rises, decreasing the efficiency of banks. Fiordelisi, Marques-Ibanez, and Molyneux (2011) indicate beneficial effects of real GDP growth rate on banks' efficiency in previous research on European nations. However, neither the Altunbas et al. (2016) research on Japanese banks nor the Zaini et al. (2017) study on 15 East European countries discover any appreciable impact of GDP growth on banks' efficiency.

3.4.7 Inflation Rate

The yearly annual increase of the consumer price index, or CPI, is used to quantify inflation, which is thought to have a negative impact on bank efficiency since it raises costs and reduces cost effectiveness. High interest margins and non-price bank activity are indicators of high inflationary conditions that can be shown by inflation (Afriyie & Akotey, 2016). Inflationary circumstances are severe in Ghana. For instance, Amoako-Boateng (2017) provides evidence that inflation raises expenses and lowers profitability when banks compete by growing their branch networks. As a result, it is anticipated that inflation and banks will not get along. The information comes from global development indices.

3.4.8 Efficiency

The DEA approach is used in this section to evaluate bank performance in Ghana. In the assessment of the factors affecting bank efficiency in Ghanaian banking sectors, the efficiency scores serve as the dependent variable. The factors used to measure efficiency in this study are, input expenses and out output expenses. The efficiency ratio, commonly referred to as the activity ratio, shows how well the business is currently operating using its own resources. Banks utilize the efficiency ratio because it enables analysts to assess how effectively the bank is running its

overhead operations to produce income. 50% is regarded as the optimal ratio; the smaller the ratio, the better. In this study, non-interest costs (fixed operational costs) including rent, salaries, and other overhead costs will be used to compute the efficiency ratio. The bank's net interest income is also computed as interest generated minus the interest paid by the bank, which includes charges for deposits, debit card fees, loan processing, and revenue from the sale of their goods in the capital markets, such as mutual funds and insurances. An analyst uses the bank ratio of efficiency to assess business insights and to learn more about the effectiveness of various business sectors. This ratio is often used by analysts to compare banks to peer companies in the same sector. Banks can use this information to identify companies that, in compared to others, are managed properly.

Bank Efficiency Ratio = Non-Interest Expense / (Net Interest Income + Non-Interest Income - Provision for Credit Losses)

3.5 The estimation technique

This section gives the DEA method was used to estimate the financial institution efficiency. The section additionally gives the financial institution performance fashions hired to evaluate the factors of financial institution efficiency inside the Ghanaian banking industry from 2010 to 2018. Estimates of the factors influencing financial institution efficiency were made using Stata13 software. A dynamic model (system GMM) and static effects regression estimator are used in this study to assess the factors that affect banks performance in Ghana. Given that it accounts for unobserved heterogeneity, the fixed effect model is used to determine the factors that influence banks' efficiency (static version). The robust standard errors test is used in the fixed effect model to account for heteroscedasticity. This is because banks in Ghana come in a variety of sizes, which might potentially contribute to unique differences in the error terms. The fixed effect model's static

models do not include lagged structured variables because the fixed effect estimators produce large biases in the coefficient estimates for lagged established variables.

Because System GMM takes into account unobserved heterogeneity, exogenous variables, and endogenous variables, it was used to investigate the factors influencing financial institution efficiency. The Generalized Method of Moments estimation is more advanced than the fixed effect estimator, which yields inconsistent results, when dynamics and endogenous explanatory factors are present in the panel estimation. GMM will be employed in a two-step process to address these flaws. Again, when using Windmeijer (2005) adaptive error correction, the system GMM estimator exhibits the least amount of bias in small samples when compared to conventional least-squares estimation, the fixed effect version, and main difference GMM estimators. The Breugh Pagan test will also be used to determine whether heteroscedasticity is present.

The Random Effect techniques

The fixed effect model assumes that all the individual differences are captured by the intercept parameter. The REM also have similar assumption but also recognize that the individuals are randomly selected and therefore treat the individual differences as random.

$$Y_{it} = \alpha_0 + \alpha_1 X_{it} + \varepsilon_{it} \quad \text{.....(3.3)}$$

The individual difference can be captured in the model by specifying the intercept parameter α to consist of a population average $\bar{\beta}$ and the random individual difference to be μ_i

$$\alpha_0 = \bar{\beta}_i + \mu_i \quad \text{.....(3.4)}$$

Where;

$E(\mu)=0$ $\text{cov}(\mu_i \mu_j)=0$ $i \neq j$ $\text{var}(\mu_i)=\delta_u^2$

$$Y_{it}=(\overline{\beta}+\mu_i)+\alpha_1 X_{it}+\varepsilon_{it} \quad \text{.....(3.5)}$$

$$Y_{it}=\overline{\beta}+\alpha X_{it}+(\mu_i+\xi_{it}) \quad \text{.....(3.6)}$$

$$Y_{it}=\overline{\beta}+\alpha X_{it}+\nu_{it} \quad \text{.....(3.7)}$$

Where $\overline{\beta}$ is now the parameter of the intercept and the error term is ν_{it} composes of a component μ_i that represents a random individual effect and the component ε_{it} is the usual egression random error. The combine error becomes $\nu_{it}=\varepsilon_{it}+\mu_i$. The assumptions of ν_{it} includes; $E(\nu_{it})=0$ (Zero mean)

$\text{var}(\nu_{it})=\sigma_e^2+\sigma_{it}^2$ (Homoscedasticity)

$\text{cov}(\nu_{it},\nu_{is})=\sigma_{it}^2$ For $t \neq s$ (error for individual i are correlated)

$\text{cov}(\nu_{it},\nu_{js})=0$ For $i \neq j$ (error for different individuals are uncorrelated)

$\text{cov}(\varepsilon_{it},x_{it})=0$, $\text{cov}(\varepsilon_{it},x_{2it})=0$ (errors ε_{it} uncorrelated with $x's$)

$\text{cov}(\mu_i,x_{it})=0$ $\text{cov}(\mu_i,x_{2it})=0$ (Random effects uncorrelated with $x's$)

3.5.1 Two-Step System GMM Estimator for Dynamic Models

Since there is no guarantee that every explanatory variable, especially bank-specific variables, will remain firmly exogenous and because financial institutions may regulate their attributes and obligation structures over time, it will be shown in this study that the tied descriptive variables are not stable. Descriptive variables may therefore be external, fixed, or endogenous. For the following reasons, this study will favor the two-step system GMM estimator over the difference GMM estimator:

The system GMM estimator, as stated by Blundell and Bond (1998), will reduce any potential biases and errors associated with the first-difference GMM estimator, especially for small samples, imbalanced panel data, and when the independent variables are continuous. The system GMM estimator will be used because, unlike the difference GMM, it is systematically controlled for heteroscedasticity. However, its standard errors are often biased downward in samples of lesser size (Blundell and Bond, 1998). Adjustments for small sample is used, as per Windemeijer (2005), to correct the standard error bias. As a result, the two-step GMM estimator offers more precise estimates than the robust one-step GMM estimator, especially for the system GMM (Rodman, 2003).

