CREDIT RISK, CAPITAL ADEQUACY RATIO, AND FINANCIAL PERFORMANCE OF COMMERCIAL BANKS IN KENYA

BY

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DECLARATION

Declaration by the Candidate

This project is my original work and has not been presented for a degree in any other university. No part of this project may be reproduced without prior written permission of the author and/ or Moi University.

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DEDICATION

This project is dedicated to Almighty God, to my dear husband, family, and friends for their love, patience, and moral and financial support and encouragement accorded while pursuing these studies.

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ABSTRACT

Commercial banks play a significant role in economic development and support economic growth in any nation through their role as financial intermediaries and providers of financial services to communities and international organizations. With the help of the financing facilities they provide, both private investors and institutional investors can explore and widen their options for profitable investment. Considered a stand-in for a bank's financial stability is the credit quality. The risk of default and non-performing loans, which increases the likelihood that assets and loans would no longer be recovered, is known as the credit risk. Despite the fact that numerous research on credit risk have been done in the past, the issue is still up for debate. Therefore, this study sought to examine whether capital adequacy ratio moderates the relationship between credit risk and financial performance of commercial banks in Kenya. The specific objectives were to examine the effect of non-performing loan rate, net charge-off rate and pre-provision profit/ loss rate on financial performance of commercial banks. The study further examined whether capital adequacy moderated the relationship between non-performing loan rate, net charge-off rate, pre-provision profit/ loss rate and financial performance of commercial banks in Kenya. The study was grounded on the stakeholder theory and the agency theory of firms. The target population was forty-two commercial banks in Kenya over the period between 2011 and 2021. After the application of an inclusion and exclusion criteria the final sample was 35 banks that yield 385 firm-year observations. The secondary data and was extracted from the Central bank of Kenya and the individual bank's financial statements. The data was analyzed through descriptive and inferential statistics with the aid of STATA. The study employed hierarchical multiple regression to test the hypotheses. The results of Hausman guided the choice of either the random effect or the fixed effect regression models. The finding revealed that non-performing loan rate (β = -0.1802 and ρ-value<0.05), net charge-off rate (β = -0.0704 and ρ-value<0.05); and pre-provision profit/ loss rate (β= 0.141 and ρ-value<0.05); on financial performance had a significant effect on financial performance of commercial banks in Kenya. Additionally, the regression results confirmed that capital adequacy moderated the association between non-performing loan rate (β = 0.222 and ρ-value<0.05), net charge-off rate (β = 0.357 and ρ-value<0.05), and pre-provision profit/ loss rate (β = 0.295 and ρ-value<0.05); on financial performance. In light of this, the study concluded that credit risk significantly contributes to Kenyan banks' profitability and that capital sufficiency has an impact on this relationship. This study advises banks to strengthen their credit management strategies as a way of improving their profitability. Additionally, in an effort to enhance bank performance, bank management and the regulator should comprehend the critical balance between credit risk and bank capital. Future research might take into account additional aspects of bank financial performance and investigate how they relate to each other in rations with various regulatory capital requirements and credit exposure.

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OPERATIONAL DEFINITION OF TERMS

Capital Adequacy: Capital adequacy is a financial institution's major capital in relation to its assets fraction ratio (loans and investments).

Credit Risk: This is the likelihood of a business to suffer losses arising from a default by a client to meet their contractual obligations of repaying a debt in according to their agreement (Mueni, 2019).

Financial Performance: Financial performance is a firm's financial outcome for a specific financial duration through evaluation of its operations, and as determined by ROA and ROE. ROA measures the ability of the bank management to generate income by utilizing company assets at their disposal.

Net Charge-off: Is the amount representing the difference between gross loan provisions and any subsequent recoveries of bad loans. Net charge-offs refer to the loan repayments owed to a bank that are unlikely to be recovered by that bank.

Non-Performing Loan: Is a loan which is no longer contributing income to the lender and it applies when it comes to the knowledge of the lender institution that the loan will no longer generate the expected income.

Pre-Provision Profit or Loss: Is the amount of income that an institution, usually a bank, earns in a given time period before subtracting funds set aside to provide for future bad loans, also referred as provision amounts.

ABBREVIATION AND ACRONYMS

ARDL - Autoregressive Distributed Lag

CAR - Capital Adequacy Ratio

CBK - Central Bank of Kenya

FGLS - Feasible Generalized Least Squares Model

GDP - Gross Domestic Product

NCBs - National Commercial Banks

NCO - Net Charge-off

NPLs - Non-performing Loans

NPLR - Non-Performing Loan ratio

NSE - Nairobi Securities Exchange

OBSE - Off-balance sheet exposure

OSMOS - Off-site Surveillance and Monitoring System

PAT - Profit After Tax

PBT - Profit Before Tax

PCBs - Private Commercial Banks

PPP - Pre-Provision Profit

PPL - Pre-Provision Loss

ROA - Return on Assets

ROE - Return on Equity

RWA - Risk Weighted Assets

SPSS - Statistical Package for Social Science

TRWA - Total Risk Weighted Assets

UAE - United Arab Emirates

USD - United States Dollar

CHAPTER ONE

INTRODUCTION

1.0 Overview

This chapter presents the background of the study, statement of the problem, institutional setting, research objectives, hypotheses, significance, and scope of the study.

1.1 Background of the Study

The banking sector all over the world acts as the life blood of modern trade and economic development and through that being a major source of finance to the economy (Ongore & Kusa, 2013). Over the last decade, the issues surrounding bank financial performance have been a frequently chosen topic among academicians and banking professionals (Titko, Skvarciany, & Jurevičienė, (2015) across the entire world and has a lot of researchers focused on the factors that influence the bank performance perceived only through its ability to yield a profit (Akintimehin *et al.*, 2019; Otekunrin *et al.*, 2018). It is important to note that soundness of commercial banks is largely dependent on their financial performance; used to indicate the strengths and the weaknesses of such a commercial bank (Makkar & Singh, 2013).

The financial performance of banks has been seen as affected by credit risk management in banks (Octaviani & Andriyani, 2018). The noted increase in credit risk due to the pandemic had occasioned reduced cash flows. (CBK, 2020). In the ten-year 2010 – 2019, the performance of the banking sector in Kenya, (Central Bank Kenya, 2011:2019), showed that loss increased year on year, and profit averaged 20.5 percent over similar period. A noticeable dip noted in 2013 of 16.6 percent, 12.2 percent in 2014 and 6.9 percent in 2015. However, starting 2016, there was a different pattern and banks had a low return on asset ratio. Losses were experienced by three of the forty-three banks and same

number of banks obtained losses in 2013. This trend continued in 2015, when five banks had losses, with nine having low financial performance. The number of banks with less than 1% return on asset ratio, a measure of financial performance, was 11 banks, and 5 experienced losses in 2016. The same trend was experienced for the period 2017 – 2019 with 8 banks having losses and an average of 20 banks having low financial performance (CBK, 2019). The financial performance of the Kenyan banking sector never resumed to the double-digit figures experienced ten years ago and the losses experienced within this period specifically showed a high level of credit risk. There are different types of risks that banks are exposed to in their operations. The most important of these is the credit risk, an internal determinant of bank performance and one of the threats to the performance of commercial banks. The higher the exposure of a bank to the credit risk, the higher the tendency of the banks to experience financial crisis and vice-versa (Panda & Hota, 2014).

Seen as well that the variables to measure credit risk not only affect the return on assets but also affect bank capital because banks provide more funds to cover possible losses. In 2012, there was an increase in credit risk largely attributable to the lag effect of the high interest rates in Kenya in the first half of 2012, and the slowdown in economic activities due to the general elections in March 2013 (CBK, 2012). In 2014 and 2015, the increase in credit risk was partly attributed to the lag effects of Kenya high-interest regime in 2012/2013 arising; and delayed payments to contractors and suppliers by government, enhanced re-classification and provisioning of loans, and challenges in the business environment (CBK, 2015).

From a Kenya regulatory standpoint, the key risk to the banking sector in 2017, was credit risk brought about by the slowed down economic activity during the protracted election period and remained elevated in the year (CBK, 2015). By the end of 2019, CBK (2019), closely monitored the banking sector, particularly on the doubling of

credit risks compared to previous periods and in this study 2010-2019. The Kenyan banking sector recorded an increase in the level of provisioning for loans, at an average increase of 122.4 % in the year Central Bank of Kenya (2016). This continued increase in loan provisions and net charge-offs, led to increased supervision of banks after the closure of Imperial, Dubai and Chase banks, signaling the increment in the level of credit risk across the whole sector.

Commercial banks must operate well and secure their safety for any changes in the economy, both domestically and internationally, because they are crucial to the health of the nation's economy and its development. To aid in the financial system's ability to achieve this, the government additionally requires policies and regulations. Guidelines on minimum capital are one of those regulations that are seen to be crucial in determining how safe banks are from the risk of capital shortfall and bankruptcy. Capital adequacy increases the strength of a bank, which improves the capacity to buffer or absorb impaired loan losses and ensure the bank can continue to run efficiently as a going concern. Yu (1996), defined the adequate capital for banks as “the level at which the deposit insuring agency would break even in guaranteeing the deposits of individual banks with premium the banks pay.”

There is a general agreement that the primary and most important function of bank capital is to safeguard depositors and other creditors from loss in the event of liquidation and to act as a buffer against losses that cannot be covered by current earnings. What qualifies as appropriate capital is a contentious topic, and professionals in banking and finance disagree on it, but they all agree that there is no clear solution in sight. Nwankwo (1992) noted that the question of what qualifies as adequate capital for banks has a lengthy history. In fact, it dates back almost as far as banking itself. Nwankwo

(1992) further notes that capital adequacy is the amount of money that a bank should have or intend to keep in order to run its operations sustainably. Studies have also reported an association between capital adequacy and bank financial performance (Dao & Nguyen, 2020; Ramadhanti & Hidayati, 2019; Al-Homaidi *et al.,* 2020).