Additionally, Roodman (2003) asserts that utilizing the difference GMM estimator with an imbalanced data panel is problematic since it has the defect of enlarging the gaps in such panels. For instance, both Y_(i,t) and Y_(i,It-1) go missing in the transformed data if any of Y_(i,t) is ignored. Once more, Arellano and Bover (1995) advise against using first-differencing and instead suggest using onward orthogonal deviation. Instead of subtracting the rate of previous observations of a variable, the forward orthogonal deviations technique subtracts the average of all future

observations of that variable that are now accessible. Only the later data for each particular variable cannot be quantified, which reduces data loss (Roodman, 2003).

Equation (3.3) can be represented by the following dynamic regression:

$Y_{i,t} = \alpha Y_{i,t-1} + \beta' X_{i,t} + \varepsilon_{it}$ I = 1, 2…N and t= 1, 2…T ……3.10

$\varepsilon_{it} = \eta_i + \mu_{it}$ ……3.11

$E(\eta_i) = 0$, $E(\mu_{it}) = 0$, $E(\eta_i \mu_{it}) = 0$ for all i = 1, 2 …N and t = 1, 2 ….T ……..3.12

Where

i = represents the individual banks and t denotes time,

$Y_{i,t}$ = dependent variable for the bank i at period t

$X_{i,t}$ = set of independent variables (observed heterogeneity)

η_i = unobserved heterogeneity,

μ_{it} = an error term,

$\varepsilon_{it} = \eta_i + \mu_{it}$ is the fixed effects decomposition of the error term.

3.5.2 Difference GMM Estimator

Conventional methods cannot be used to estimate and in equation (3.3) due to the lagged dependent variable's inclusion as an explanatory variable. To remove any potential bias that might result from an unobserved bank specific impact (unobserved heterogeneity), Arellano and Bond (1995) suggest first-differencing the variables in equation (3.3). The reason for this is because unobserved

heterogeneity does not change over time. This breaks the link between the lagged dependent variable and the unobserved heterogeneity of banks (error term).

3.5.3. Some Rules of Thumb in GMM Estimation

i. The number of years must always be lesser than the number of units (in this case, banks) in order to control for dynamic panel bias.

ii. The number of instruments should not exceed the number of units (banks).

3.5.4 Choice of Lagged Variables as Instruments

The kind of the explanatory factors determines the choice of lag variables as instruments:

i. Current values of the exogenous explanatory variables are employed as reliable instruments.

ii. Lagged values for at least one period can be employed as reliable instruments for preset explanatory factors or lag dependent variables (which are not connected with upcoming values of the error term).

iii. The only appropriate instruments for endogenous explanatory variables are their lag values for at least two periods.

3.6 Estimation of Banks' Efficiency in Ghana's Banking Industry

This segment will assess banks' efficiency in Ghana utilizing the DEA method. The efficiency scores will be the dependent variable in the estimation of the causes determining banks' efficiency in the Ghanaian banking industries.

3.6.1 Transformation of the DEA Efficiency as the Dependent Variable

The logistic specification will be used to convert the scores for efficiency into natural log odds ratio in the following manner since the projected values of the DEA efficiency (EFF_u) vary from zero to one:

$$EFF_R = \ln\left[\frac{EFF_u}{1 - EFF_u}\right]$$

It is both continuous and linear. This process of change is monotone. It spans the spectrum from -infinity to infinity. Since it adheres to the same fundamental ideas as linear regression, it may be estimated using the standard ordinary least squares methods because the value of EFF_R has been determined (Gujarati, 1992).

When the efficiency score, IEFF_RI is 0 or 1, however, it is uncertain. Because of this issue, there are more undefined efficiency ratings than total observations, which results in a small amount of data loss. Accordingly, the logit transformation is altered by adding 1/2N to both the numerator as well as the where N is the quantity of data for the efficiency, as per Campbell, Cornett, McNutt, and Tehranian (2008). The benefit of this modified logit transformation is that when the efficiency score is equal to 0 or 1, certain observations are not decreased or excluded (Maddala, 1983). In order to identify the factors that influence efficiency as well as to look into the causal relationship between efficiency and bad loans, the modified logit transformation, or EFF, will be employed as the dependent variable. Directly obtaining the marginal impacts of the explanatory factors on effectiveness is not possible. However, it is possible to immediately read the signs and statistically significant of each coefficient of the efficiency determining factors. Both the signs and statistically significant aspects of each factor's coefficient are required for this investigation. In this recent study on bank efficiency (Altunbas et al., 2016), the logit approach will be used.

CHAPTER FOUR

PRESENTATION AND DISCUSSIONS OF RESULTS

4.1 Introduction

The chapter presents the estimation and discussion of the results. The Stata16 was used for the empirical estimations. The chapter is organized into five sections. Section one provides the descriptive analysis while section two delves into the estimation of banks' operational efficiency and non-performing loans (NPLs) using the random effect model confirmed from the Hausman test. In the third section, similar estimation of the relationship between banks' operational efficiency and non-performing loan using the system GMM is presented and discussed. The fourth section discusses the results from both estimations technique while the final section provides the concluding remarks.

4.2 Descriptive statistics and correlation analysis

The descriptive and correlational analyses of the explanatory variables that were used to gauge the effectiveness of Ghanaian banks between 2010 and 2020 are presented in this section. The mean, standard deviation, minimum, and maximum are included in the summary.

Table 4. 1: Summary statistics of the determinants of the efficiencies of banks in Ghana.

variable	observation	mean	Stand deviation	min	max
CAP	143	15.70	4.66	5.46	39.09
SIZE	143	15.98	2.24	12.19	21.45
NPL	143	14.53	6.93	4	35
INF	143	11.56	3.55	7.13	17.45
GDPG	143	6.99	2.88	3.37	14.04
EFF	143	0.41	0.12	0.14	0.64

Notes; INF,NPL,GDP and CAP are ratios and size in million. The number of banks are 13

Table (4.1) above depicts a large variation of the banks in Ghana as indicated by the minimum and maximum values. The standard deviation indicates a high dispersion of the banks, prominent amongst the factors are the CAP and NPL, which is a suggestion of heterogeneity among the banks. The restructuring of the banking sector with the introduction of new capital minimum requirement leading to merging of the some of the banks will help reduce this heterogeneity. GDP growth rate has an average of 6.99 within the period of the study, which indicated a sustained growth over the period of the study. Inflation also showed a moderate rate with regard to the financial reforms. It has a minimum of 7.13 percent and a maximum value of 17.45 percent with an average of 11.56 percent from 2010 to 2020. NPLs displayed a worrying trend. It has a mean, minimum and maximum values of 14.53, 4 and 35 percent respectively. However, the banks are well capitalized with an average of 15.70 percent. Efficiency also recorded a mean of 0.41, with standard deviation of 0.12. it also recorded minimum and maximum value of 0.14 and 0.64 respectively.

4.3 Testing for multicollinearity using the correlation co-efficient

In determining if the determinants are multicollinear. The correlation test that was used in the study is shown in the matrix in table (4.2), and the results show that there is no meaningful link between the variables.

Table 4. 2: Correlation Coefficients of Determinants of Banks' Efficiency in Ghana

Variables	CAP	SIZE	NPL	INF	GDPG	EFF
CAP	1.0000					
SIZE	-0.0067	1.0000				
NPL	-0.0572	-0.1566	1.0000			
INF	-0.0873	0.0565	0.1643	1.0000		
GDPG	-0.0144	-0.0999	-0.0249	-0.6781	1.0000	
EFF	-0.1243	0.7777	-0.2120	-0.2968	0.0873	1.0000

4.4 The Random effect model and the system GMM results

In this section, the study estimates the operational efficiency of banks using REM and the system GMM estimation techniques. The study uses the Hausman specification test to choose between the fixed effect and the random effect techniques. The study also conducts the Breusch-Pagan Lagrange Multiplier test for heteroscedasticity. Gujarati and Porter (2008) postulated that the presence of autocorrelation and heteroscedasticity renders the ordinary least square (OLS) estimates inefficient. Even though, the estimators might be unbiased, linear and normally distributed in large samples. Nevertheless, they are not "BLUE".

4.4.1 The Hausman specification Test

The Hausman test was used in the study to choose between both the fixed effect model and the random effect model as the best suitable model. The test's findings demonstrate that the random effect model was preferable to the fixed effect model, which was the null hypothesis. Table (4.3) presents these findings.

Table 4. 3: Hausman Test for the fixed effect versus Random effect

Test: difference in coefficients not systematic (Random effect)	
chi2(5) = (b-B)'[(V_b-V_B) ^ (-1)] (b-B)	
=	0.56
Prob>chi2 =	0.9896

Source: Author's computation using Stata 16

From the above diagnostic test, the random effect model is suitable for the estimation of the relationship between banks' efficiency and non-performing loans.

Table 4. 4: Estimated results of Banks' efficiency determinants

variables	Random Effect Model estimates	Two step System GMM estimates
EFF (L1)		0.3528
		(0.2353)
Capital	-0.0048***	-0.0050
	(0.0019)	(0.0038)
Non-Performing loans	-0.0025***	-0.0010
	(0.0011)	(0.0015)
Inflation	-0.0043	-0.0015
	(0.0038)	(0.0059)
GDP Growth	0.0003	0.0045
	(0.0051)	(0.0065)
Size	0.0013	-0.0062
	(0.0004)***	(0.0059)
Constant	0.5307	0.442
	(0.0909)	(0.2008)
R-squared		0.673
Wald test Heteroscedasticity (p-value)		0.015***
F-statistic (p- value)		0.000***
Number of observations		143
Number of banks		13
Hansen test (p-value)		0.847
Arellano-bond test:		
AR(1) p-value		0.042
AR(2) p-value		0.738
Difference-in-Hansen test (p-value)		
GMM instruments for levels		0.428

Notes: t-statistics in brackets below the co efficient estimates. *, ** and *** indicate significant at 10%, 5% and 1%, respectively. F-Statistic is for the joint significance of the coefficients of the explanatory variables. AR (1) and AR (2) are tests for first and second order autocorrelation in the first-differenced residuals, respectively.

4.4.2 Explanations of the Random Effect Model and the two-step system GMM coefficients.

According to the findings in Table (4.4), capital has a negative impact on the Ghanaian banks' operational effectiveness. At a 1% level of significance, the coefficient of -0.0048 is significant. The coefficient's sign and magnitude indicate that a one-unit rise in capital will result in a 0.0048 reduction in the efficiency of banks. Similar to this, a unit drop in capital will result in a 0.0048-unit gain in bank efficiency.

From the two-step system GMM, capital negatively affects banks' efficiency in Ghana. More specifically, a unit increase in capital will lead to a decrease in banks' efficiency by 0.0050. Similarly, a unit decrease in capital will increase banks' efficiency by 0.0050 units, ceteris paribus. The Coefficient of 0.0050 is not significant.

The non-performing loans have a negative effect on banks' efficiency. The results from Table (4.4) implies that a unit increase in non-performing loans will lead to a decrease in banks' efficiency by 0.0025 units. Similarly, a unit decrease in non-performing loans will increase banks' efficiency by 0.0025 units. The coefficient is significant at one percent significant level. From the two-step system GMM, an increase in non-performing loans will lead to a decrease in banks' efficiency by 0.0010 units. Similarly, a unit decrease in NPL will increase banks' efficiency by 0.0010. This relationship is also insignificant.

Inflation has an inverse relationship with banks' efficiency. However, it is statistically insignificant. The results highlight that a unit decrease in inflation brings about 0.0043 increase in banks' efficiency and the vice versa. From the two-step system GMM too, there is negative effect. The coefficient of -0.0015 is also statistically insignificant. A unit increases in inflation brings about 0.0015 units decline in banks' efficiency.

The results confirmed that GDP growth rate influences the banks' efficiency positively. However, it is also insignificant. Further details reveal that a unit increases in GDP growth rate will results in an increase in banks' efficiency by 0.0003 units and the vice versa. The GMM results also indicates that GDP growth rate influences banks' efficiency positively but statistically insignificant.

The coefficient of bank size is positive and statistically significant. A unit increase in bank size will lead to a fall in efficiency by 0.0013 units. Equally, a unit decreases in bank size will increase efficiency by 0.0013 units. The two-step system GMM however presents a negative and statistically insignificant coefficient. A unit increases in bank size will lead to an increase in banks' efficiency by 0.0062 units. Equally, a decrease in bank size will lead to an increase in inefficiency by 0.0062 units.

Table 4. 5: Estimated results of non-performing loans determinants

variables	Random Effect Model estimates	Two step System GMM estimates
NPL (L1)		0.6492
		(0.1102)
Capital	-0.4217***	-0.2404
	(0.0018)	(0.2999)
Efficiency	-6.152	1.1228
	(5.3592)	(19.148)
Inflation	-0.0972***	0.1733
	(0.000)	(0.3726)
GDP Growth	0.1537	0.1017***
	(0.006)***	(0.001)
Size	-0.1375	-0.3447
	(0.3194)	(0.4657)
Constant	27.490	12.963
	(5.2774)	(14.2718)
R-squared		0.569
Wald test Heteroscedasticity (p-value)		0.059**
F-statistic (p- value)		0.000***
Number of observations		143
Number of banks		13
Hansen test (p-value)		0.349
Arellano-bond test:		
AR(1) p-value		0.033
AR(2) p-value		0.623
Difference-in-Hansen test (p-value)		
GMM instruments for levels		0.428

Notes: t-statistics in brackets below the co efficient estimates. *, ** and *** indicate significant at 10%, 5% and 1%, respectively. F-Statistic is for the joint significance of the coefficients of the explanatory variables. AR(1) and AR(2) are tests for first and second order autocorrelation in the first-differenced residuals, respectively.

4.4.3 Explanations of the Random Effect Model and the two-step system GMM coefficients.

According to Table (4.5)'s findings, capital has a negative impact on non-performing loan in Ghana. At a 1% level of significance, the coefficient of -0.4217 is significant. The coefficient's sign and magnitude indicate that a unit rise in capital will result in a 0.4217 reduction in non-performing loans. Similar to this, a unit drop in capital will result in a rise of 0.4217 units in non-performing loans. The two-step GMM approach has a detrimental impact on Ghana's non-performing loans. In more precise terms, a unit rise in capital will result in a 0.2404 reduction in non-performing loans. Similarly, a unit decrease in capital will increase non-performing loans by 0.2404 units, ceteris paribus. The Coefficient of 0.2404 is not significant.