In Kenya, the capital adequacy ratio shrunk from an average of 20.15 to 16.6 percent in the period 2010- 2019. Notably, that the average of the industry capital adequacy level was not met by many banks for every period. The required level of capital adequacy is above 10.5 percent, which makes the ratios observed in the period not favourable (CBK, 2013). In view of the existing literature, this study extends the credit risk and financial performance literature by examining the association in Kenya. All the above studies were not conducted in Kenya, and thus the concluded results may not apply in Kenya. In Kenya, variables used to measure credit risk of pre-provision profit or loss and net charge-off have not been exploited in Kenya. This study therefore extends previous research and introduces different measures to determine credit risk and assess its impact on financial performance. This study further builds on earlier studies by Boahene *et al.*, 2012; Zainal, 2013; Kutum, 2017; and Bandara, Jameel, & Athambawa, 2021; who conducted their studies in other jurisdictions than Kenya namely, Ghana, Malaysia, Palestine, and Sri Lanka, respectively. Similarly, the study adopted measures of credit risk as suggested by previous studies. For instance, Boahene, Dasah, & Agyei (2012), who conducted a study on the relationship between credit risk and profitability of some selected banks in Ghana measured credit risk using the variables of non-performing loans, impairment charge, loan loss reserve, pre-provision profit/ loss, loan loss provision; Zainal (2013), in his study on credit risk management and its effect on the profitability of service sector listed on Bursa Malaysia, measured credit risk by non-performing loans ratio, pre-provision profit rate

and net charge-off rate; Kutum (2017), in his study on the impact between credit risk and the profitability of five banks on the Palestine Exchange, measured credit risk by net charge-offs to total loans and advances, non-performing loans to total loans and advances and pre-provision profit to total loans and advances. Additionally, the study contributes to the literature by examining whether capital adequacy moderates the relationship between credit risk and bank performance in Kenya.

1.1.1 Commercial banks in Kenya

The origins of commercial banks can be traced back to ancient times, specifically around 9000 BC, when various forms of currency such as grain money, food, and cattle money were utilized (Bank & Davies, 2002). The establishment of commercial banks in Kenya may be traced back to the colonial era, specifically the founding of the East African Protectorate in 1865 and Kenya's final declaration as a British colony in 1920. The banking sector in Kenya was first introduced by the National Bank of India in 1896. Subsequently, the Standard Bank of South Africa became a participant in 1910, followed by Barclays Bank in 1916. The Central Bank of Kenya, which was created in 1966, fulfills the role of both the government's banker and the regulator of the financial system. As of December 31, 2022, the banking sector in Kenya consisted of various entities. These include the Central Bank of Kenya (CBK), which serves as the regulatory authority. Additionally, there were 38 commercial banks, 1 mortgage finance company, 1 mortgage refinance company, 10 representative offices of foreign banks, 14 microfinance banks (MFBs), 3 credit reference bureaus (CRBs), 19 money remittance providers (MRPs), 8 non-operating bank holding companies, 10 digital credit providers (DCPs), and 72 foreign exchange (forex) bureaus. Among the total of 39 banking institutions, 37 were under private control, whereas the Kenya Government held majority ownership in 2 banks. Out of the total 37 banks that were privately owned,

20 banks were under local ownership, indicating that the majority shareholders were residents of Kenya. On the other hand, the remaining 17 banks were owned by foreign entities. The sample consisted of 20 locally held financial institutions, which included 19 commercial banks and 1 mortgage finance company. Out of the total of 17 institutions, all of them are classified as commercial banks. Among them, 14 are identified as local subsidiaries of foreign banks, while the remaining 3 are categorized as branches of foreign banks. All entities categorized as licensed currency bureaus, microfinance banks, credit reference bureaus, money remittance providers, digital credit providers, and non-operating bank holding companies are privately held.

The Government of Kenya (2007) outlines in Kenya's Vision 2030 a vision for the financial sector that is characterized by vibrancy, efficiency, stability, and inclusivity. This vision aims to enhance the accessibility of financial services for families. Vision 2030 aligns with the Global Sustainable Development Goals, which promote the establishment of strong and well-regulated financial markets as a prerequisite for addressing worldwide disparities. The significance of the banking sector's influence on the Kenyan economy should not be ignored. Based on the findings of CBK (2021), there was a 10.0 percent increase in total net assets from Ksh.6.0 trillion in December 2021 to Ksh.6.6 trillion in December 2022. This growth can be attributed to the rise in loans and advances. The client deposits experienced a growth rate of 12.3 percent, rising from Ksh.4.5 trillion in December 2021 to Ksh.5.0 trillion in December 2022. The increase of deposits can be attributed to the mobilization of deposits through agency banking and mobile phone platforms. As reported by CBK (2022), the pre-tax profit for the industry had a growth of 22.0 percent, rising from Ksh.197.0 billion in December 2021 to Ksh.240.4 billion in December 2022. The expansion was primarily facilitated by a greater rise in total income (Ksh.92.7 billion) in comparison to the increase in total

expenses (Ksh.80.5 billion). In contrast, there was an 11.5 percent increase in gross loans, rising from Ksh.3,255.4 trillion in December 2021 to Ksh.3,630.3 trillion in 2022. The increase in loans can be ascribed to the heightened demand for credit across different economic sectors. The liquidity ratio of the banking industry decreased from 56.2 percent in December 2021 to 50.8 percent in December 2022. Additionally, the ratio of non-performing loans decreased from 14.1 percent in December 2021 to 13.9 percent in December 2022. The significant decrease can be mostly attributed to enhanced company operations as the economy continues its recovery from the COVID-19 pandemic.

Significantly, there has been a gradual evolution within the banking sector in the past twenty years, as seen by advancements in financial inclusion, financial innovation, increased deposits, and the sector's ability to withstand global economic crises (CBK, 2016). According to a survey done by CBK in 2016, the level of financial inclusion in Kenya was found to be 82.6 percent. Furthermore, the research findings indicated a higher adoption rate of mobile banking in comparison to traditional banking methods.

With regard to capital adequacy, the CBK Prudential Guideline on Capital Adequacy (CBK/PG/04) mandates banks to comply with the specified capital adequacy ratios. The existing minimum regulatory capital adequacy ratios for the ratios of Core Capital to Total Deposits, Core Capital to Total risk-weighted assets, and Total Capital to Total risk-weighted assets are 8.0 percent, 10.5 percent, and 14.5 percent, correspondingly. The Core Capital to Total risk-weighted assets ratio experienced a marginal decline, decreasing from 16.6 percent in December 2021 to 16.1 percent in December 2022. The ratio of Total Capital to Total risk-weighted assets had a decline from 19.5 percent in December 2021 to 19.0 percent in December 2022. Nevertheless, there was a little

increase in the core capital to total deposits ratio, rising from 16.9 percent in December 2021 to 17.2 percent in December 2022. In 2022, the Kenyan banking industry demonstrated complete compliance with the capital adequacy ratios.

1.2 Statement of the Problem

Commercial banks in Kenya have been performing poorly in the last decade to the extent that several banks have collapsed and others placed under receivership in spite of the banking sector's firmness and resilience. There were bank closures experienced and fourteen acquisitions and mergers occurring between the years 2014 to 2019, (CBK, 2014:2018). In Kenya, several banks have collapsed owing to poor credit risk management and corporate governance failure (Chase, Imperial, Dubai, and Charterhouse banks). The overall financial performance of the banking sector in Kenya has been slowing down, from 2013 to date, and the loss for the banking sector in Kenya noticeably dipped from earlier years (CBK, 2013: 2019). CBK reports indicate that the banking sector's overall financial performance dropped from 10.1 percent in 2018 to 9.1 percent in 2019 (CBK, 2019).

The losses experienced in the banking sector in Kenya were noted to be at the same level as the rise in credit risk. The poor performance and increased credit risks have further led to mergers and acquisitions, such as the NIC and CBA merger, National Bank and KCB Bank acquisition). CBK reports indicate there were fourteen acquisitions and mergers, between the years 2014 to 2019 (CBK, 2014:2018). CBK for reports that over the same period, credit risk represented by non-performing loan levels was about fifty percent of overall gross loans and advances issued in that period (CBK, 2016:2019). During the same period, credit risk deteriorated from a 12.5 percent non-performing loan ratio in December 2019 to 14.5 percent in December 2020. Amount of

credit risk increased by 29.6 percent (CBK, 2020).

The impact of credit risk on financial performance has been a topic of interest to many scholars since credit risk has been identified as one of the major factors known to impact the financial performance of banks (Azam, 2019; Thorsten & Jan, 2021). However, there is a conflicting conclusion between the study findings of the impact of credit risk variables of non-performing loans, net charge-off, and pre-provision ratios on performance measured by return on assets. Net charge-off was found not to be an important variable (Bandara *et al*., 2021); while others found the variable had a positive and significant relationship with firm profitability and so as (Zainal, 2013; Boahene *et al*., 2012). (Kutum, 2017), found a weak but positive relationship between non-performing loans, and pre-provision profit to total loans and advances. Some studies show no association between credit risk dimensions (non-performing loan rate, pre-provision profit rate, net charge-off rate, and bank's profitability (Bandara *et al*., 2021; Kutum, 2017; Boahene *et al*., 2012; Zainal, 2013; Kithinji, 2010).

Studies show that capital adequacy influences bank performance (Dao & Nguyen, 2020; Ramadhanti & Hidayati, 2019). The importance of capital adequacy bank regulators, across the globe, usually sets policies or regulations on how banks should handle their capital. Capital is a fund that is invested by the owner in establishing an entity, and it is intended to finance bank operations in addition to meeting the regulations set by the monetary authority (Bhattacharya, 2013). Adequate bank capital can increase public confidence because it indicates that the bank can accommodate the possible risk of losses that will be experienced by the bank due to its operations. That way, capital adequacy may have an impact on increasing profits or profitability, besides cushioning the bank against credit risks. Therefore, this study contributes to the

literature by examining whether of capital adequacy ratio moderates the relationship between credit risk and financial performance.