The efficiency has a negative effect on non-performing loans. The results from Table (4.5) implies that a unit increase in efficiency will lead to a decrease in non-performing loans by 6.152 units. Similarly, a unit decrease in efficiency will increase non-performing loans by 6.152 units. The coefficient is insignificant. From the two-step system GMM, an increase in banks' operational efficiency will lead to an increase in non-performing loans by 1.1228 units. Similarly, a unit decrease in banks' efficiency will decrease non-performing by 1.1228. This relationship is also insignificant.

Inflation has an inverse relationship with non-performing loans. However, it is statistically significant. The results highlight that a unit decrease in inflation brings about 0.0972 increase in non-performing loans and the vice versa. From the two-step system GMM too, there is positive effect. The coefficient of 0.1733 is also statistically insignificant. A unit increases in inflation brings about 0.1733 units increase in non-performing loans.

The results confirmed that GDP growth rate influences non-performing loans negatively. However, it is also significant. Further details reveal that a unit increases in GDP growth rate will results in a decrease in non-performing loans by 0.1537 units and the vice versa. The GMM results also indicate that GDP growth rate influences non-performing loans negatively but statistically significant.

The coefficient of bank size is negative and statistically insignificant. A unit increase in bank size will lead to a fall in non-performing loans by 0.1375 units. Equally, a unit decreases in bank size will improve non-performing loans by 0.1375 units. The two-step system GMM also presents a negative and statistically insignificant coefficient. A unit decreases in bank size will lead to an increase in non-performing loans by 0.3447 units. Equally, a decrease in bank size will lead to an increase in non-performing loans by 0.3447units.

4.4.5 Variance Inflation Factor

The variance inflation factor (VIF) also indicated no collinearity among the explanatory variables. If the value of the VIF is below 10, then there is no multicollinearity as indicated in the table (4.6) below.

Table 4. 6: The variance inflation factor (VIF) results

variable	VIF	1/VIF
INFL	1.96	0.5104
GDPG	1.90	0.5252
NPL	1.07	0.9335
SIZE	1.04	0.9642
CAP	1.02	0.9011
Mean VIF	1.40	

Author computation

In this study, the highest value of the VIF values for efficiency is 1.40 hence support the results.

4.5 Discussion of the results

Table (4.4) presents the outcomes for the Random effect and the dynamic (the system GMM) model for the effect of nonperforming loans on the operational efficiency of banks in Ghana. An improvement in banks' operational efficiency is indicated by a positive coefficient, while a negative coefficient depicts a decline in efficiency.

4.5.1 The model specification and validity of instruments tests

The Wald test's p-value for the diagnostic test of the Random effect model for the banks' operational efficiency was 0.015, making it statistically significant at the level of 5%. This result confirmed the joint significance of the explanatory variable coefficients shown in Table (4.4). This implied that the variables used as determinants are relevant in explaining the efficiency of banks in Ghana. The analysis of the Breusch Pagan Lagrange multiplier test for heteroscedasticity suggested the existence of heteroscedasticity and hence the application of robust standard error.

The p-value for the Hansen test was 0.847 in the findings of the dynamic panel model, which is close to one and causes worry. As a result, it may be assumed that the instruments are invalid. As a result, it questioned the model's specification. The extra instrument limits imposed by the degree of formula in the system GMM specification, on the other hand, were validated by the difference-in-Hansen test (with a p-value of 0.428). This demonstrated the exogeneity of the instruments in the level equations and improved the validity of the instruments employed in the system GMM estimation. Furthermore, the Arellano-Bond test statistic AR (1) has a p-value of 0.042, indicating that it rejected the null hypothesis that the banks' efficiency model has first-order serial autocorrelation. However, the Arellano-Bond test statistic AR(2)'s p-value of 0.738, which is

greater than 10% threshold of significance, failed to reject the null hypothesis, and the model failed to reveal second order serial correlation. In addition, there are far fewer instruments than banks. Nevertheless, the findings revealed that the lagged value of the banks' efficiency coefficient is negligible, and the Hansen test's conclusion about the endogeneity of nonperforming loan and capitalization is dubious. This showed that the static model (Random effect model) was superior than the fixed effect model. As a consequence, the estimations from the Random effect model are used to determine how efficiently the banks operate.

4.5.2 Discussion On the determinants of Non-performing loans

Based on table (4.5), it was discovered that bank capital, inflation and GDP significantly influences non-performing loans in Ghana. Non-performing loans will improve by 0.421 units for every unit increase in capital, and vice versa. Also, a unit decrease in inflation brings about 0.0972 increase in non-performing loans and the vice versa. And a unit increases in GDP growth rate will results in a decrease in non-performing loans by 0.1537 units and the vice versa This finding supported the work of Khan, (2020), and Amuakwa-mensah, (2015), who ascribed their findings to agency issues, disaster myopia, and herd behavior as potential causes of bank managers' propensity to lend significantly during boom times. In the Ghanaian environment, fierce rivalry for consumers has prompted a large number of capitalized banks to make loans without properly vetting the collateral security that would serve as a loan guarantee. It was discovered that previous non-performing loans had a considerable impact on present non-performing loans. A pile up loans default affect the loanability of current banks in Ghana. But the results shown that, none of the microeconomic variables has an effect on non-performing loans. They were all insignificant.

4.5.3 Discussion of the determinants of banks operational efficiency

According to the findings in Table (4.4), bank capitalization significantly decreased banks' efficiency. The argument makes the point that Ghanaian banks with larger capital may not necessarily be effective. This comes as a shock considering that banks with larger capital are seen as being somewhat safe for depositors and may be able to lower their borrowing costs, which would reduce inefficiencies (Alhassan, 2014). The research by Zaini et al. (2017) on Malaysians, Reddy and Nirmala (2013) on Indians, and Cucinelli (2015) are all in agreement with these findings. The results also showed that bank size was also a significant factor in predicting banks' efficiency in Ghana throughout the research period. Since greater efficiency is thought to be linked to a better assessment of credit risk, it is believed that a bank's size will always have a beneficial impact on banks' efficiency.

On the effect of microeconomic factors on banks' operational efficiency, the rate of inflation on banks' operational efficiency is not significant with a negative effect, which indicate that the higher the inflation rate, the lower the efficiency of banks in Ghana. Even after the economic structural adjustment changes of 1987, Ghana's inflation rate is still relatively high and erratic. As a result of rising inflation, which is a depiction of the high interest rates Ghanaian banks charge to offset high borrowing rates following over twenty years of financial industry reforms, banks in Ghana faced a great deal of uncertainty. Because the banks are unable to reflect on the costs of rising to their clients by charging them higher lending rates compared to deposit rates, the negative sign indicated that the Ghanaian banking system is unable to benefit from an inflationary economic climate. The findings supported Haniifah's (2015) study on the transformation of the banking industry in Eastern Europe. Therefore, high inflation rate in Ghana may be impacting bank behaviour such as encouraging banks' competition through excessive branch networks (Amuakwa-mensah, 2015).