1.3 Objectives

1.3.1 General Objectives

The general objective of the study was to examine the relationship between credit risk, capital adequacy ratio, and financial performance of commercial banks in Kenya.

1.3.2 Specific Objectives

The specific objective of the study was to;

i. To determine the effect of non-performing loan rate on financial performance of commercial banks in Kenya.
ii. To examine the effect of net charge-off rate on financial performance of commercial banks in Kenya.
iii. To establish the effect of pre-provision profit or loss rate on financial performance of commercial banks in Kenya.
iv. To investigate the moderating effect of capital adequacy ratio on the relationship between credit risk and financial performance of commercial banks in Kenya.
    a. To investigate the moderating effect of capital adequacy ratio on the relationship between non-performing loan rate and financial performance of commercial banks in Kenya.
    b. To investigate the moderating effect of capital adequacy ratio on the relationship between net charge-off rate and financial performance of commercial banks in Kenya.
    c. To investigate the moderating effect of capital adequacy ratio on the

relationship between pre-provision profit or loss rate and financial performance of commercial banks in Kenya.

1.4 Hypotheses

The study had the following hypotheses

H_{01}: Non-performing loan rate has no significant effect on financial performance of commercial banks in Kenya

H_{02}: Net charge-off rate has no significant effect on financial performance of commercial banks in Kenya

H_{03}: Pre-provision profit or loss rate has no significant effect on financial performance of commercial banks in Kenya

H_{04}: Capital adequacy ratio does not moderate the relationship between:

a) Non-performing loan rate and financial performance of commercial banks in Kenya

b) Net charge- off rate and financial performance of commercial banks in Kenya

c) Pre-provision profit or loss rate and financial performance of commercial banks in Kenya

1.5 Significance of the Study

The study is valuable to various stakeholders. First, the banking industry practitioners may better understand the effect of capital adequacy on the relationship between credit risk and financial performance of commercial banks in Kenya. Second, the Kenyan Central Bank, which is charged with overseeing commercial banks, may gain crucial knowledge about how credit risk affects the financial performance of commercial banks

as well as the moderating role that capital adequacy plays in this relationship. When evaluating the financial performance of banks to create efficient fiscal policies in that regard, the government will find the information beneficial. Third, the findings may be useful for future research and other empirical investigations. The study specifically adds to the body of knowledge regarding the moderator variable capital adequacy and the relationship between credit risk, capital adequacy ratio, and financial performance.

1.6 Scope of the Study

The study determined whether capital adequacy moderated the relationship between credit risk and the financial performance of commercial banks in Kenya. It focused only on the 42 commercial banks regulated and licensed to operate banking business over the period between 2011 and 2021 since the period had consistent data and there were major policy interventions to stimulate the banking sector development. In addition, the banking sector had recovered from the 2008 Global Financial Crisis. The study employed secondary data that was sourced from the Central Bank of Kenya website and financial statements of commercial banks obtained from their databases.

CHAPTER TWO

LITERATURE REVIEW

2.0 Chapter Overview

The chapter presents an overview of the literature relating to this study. The chapter begins with an overview of the key concepts and a review of previous studies done in order to develop the hypotheses and identify an explanation of the variables of the study. The section also gives empirical literature of past studies in line with the identified variables in the conceptual model. The literature captures a review of previous research regarding each construct and a conceptual framework.

2.1 Introduction

2.1.1 Concept of Financial Performance

Financial performance has been perceived only through a firm's ability to yield a profit; profitability can also be described as the excess of the return on capital employed, which is obtained from the effectiveness of management and the efficiency of resources utilization at its disposal. (Akintimehin *et al*., 2019).

The financial performance of the banking sector is proxied by profitability ratios such as return on assets, return on equity, net fees, and commission income as a percentage of total assets and net interest margin. Return on assets is a ratio that measures the profitability of a bank (Khrawish, 2011) and measures the ability of the bank management to generate income by utilizing company assets at their disposal.

Financial performance is done to establish the ability of bank management usage of its resources to produce income. It also indicates the effectiveness of a corporation's management in generating net income from existing assets of the institution (Khrawish, 2011). Financial performance evaluation aims at improving the net income that should

improve the institution to the benefit of its stakeholders. Various ways are employed to measure bank performance; ROE indicates the capability of a bank to generate returns using shareholders' funds and ROA, is a measure of total income compared to its total assets (Mueni, 2019).

Two indicators used in previous studies for measuring a bank's performance are RAO and ROE Following prior studies, this study used the conventional measure of firm financial performance, which is ROA. ROA is defined as the ratio of net profit after tax divided by total assets, has been used by various researchers, e.g., Khan, Siddique, & Sarwar, 2020; Mueni, 2019; Almaqtari, Al-Homaidi, Tabash, & Farhan, 2019; Kumar & Kishore, 2019; Setiadi, 2018; Serwadda, 2018; Ozili, 2017).