GDP growth rate also influences the efficiency of banks in Ghana negatively, but is statistically not significant in explaining banks efficiency in Ghana. This confirmed the results of Fries and According to Cucinelli's (2015) research, there is no correlation between efficiency and GDP growth rates in Pakistan or 15 East European nations. This two research, however, discovered a favorable correlation between the GDP growth rate and bank efficiency. Finally, the results imply that between 2010 and 2018, there was no relationship between the management effectiveness of Ghanaian banks and the GDP growth rate. The findings indicated that the only variables that affect bank efficiency in Ghana are bank capitalization and non-performing loans. This shows that these variables are extremely important and should be taken into consideration when assessing bank efficiency in Ghana.

4.5.4 Discussion on the effect of Non-performing loans on banks' operational efficiency

Table 4.4 showed NPL have a negative relationship with banks' operational efficiency and is significant at one percent. This suggests that higher non-performing loans in Ghana have a serious effect on the level of banks' efficiency. This result followed the studies of Laxmi et al., (2018) on Nepal banks, Alshebmi, Hassan and Adam (2020) on Saudi Arabian banks and Ashraf, Arshad and Hu (2016) in Pakistan and Zaini *et al.*, (2017) on Malaysia banks. The decrease in profit as the result of NPL could be the possible reason for this negative relationship in Ghana. Many banks in Ghana has been liquidated as the results of non-performing loans such as capital and UT bank. According to Benthem (2017) loans and banks' operational efficiency in universal Banks are connected, which in turn affects profitability. Non–performing loans could be seen as undesirable outputs and costs to the loaning banks, which reduces the performance of the banks (D. Zhang et al., 2016). Tabak, Cajueiro and Craveiros, (2011) stated that non-performing loans were meticulously linked with banking crises. NPL can also affect the psychology of bankers with

regard to their disposition of funds towards credit delivery and credit expansion (Altunbas et al., 2016). And interestingly, the results indicated bank size exhibits a positive relationship with banks' efficiency. However, it is statistically not significant and therefore has no effect on banks' operational efficiency. These results confirmed that of Benthem (2017) and Ghosh (2015) on US banks.

4.6 Diagnostic test

4.6.1 Heteroskedasticity

The Breusch-Pagan Lagrangian multiplier test is used to check for the presence of heteroscedasticity. The test failed to accept the null hypothesis of homoscedasticity at 1% level of significance. Hence confirming the presence of heteroscedasticity. Therefore, the use of the pooled ordinary least square (OLS) will produce biased and inconsistent estimates, which will be unreliable and misleading. Therefore, the Random effect model that uses the GLS will be most appropriate in the presence of Heteroskedasticity. The robust command is also used.

Table 4. 7: Breusch-Pagan Lagrangian multiplier test for heteroskedasticity

chibar2(01) = 1032.51
Prob > chibar2 = 0.0000

Source: Author's computation using Stata 13

4.6.2 Test for Autocorrelation

From Table (4.6) the study tested the null hypothesis of no serial or autocorrelation. If the p-value is below 0.05, we fail to accept the null hypothesis. It is evidenced from the **Arellano-Bond (AR (2))** test results in Table 4.5 that there is no autocorrelation in the second order, as the p-values is above 0.05.

4.7 Concluding remarks

The study presents the Random effect model as an estimation for the banks' efficiency and the system GMM technique as a dynamic model. The Estimation results showed that the non-performing loans, size and capital have negative effects on banks' operational efficiency in Ghana. Both were significant at 1% level of significance. The estimation from the REM shows that other control variables (inflation and GDP growth) have no influence on banks' operational efficiency in Ghana. Again, it was also concluded that, capital, inflation and GDP significantly affect non-performing loans.

CHAPTER FIVE

SUMMARY CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction.

This section highlights the results on the investigation of the effects of non-performing loans on banks operational efficiency in Ghana. The section is organized into three sections. Section one summaries the findings. The second section talks about the conclusions. And the last section looks at the policy implications and the recommendations, as well as the limitation of the study.

5.1 Summary of the findings

The Ghana banking sector having gone through a lot of reforms since 1988 have enhanced their productivity, efficiency and competition. The reformation has been gradual but consistent. These reformations are carried out to promote efficiency and competition to pave way for economic growth and financial stability. Before the banking reforms were carried out, the sector was besieged with inadequate capitals, high non-performing loans, high operational cost and government interference (IMF 1999). The reforms has therefore improved the mobilization of domestic savings and strengthened economic growth.

This study investigated non-performing loans effects on banks' efficiency in Ghana, using panel data covering 14 commercial banks in Ghana, over the sample period 2010 to 2020. Following standard theoretical and empirical literature on the relationship between non-performing loans and banks' efficiency, a lot of studies have reported mixed results for developed, developing and cross countries. Evidence from the developed economies include Ghosh, (2015) on US, Cucinelli, (2015) on Italy and Alshebmi, Hassan and Adam (2020) on Saudi Arabia. The developing countries includes (Haniifah, 2015) on Uganda, (Kingu et al., 2018) on Tanzania, (Adusei, 2018)

on Ghana. Cross countries studies include Altunbas *et al.*, (2016) on Japan, Zaini *et al.*, (2017) on Malaysia. Zhang *et al.*, (2016) on China. Some other studies indicated that the financial reform has improved banking efficiency. These include Benthem (2017) on Ghana, Altunbas *et al.*, (2016) on Japan and Alhassan and Tetteh, (2017) on South Africa.

The dynamic system generalized method of moments (system-GMM), which deals with the issue of endogeneity and the Random effect model, was calculated for the investigation. The research outlined the following precise goals in order to fulfill this objective:

(i) to determine the bank-specific and macroeconomic factors of non-performing loans of Ghana's banking sector.

(ii) to find out the determinant of banks' operational efficiency in Ghana

(iii) to determine the effect of non-performing loans on banks' operational efficiency of universal banks in Ghana.

The study looks out at the effects of bank specific and microeconomics factors have on non-performing loans. The regressors are bank capital, bank size, banks' efficiency, inflation and GDP growth rate. The results indicated that capital, inflation and GDP have significantly affect non-performing loans.

Again, the study looked at the determinants of banks' efficiency. The results indicated that a rise in capital, non-performing loans and size affect the banks' efficiency. The study looks at the effect of non-performing loans on the dependent variables. (Banks efficiency), the regressors are bank capital, bank size, non-performing loans, inflation and GDP growth rate. The study uses the Hausman test to choose the Random effect model for the analysis of the effect of non-performing loans on banks' efficiency.

Furthermore, the study addresses the effect of non-performing loans on banks' efficiency using the system GMM technique. The Hansen and Arellano AR (2) test indicated that there was no over identification as well as autocorrelation. However, the novelty was that none of the variables was significant at any level.

5.2 Conclusions

The banking system in Ghana has undergone change, including the liberalization of interest rates, the elimination of barriers to international banks' admission, and the creation of new regulatory and oversight frameworks. The most recent reformation includes the current domestic debt exchange scheme and recapitalizing of the minimum funding requirement from GH120 million to GH400 million in 2018. In order to assist the government's economic vision and transformative strategy, this was done to further expand, strengthen, and modernize the financial sector. In Ghana today, there are 23 commercial banks in operation. After the industry just underwent recapitalization, regulators, policymakers, and bank management will find this research on banks' efficiency to be highly useful and essential. In Ghana, non-performing loans were shown to be significantly influenced by bank capital. The low efficiency of the outcomes is a result of the high operational and financial costs. High nonperforming loans, non-interest operational expenditures such as rent, payroll, fees and commissions, advertising and public relations, depreciation, and other administrative costs are challenging these banks must deal with. In 2016, staff costs accounted for around 52% of total costs, up from 46% in 2002. This might be the outcome of the very competitive high pay to recruit or keep competent workers.

The study comes to the conclusion that capital, inflation and GDP have considerable impact on non-performing loans according to the empirical evidence. The performance of Ghana's banks is

negatively impacted by non-performing loans. According to Zhang et al. (2016), capital has a negative and substantial influence, revealing that highly capitalized banks may be less efficient. High moral hazard motives may be increased by heavily capitalized institutions, which might raise costs and, as a result, reduce efficiency. Additionally, several of the banks are still developing, making them particularly vulnerable to these factors. Non-performing loans affect the valuations and profitability of banks. Lending interest rates are usually high in order to compensate for the high risk of borrowing. Also, the study concluded that, capital, non-performing loans and size significantly impacted bank efficiency.

5.3 Policy Implications and Recommendations.

On policy perspective, the results of the study offer a vital implication to bank regulators, policy makers and banks management to promote economic growth and financial stability. The study recommends that management should implement policies and regulations that should provide screening of borrowers to reduce the moral hazard and adverse selection to reduce financial loss. Also, banks in Ghana should desist from aggressive lending to customers as a way of competing for customers to reduce the loan default. This will reduce the non-performing loans.

In addition, large banks should consider both bank-specific and macroeconomic variables when making loans in order to reduce the level of NPLs, according to the study's findings. Banks in Ghana should pay close attention to bank-specific factors when making loans in order to restrain the level of NPLs. Large banks must take into account the Ghanaian economy's capacity to compete internationally since it may affect borrowers in export-oriented industries' ability to repay their loans, which would lead to greater NPLs. Furthermore, commercial banks, especially major banks, should keep an eye on and take into account the economy's level of inflation while

managing NPLs. Finally, banks should regularly examine loan interest rates to motivate borrowers to repay their debts because past NPLs have a detrimental impact on present NPLs. In order to evaluate the stability and security of the banking sector, the Central Bank of Ghana may also enhance its monitoring framework, which includes careful macroeconomic indicators like inflation and the real effective exchange rate.

Besides the study also recommends that banks should train their own qualified staff to meet their demand and avoid competitions for personnel by increasing remuneration as a way of attracting them.

5.3.1 Limitations of the Study and Areas for Further Research

The study failed to use all the twenty-three licensed banks by the bank of Ghana due to lack of consistent data with some of the banks, closures and merging of some banks. Furthermore, the study did not run causality test to determine whether banks efficiency causes non-performing loans and vice versa mainly due to relatively small-time span as many of these analyses always require 30 years or more. Future studies can test for the robustness of this study by using the panel vector auto-regressions (VARs).

REFERENCES

Acheampong, T. (2023). *Ghana's domestic debt restructuring has stalled: four reasons why*. https://abdn.pure.elsevier.com/en/publications/ghanas-domestic-debt-restructuring-has-stalled-four-reasons-why

Adjei-Frimpong, K. (2013). Bank Efficiency and Bank Competition: Empirical Evidence from Ghana's Banking Industry. *Lincoln University Press*, 1–199.

Adusei, C. (2018). *DETERMINANTS OF NON-PERFORMING LOANS IN THE BANKING SECTOR OF GHANA BETWEEN 1998 AND 2013 Keyword s*. *6*(3), 142–154. https://doi.org/10.18488/journal.107.2018.63.142.154

Afriyie, H. O., & Akotey, J. O. (2016). *Credit Risk Management and Profitability of Rural Banks in the Brong Ahafo Region of Ghana*. www.iiste.org

Alhassan, A. L. (2014). *Competition and bank efficiency in emerging markets : empirical evidence from Ghana*. *1935*. https://doi.org/10.1108/AJEMS-01-2014-0007

Alhassan, A. L., & Tetteh, M. L. (2017). Non-Interest Income and Bank Efficiency in Ghana: A Two-Stage DEA Bootstrapping Approach. *Journal of African Business*, *18*(1), 124–142. https://doi.org/10.1080/15228916.2016.1227668

Alkhazaleh, A. M., & Almsafir, M. (2014). Bank Specific Determinants of Profitability in Jordan. *Journal of Advanced Social Research*, *4*(10), 1–20.

Alshebmi, A. S., Hassan, M., & Adam, M. (2020). *Assessing the Non-Performing Loans and their Effect on Banks Profitability : Empirical Evidence from the Saudi Arabia Banking Sector*. *11*(8), 69–90.

Altunbas, Y., Liu, M. H., Molyneux, P., & Seth, R. (2016). Efficiency and risk in Japanese banking. *Journal of Banking and Finance*, *24*(10), 1605–1628. https://doi.org/10.1016/S0378-4266(99)00095-3

Amoako-Boateng, S. B. (2017). *Amoako-Boateng, S. B., Comparative analysis... - Google Scholar*. https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=Amoako-Boateng%2C+S.+B.%2C+2017.Comparative+analysis+of+technical+efficiency+of+listed+and+unlisted++banks+in+Ghana%2C+Cape+Coast%3A+University+of+cape+Coast+&btnG

Amuakwa-mensah, F. (2015). *Determinants of non-performing loans in Ghana banking industry Angela Boakye-Adjei*. *5*(1).

Annor, E. S., & Obeng, F. S. (2017). *Impact of Credit Risk Management on the Profitability of Selected Commercial Banks Listed on the Ghana Stock Exchange*. *20*(2), 1–10. https://doi.org/10.9734/JEMT/2017/36881

Asiama, R. K., & Amoah, A. (2019). *Non-performing loans and monetary policy dynamics in Ghana*. *10*(2), 169–184. https://doi.org/10.1108/AJEMS-04-2018-0103

Benthem, C. S. van. (2017). *The relation among non-performing loans, operating efficiency, and capitalization in commercial banking*.

Cucinelli, D. (2015). *The Impact of Non-performing Loans on Bank Lending Behavior : Evidence from the Italian Banking Sector*. *8*(16), 59–71. https://doi.org/10.17015/ejbe.2015.016.04

Fiordelisi, F., Marques-Ibanez, D., & Molyneux, P. (2011). Efficiency and risk in European banking. *Journal of Banking and Finance*, *35*(5), 1315–1326. https://jbankfin.2010.10.005

Haniifah, N. (2015). *Economic Determinants of Non-performing Loans (NPLs) in Ugandan Commercial Banks*. *5*(2), 137–153.