2.1.2 Concept of Credit Risk

Credit risk according to the Basel Committee of Banking Supervision (BCBS) (Witzany, 2017); is the possibility of losing the outstanding loan partially or totally, due to credit events (default risk) noted as for example; bankruptcy, failure to pay a due obligation, where the borrower refuses to honor, stops making the agreed-upon payments or not required to make payments to a loan contract or credit rating change and restructure. Credit risk is the single largest factor affecting the soundness of financial institutions and the financial system as a whole this is because lending is the principal business for banks (CBK, 2018). By far, some of the common measurements of credit risks are pre-provision profit or loss over total loans and advances, net charge-offs over total loans and advances, and non-performing loans over total loans and advances (Kutum, 2017).

Name a few researchers in Kenya, (Mueni, 2019) considered credit risk variables of non-performing loans and loan loss provisioning; (Kagecha, 2016) included in addition

to variable of asset quality, size, and capital adequacy considered other variables to include macro-economic factors evaluated against bank profitability. (Muriithi *et al.,* 2016) measured credit risk using asset quality, loan loss provision, capital to risk-weighted assets, loan and advances ratios, and ROE=measured financial performance.

Studies done in other countries on credit risk and financial performance had more or less the same variables but also had some new never explored variables in Kenya. Bandara *et al.,* (2021), in their study of the impact of credit risk on the profitability of the banking sector in Sri Lanka on thirteen banks over eight years in 10 to 2017, determined that net charge-off was not an important variable for expanding the bank's profitability. The study further found that non-performing loans have a negative and significant return on assets, and CAR positively expands return on assets.

Kutum (2017), in his study of the impact of credit risk on the profitability of banks listed on five banks on the Palestine Exchange, found a weak but positive relationship between credit risk as measured by non-performing loans; and pre-provision profit to total loans and advances; profitability as measured by return on assets.

Zainal (2013), in his study on credit risk management and its effect on the profitability of the service sector listed on Bursa Malaysia; on sixty selected firms from the service sector covering the three-year period from 2010, 2011, and 2012, found that non-performing loan rate, net charge-off rate, and the pre-provision profit as a percentage of net total loans and advances) had a positive and significant relationship with firm profitability for each year.

In Ghana, (Boahene *et al*., 2012), conducted a study on the relationship between credit risk and profitability of some selected banks in Ghana measured credit risk using the variables of non-performing loans, impairment charge, loan loss reserve, pre-provision

profit/ loss, loan loss provision. Pre-provision profit had a positive and significant relationship with bank profitability, and debt capital had a positive and significant relationship with bank profitability. Following prior studies, this study used the most frequent variable of non-performing loans, and less commonly used credit risk variables of net charge-offs, and pre-provision profit or loss as the independent variables (Bandara *et al*., 2021; Boahene *et al*., 2012; Kutum, 2017).

2.1.3 Concept of Capital Adequacy Ratio

This is the amount of shareholder or owner capital needed to cover the risk of loss arising from the investment of risky assets and to finance all fixed assets and bank inventory (Brastama & Yadnya, 2020).

There are two regimes used as sources of capital adequacy ratios and threshold requirements namely Bank of International Settlements (BIS) and the Central Bank of Kenya (CBK). The Bank of International Settlement (BIS) based Basel III framework gives three ratios to indicate capital adequacy namely, Common Equity Tier 1/Risk weighted assets, (Not less than 4.5%) Tier 1 Capital/RWAs (not less than 6%) and Total Capital/RWAs (not less than 8%) (BIS, 2010). On the other hand, in Kenya, the CBK through its Capital Adequacy Regulation of 2013 gives two statutory ratios. The first ratio is given by Core Capital/TRWA+OBSE, which is often referred to as the capital adequacy ratio, and the second ratio is given by Total Capital/TRWA+OBSE. The Banking and Financial Institutions (Capital Adequacy) Regulation, 2013 among other things sets the percentage of capital adequacy. Guideline three (PG/03) of this regulation requires every bank or financial institution to maintain at all times a minimum core capital ratio and total capital ratio equivalent to ten percent (10%) and twelve percent (12%) respectively of its total risk-weighted assets and off-balance sheet exposures (CBK, 2013).

The level of capital of a bank shows the ability of the bank to manage its risks while doing business. (CBK, 2013). Capital adequacy is measured by the ratio of equity to total assets (e.g., Schiniotakis, 2012; Mokni & Rachdi, 2014; Rani & Zergaw, 2017; Rjoub *et al*., 2017).

Different studies indicated that the capital adequacy ratio is a significant and positive determinant of a bank's profitability (e.g., Bougatef, 2017; Chowdhury and Rasid, 2017; Francis, 2013; Jara-Bertin *et al*., 2014; Menicucci and Paolucci, 2016; Saona, 2016). However, Naeem *et al*. (2017) concluded that the capital adequacy ratio has a positive but insignificant relationship with the bank's profitability as measured by ROA. The findings of Yahya *et al*. (2017) revealed that capital adequacy has a negative and insignificant relationship with ROA, for example.