Khan, M. A. (2020). *Determinants of non-performing loans in the banking sector in developing state*. *5*(1), 135–145. https://doi.org/10.1108/AJAR-10-2019-0080

Kingu, P. S., Macha, S., & Gwahula, R. (2018). *Impact of Non- Performing Loans on Bank ' s Profitability : Empirical Evidence from Commercial Banks in Tanzania*. *06*(01), 71–78. https://doi.org/10.18535/ijsrm/v6i1.em11

Saka, A. N. A., Aboagye, A. Q. Q., & Gemegah, A. (2012). Technical Efficiency of the Ghanaian Banking Industry and the Effects of the Entry of Foreign Banks. *Journal of African Business*, *13*(3), 232–243. https://doi.org/10.1080/15228916.2012.727755

Tan, Y., & Floros, C. (2013). Risk, capital and efficiency in Chinese banking. *Journal of International Financial Markets, Institutions and Money*, *26*(1), 378–393. https://doi.org/10.1016/j.intfin.2013.07.009

Yakubu, I. N., Alhassan, M. M., Mikhail, A. A., & Alhassan, A.-N. I. (2017). Commercial Banks Performance in Ghana: Does Capital Structure Matter? *International Journal of Accounting and Financial Reporting*, *7*(1), 333. https://doi.org/10.5296/ijafr.v7i1.11306

Zaini, M., Karim, A., Chan, S.-G., & Hassan, S. (2017). *BANK EFFICIENCY AND NON-PERFORMING LOANS: EVIDENCE FROM MALAYSIA AND SINGAPORE*.

Zhang, D., Cai, J., Dickinson, D. G., & Kutan, A. M. (2016). Non-performing loans, moral hazard and regulation of the Chinese commercial banking system. *Journal of Banking and*

Finance, *63*, 48–60. https://doi.org/10.1016/j.jbankfin.2015.11.010

Zhang, J., & Jiang, H. (2018). Capital regulatory pressure, charter value and bank risk-taking: empirical evidence for China. *Journal of Financial Regulation and Compliance*, *26*(1), 170–186. https://doi.org/10.1108/JFRC-01-2017-0002

APPENDICES

APPENDIX 1: LIST OF BANKS

1. ACCESS BANK
2. AGRICULTURE DEVELOPMENT BANK
3. BARCLAYS BANK GHANA
4. BANK OF AFRICA
5. ECO BANK GHANA
6. CAL BANK
7. GHANA COMMERCIAL BANK
8. FEDELITY BANK GHANA
9. ZENITH BANK GHANA
10. STANDARD CHARTERED BANK
11. GT BANK
12. REPUBLIC BANK
13. STANBIC BANK

APPENDIX 2: DATA

GROUP	YEAR	ID	CAP	NPL	INFL.	GDPG	LN(SIZE)	EFF
ACCESS	2010	1	39.09	14.50	10.71	7.90	12.19	0.32
ACCESS	2011	1	35.21	15.81	8.73	14.04	12.55	0.21
ACCESS	2012	1	21.41	15.16	7.13	9.29	13.59	0.22
ACCESS	2013	1	21.85	9.79	11.67	7.31	13.81	0.21
ACCESS	2014	1	16.94	8.60	15.49	3.99	14.36	0.34
ACCESS	2015	1	14.83	5.40	17.15	3.84	14.70	0.43
ACCESS	2016	1	18.38	11.14	17.45	3.37	14.80	0.44
ACCESS	2017	1	17.87	32.10	12.37	8.13	14.75	0.25
ACCESS	2018	1	14.68	32.30	9.40	6.20	14.98	0.48
ACCESS	2019	1	17.06	9.90	7.14	6.51	15.37	0.61
ACCESS	2020	1	18.07	11.51	9.89	6.34	15.58	0.53
ADB	2010	2	10.98	11.82	10.71	7.90	13.78	0.54
ADB	2011	2	14.97	10.01	8.73	14.04	14.01	0.51
ADB	2012	2	14.28	10.78	7.13	9.29	14.19	0.44
ADB	2013	2	17.33	13.02	11.67	7.31	14.30	0.14
ADB	2014	2	15.94	23.29	15.49	3.99	14.58	0.22
ADB	2015	2	15.60	33.89	17.15	3.84	14.57	0.14
ADB	2016	2	14.98	31.41	17.45	3.37	14.93	0.25
ADB	2017	2	13.51	35.22	12.37	8.13	15.08	0.31
ADB	2018	2	13.35	32.10	9.40	6.20	15.10	0.33
ADB	2019	2	17.33	14.30	7.14	6.51	15.34	0.59
ADB	2020	2	14.88	15.70	9.89	5.64	13.65	0.37
ABSA BANK	2010	3	14.80	25.19	10.71	7.90	12.40	0.23
ABSA BANK	2011	3	11.18	33.19	8.73	14.04	12.67	0.41
ABSA BANK	2012	3	18.88	16.25	7.13	9.29	12.83	0.51
ABSA BANK	2013	3	19.14	13.13	11.67	7.31	13.01	0.41
ABSA BANK	2014	3	16.13	12.30	15.49	3.99	13.08	0.42
ABSA BANK	2015	3	16.16	18.66	17.15	3.84	15.10	0.24
ABSA BANK	2016	3	14.98	19.17	17.45	3.37	15.48	0.33
ABSA BANK	2017	3	17.68	16.51	12.37	8.13	15.60	0.45
ABSA BANK	2018	3	17.29	11.53	9.40	6.20	15.73	0.41
ABSA BANK	2019	3	13.87	6.64	7.14	6.51	16.28	0.57
ABSA BANK	2020	3	15.53	7.70	9.89	6.34	16.35	0.43
BOA	2010	4	12.14	15.02	10.71	7.90	15.12	0.35
BOA	2011	4	11.18	14.12	8.73	14.04	17.59	0.52
BOA	2012	4	10.88	22.00	7.13	9.29	17.94	0.34
BOA	2013	4	13.03	21.00	11.67	7.31	18.23	0.27

BOA	2014	4	11.99	20.00	15.49	3.99	18.52	0.21
BOA	2015	4	12.08	15.00	17.15	3.84	20.86	0.32
BOA	2016	4	14.32	17.00	17.45	3.37	20.86	0.52
BOA	2017	4	14.03	18.80	12.37	8.13	21.02	0.62
BOA	2018	4	16.54	12.61	9.40	6.20	20.95	0.43
BOA	2019	4	29.14	11.92	7.14	6.51	21.44	0.52
BOA	2020	4	31.39	15.54	9.89	6.34	21.45	0.44
ECOBANK	2010	5	14.96	4.01	10.71	7.90	14.24	0.33
ECOBANK	2011	5	12.32	6.40	8.73	14.04	14.57	0.61
ECOBANK	2012	5	10.90	6.38	7.13	9.29	16.81	0.44
ECOBANK	2013	5	9.47	6.20	11.67	7.31	16.93	0.42
ECOBANK	2014	5	13.84	11.24	15.49	3.99	15.57	0.32
ECOBANK	2015	5	13.30	15.87	17.15	3.84	15.72	0.52
ECOBANK	2016	5	11.97	11.90	17.45	3.37	15.90	0.32
ECOBANK	2017	5	11.40	20.04	12.37	8.13	16.02	0.55
ECOBANK	2018	5	12.69	11.50	9.40	6.20	16.16	0.52
ECOBANK	2019	5	15.26	7.32	7.14	6.51	16.58	0.59
ECOBANK	2020	5	15.35	6.70	9.89	6.34	16.59	0.45
CALBANK	2010	6	15.31	11.40	10.71	7.90	13.12	0.63
CALBANK	2011	6	11.82	9.70	8.73	14.04	13.57	0.34
CALBANK	2012	6	17.84	5.10	7.13	9.29	13.97	0.33
CALBANK	2013	6	18.35	7.90	11.67	7.31	14.26	0.22
CALBANK	2014	6	15.04	6.20	15.49	3.99	15.03	0.21
CALBANK	2015	6	15.10	5.50	17.15	3.84	15.02	0.41
CALBANK	2016	6	14.36	8.00	17.45	3.37	15.10	0.14
CALBANK	2017	6	15.91	10.90	12.37	8.13	15.26	0.52
CALBANK	2018	6	14.38	8.00	9.40	6.20	15.51	0.61
CALBANK	2019	6	13.65	10.00	7.14	6.51	15.77	0.53
CALBANK	2020	6	14.07	13.50	9.89	6.34	15.88	0.45
GCB	2010	7	8.89	15.00	10.71	7.90	14.55	0.41
GCB	2011	7	7.24	26.00	8.73	14.04	14.72	0.24
GCB	2012	7	17.99	15.23	7.13	9.29	14.76	0.32
GCB	2013	7	13.69	14.00	11.67	7.31	15.04	0.43
GCB	2014	7	16.19	10.00	15.49	3.99	15.26	0.34
GCB	2015	7	18.28	14.70	17.15	3.84	15.36	0.34
GCB	2016	7	17.45	17.00	17.45	3.37	15.62	0.33
GCB	2017	7	11.65	23.00	12.37	8.13	16.07	0.24
GCB	2018	7	12.46	22.00	9.40	6.20	16.18	0.41
GCB	2019	7	14.22	14.30	7.14	6.51	16.34	0.48
GCB	2020	7	14.15	14.80	9.89	6.34	16.55	0.38