In this study, the determination of the capital adequacy ratio is defined as provided under Section 2(1) of the Banking Act namely as permanent shareholders' equity (CBK, 2013); and capital adequacy ratio maintained at all times at a minimum of core capital equivalent to above 10.5% of its total risk-weighted assets and off-balance sheet exposures (CBK, 2013).

2.2 Theoretical Review

In conducting the study, two theories were used to determine the relationship between credit risk, capital adequacy ratio, and financial performance of commercial banks in Kenya.

2.2.1 Agency Theory

Agency theory is used to explain the costs associated with credit risk, financial performance, and capital adequacy. Within these perspectives, agency theory by Jensen and Meckling (1976), is based on the idea that managers serve as agents for the owners

or shareholders. If managers take actions that are in their own best interests rather than the shareholders, an agency problem is said to exist. In the strictest interpretation of this theory, managers are considered irresponsible if they take any substantive action that is in the best interests of anyone other than the shareholders (Buuml & Abdioğlu, 2011).

Agency theory reinforces this study by envisioning managers primarily as agents for the shareholders, with the responsibility of looking after their interests. Commercial bank managers, as rational individuals trying to further their own self-interest, may not always have sufficient incentives to work towards a common goal and therefore may not share information with each other. These problems of goal incongruence and information asymmetry are the basis of agency problems of adverse selection and moral hazard (Cumming & Johan, 2013).

Information asymmetry under this agency model can be demonstrated between the borrower and the bank manager where due to lack of proper information shared may lead to poor credit assessment and therefore the ability to repay loans issued by a commercial bank is not well assessed leading to non-performing loans and thus credit risk.

The moral hazard hypothesis can be described in two ways, where the commercial bank manager due to low capital may lead to an increase in the level of non-performing loan (Zhang *et al*., 2016) since loan originations and processing comes with other administration and portfolio management activities that the bank is not able to meet owing to low capital deployment at an operational level. Thus, under the moral hazard hypothesis, it is expected that low financial capital will result in high non-performing loans (Wood & Skinner, 2018; Pasha & Khemraj, 2012). The other dimension is where there is high capital levels, the bank manager can misuse the capital and engage in

decisions that would not yield the profit of the financial institution and thus affect the financial performance. When examining US banks, Koudstaal & Wijnbergen (2012) report that the more troubled the loan portfolio, the greater the loan provisions leading to low profit and overall capital adequacy since the amount of core capital includes an amount of profit booked after the end of a period.

The stakeholder theory is evaluated to explore the relationship between credit risk, capital adequacy ratio, and financial performance of commercial banks in Kenya.

2.2.2 Stakeholder Theory

The stakeholder theory brings out the concept of capital adequacy of the financial institution which is contributed by the financial institution as a vehicle to maximize returns to the owners of capital (Freeman, 2015). In the traditional view of the firm, the shareholder view, the shareholders or stockholders are the owners of the company, and the firm has a binding financial obligation to put their needs first, to increase value for them. Businesses are variously understood as relying primarily on markets, business strategy or industry structure, agency relationships, and transaction costs (Parmar *et al*., 2010).

Firm performance for much of the business and economics literature is focused on providing financial returns, variously referred to as profits, return on investment, economic rents, or shareholder returns (Barney, 2011).

The banking business mainly focuses on the issuance of loans collected as interest income. There is also an aspect of non-interest income collected from diversified sources such as investing in Treasury bills and securities, and Digital products. This theory fundamentally is about how business works at its best and how it could work with value creation and trade, and how to manage a business effectively (Carroll, 2016).

The financiers or equity stock owners prefer to apply the stakeholder concept to performance evaluation. Fortunately, many reasons exist to explain why stakeholder management should be associated with higher financial performance (Jones, 1995).

Many scholars believe that shareholders should be the highest priority firm stakeholder (i.e., Berle & Means, 1932; Rappaport, 1986; Jensen, 2001; Wallace, 2003), in part because shareholders do not have a specifiable contract with the organization, which makes them residual claimants (Fama & Jensen, 1983). The logic continues that providing the maximum possible return to shareholders is the primary duty of the firm managers.

From a stakeholder perspective, financial performance metrics are important because they are important to all of the firm's core stakeholders, and utility received by the various stakeholders involved in the firms success (Barney, 2011).

2.3 Empirical Review

There have been various empirical studies on the relationship between credit risk, capital adequacy ratio, and financial performance of commercial banks in Kenya.

Gupta & Mahakud (2020), in their study assessing the role of various bank-specific, industry-specific, and macroeconomic determinants in Indian commercial banks' performance, used the following independent variables bank size, capital ratio, risk, cost-to-income ratio, funding cost, revenue diversification, labour productivity and bank age; while ROA, ROE, net interest margin (NIM) and pre-provision profit ratio as dependent variables. The period of the study was 19 years for 64 commercial banks in India. Regression analysis was applied and found that the impact of credit risk measured through NPLR is negative and highly significant, and capital ratio (measured as the ratio of total equity to total assets) is statistically significant and bears a positive

sign for ROE and pre-provision profit. The study analyses the pre-provision ratio as an independent variable and not a dependable variable.