FEDELITY	2010	8	5.76	6.01	10.71	7.90	20.29	0.51
FEDELITY	2011	8	5.46	6.17	8.73	14.04	20.75	0.33
FEDELITY	2012	8	9.00	6.41	7.13	9.29	14.04	0.46
FEDELITY	2013	8	9.21	5.68	11.67	7.31	14.34	0.41
FEDELITY	2014	8	12.53	12.02	15.49	3.99	14.96	0.44
FEDELITY	2015	8	12.52	12.52	17.15	3.84	15.22	0.55
FEDELITY	2016	8	11.78	14.03	17.45	3.37	15.25	0.33
FEDELITY	2017	8	10.07	16.02	12.37	8.13	15.50	0.21
FEDELITY	2018	8	9.62	12.04	9.40	6.20	15.67	0.51
FEDELITY	2019	8	13.21	13.70	7.14	6.51	14.38	0.57
FEDELITY	2020	8	13.66	12.80	9.89	6.34	14.46	0.41
ZENITH	2010	9	13.24	11.00	10.71	7.90	18.28	0.32
ZENITH	2011	9	15.78	10.60	8.73	14.04	16.22	0.64
ZENITH	2012	9	14.79	8.32	7.13	9.29	18.76	0.55
ZENITH	2013	9	12.68	4.90	11.67	7.31	19.31	0.51
ZENITH	2014	9	11.44	6.91	15.49	3.99	19.68	0.36
ZENITH	2015	9	17.05	10.48	17.15	3.84	19.89	0.32
ZENITH	2016	9	16.89	10.62	17.45	3.37	20.17	0.33
ZENITH	2017	9	15.99	6.83	12.37	8.13	20.43	0.22
ZENITH	2018	9	15.65	12.80	9.40	6.20	20.59	0.42
ZENITH	2019	9	16.72	16.49	7.14	6.51	16.70	0.49
ZENITH	2020	9	18.13	6.15	9.89	6.34	16.13	0.37
STANCHART	2010	10	11.75	23.20	10.71	7.90	12.19	0.25
STANCHART	2011	10	11.95	22.30	8.73	14.04	12.37	0.51
STANCHART	2012	10	13.02	26.10	7.13	9.29	12.65	0.49
STANCHART	2013	10	15.09	24.10	11.67	7.31	13.18	0.43
STANCHART	2014	10	16.30	25.64	15.49	3.99	13.10	0.51
STANCHART	2015	10	16.76	25.00	17.15	3.84	15.27	0.42
STANCHART	2016	10	17.50	24.00	17.45	3.37	15.29	0.45
STANCHART	2017	10	19.27	22.00	12.37	8.13	15.38	0.45
STANCHART	2018	10	19.22	20.90	9.40	6.20	15.39	0.32
STANCHART	2019	10	13.88	11.31	7.14	6.51	16.10	0.48
STANCHART	2020	10	14.49	7.21	9.89	6.34	12.48	0.38
GT BANK	2010	11	23.48	8.47	10.71	7.90	18.39	0.31
GT BANK	2011	11	23.49	9.09	8.73	14.04	18.46	0.33
GT BANK	2012	11	21.02	20.93	7.13	9.29	18.78	0.42
GT BANK	2013	11	19.86	17.57	11.67	7.31	19.04	0.62
GT BANK	2014	11	18.24	13.27	15.49	3.99	19.14	0.45
GT BANK	2015	11	17.14	23.53	17.15	3.84	14.14	0.42
GT BANK	2016	11	18.32	12.69	17.45	3.37	14.25	0.35

GT BANK	2017	11	17.90	19.90	12.37	8.13	14.44	0.31
GT BANK	2018	11	25.42	4.12	9.40	6.20	14.64	0.34
GT BANK	2019	11	24.23	7.10	7.14	6.51	15.00	0.51
GT BANK	2020	11	24.69	4.00	9.89	6.34	15.22	0.46
REPUBLIC	2010	12	19.31	12.71	10.71	7.90	18.06	0.25
REPUBLIC	2011	12	17.17	11.87	8.73	14.04	18.12	0.45
REPUBLIC	2012	12	21.21	12.50	7.13	9.29	18.66	0.42
REPUBLIC	2013	12	21.67	11.58	11.67	7.31	18.91	0.34
REPUBLIC	2014	12	16.82	10.43	15.49	3.99	19.28	0.35
REPUBLIC	2015	12	17.83	20.33	17.15	3.84	19.01	0.24
REPUBLIC	2016	12	11.48	21.77	17.45	3.37	18.77	0.51
REPUBLIC	2017	12	15.04	25.14	12.37	8.13	19.24	0.25
REPUBLIC	2018	12	17.41	20.79	9.40	6.20	20.03	0.44
REPUBLIC	2019	12	16.73	18.28	7.14	6.51	16.56	0.53
REPUBLIC	2020	12	16.67	18.69	9.89	6.34	14.35	0.41
STANBIC	2010	13	14.61	15.67	10.71	7.90	15.37	0.37
STANBIC	2011	13	15.21	14.54	8.73	14.04	15.38	0.34
STANBIC	2012	13	14.66	13.98	7.13	9.29	15.40	0.53
STANBIC	2013	13	13.10	17.65	11.67	7.31	15.42	0.44
STANBIC	2014	13	13.71	16.12	15.49	3.99	15.43	0.35
STANBIC	2015	13	12.26	16.71	17.15	3.84	15.48	0.54
STANBIC	2016	13	12.90	15.58	17.45	3.37	15.50	0.61
STANBIC	2017	13	17.44	11.62	12.37	8.13	15.48	0.54
STANBIC	2018	13	16.99	10.91	9.40	6.20	15.53	0.44
STANBIC	2019	13	14.59	7.40	7.14	6.51	16.05	0.53
STANBIC	2020	13	13.19	7.50	9.89	6.34	16.36	0.47