Mueni (2019), in her study on the effect of credit risk on the performance of Kenyan commercial banks, adopted a descriptive research design utilizing panel data covering the period from 2009-2017. The population is comprised of all the 41 commercial banks operating in Kenya. This study used secondary data, which was collected from published annual financial statements of the commercial banks using descriptive and inferential statistics obtained from panel linear regression analysis. The study used asset quality, insider lending, loan growth rate, and provision for loan loss as credit risk and ROE and ROA used to measure the financial performance of commercial banks in Kenya. The findings showed that credit risk variables had a negative but insignificant effect on financial performance.

Serwadda (2018) did a study on the impact of credit risk management systems and financial performance on commercial banks in Uganda for a period of 2006–2015 using panel data for a sample of 20 commercial banks. The study employed return on assets as a dependent variable and non-performing loans, growth in interest earnings, and loan provisions to total loans as credit risk measures. Secondary data was sourced from the Bank scope database, the African Development Bank and the Central Bank of Uganda. The study employed descriptive statistics, regressions, and correlation analysis. Regression models estimated the magnitude of significance of credit risk management on the performance of commercial banks in Uganda. The study revealed that credit risk management negatively impacts the performance of commercial banks. The research used descriptive statistics regression, and correlation analysis. The research found that credit risk significantly affected the performance of Ugandan commercial banks and recommended that the commercial banks emphasize non-performing loans and loan

provisions, and growth in interest earnings. This research was conducted in Uganda.

Kutum (2017), in his study of the impact of credit risk on the profitability of banks listed on the Palestine Exchange; Credit risk was measured by net charge-offs to total loans and advances, non-performing loans to total loans and advances, pre-provision profit to total loans and advances, and profitability measured by return on equity and return on assets. He found that return on equity as a measure of profitability cannot be explained by credit risk, a weak but positive relationship existed between credit risk as measured by non-performing loans to total loans and advances and profitability as measured by return on assets. The research was done in Palestine and using Exchange houses, and may not apply to Kenyan commercial banks.

Bhattarai (2016), carried out research to examine the impact of credit risk on the performance of Nepalese commercial banks. The study employed return on assets as a dependent variable and non-performing loans, cost of a loan asset, bank size, cash reserve and capital adequacy as credit risk measures, and ROA for financial performance. The study used causal-comparative and descriptive research designs. The regression model was used to analyze the study. The researcher concluded that credit risk indicators affected bank performance. However, the study was done in Nepal thus its findings and recommendations may not be applicable in Kenya.

Boahene *et al*. (2012), in their study of the relationship between credit risk and profitability of some selected banks in Ghana, conducted the study on six selected commercial banks covering a five-year period (2005-2009). The credit risk variables used were non-performing loans, loan impairment, loan loss reserve, pre-provision profit, loan loss provision, and profitability measured by Return on Equity (ROE). Using regression analysis, credit risk had a positive and significant relationship with

bank profitability or performance, pre-provision profit had a positive and significant relationship with bank profitability, and debt capital had a positive and significant relationship with bank profitability. This study was conducted in Ghana and the results may not apply to commercial banks in Kenya.

Research done by Muriithi *et al.,* (2014), on credit risk and financial performance in Kenya. Credit risk was measured using asset quality, loan loss provision, capital-to-risk-weighted assets, loan and advance ratios, and ROE-measured financial performance. Panel data techniques of fixed effects estimation and generalized method of moments were used for estimation and to purge time-invariant for unobserved firm specific effects. The study used a coefficient of determination to establish the variations within the independent and dependent variables. The finding showed that credit risk had an unfavorable relationship with the performance of banks, including capital adequacy the former will reduce the return on equity as a result of holding excess capital, measured by variable capital to risk-weighted assets. However, this study did not consider the other variable of ROA for financial performance studied in the current study and does not consider other credit risk variables for variables of net charge-offs and pre-provision profit or loss.

Marshal and Onyekachi (2014), carried out research on credit risk and bank performance in Nigeria. Data was gathered from the account's statements and annual reports of the banks the data was analyzed using panel data regression techniques. The result showed that there is a positive relationship between ratio of non-performing loans to loans and advances and bank's performance, measured by the variable, ROA. This indicated that banks in the study which were five did not conform to *apriori* empirical study results. There existed a positive and significant relationship between the ratio of loans and advances to total deposits, and banks performance. This research was carried

out in Nigeria and for a selected five banks, therefore its recommendations may not apply generally to Kenya commercial banks.

Li and Zou (2014), investigated if there is a relationship between credit risk management and profitability of 47 commercial banks from 2007 and 2012 in Europe and if the relationship was stable or fluctuating. In the research model, ROE and ROA were defined as proxies of profitability while NPLR and CAR were defined as proxies of credit risk management. A series of statistical tests were performed in order to test if the relationship exists. Other statistical tests were performed to investigate if the relationship is stable or not. The findings revealed that credit risk management did have positive effects on the profitability of commercial banks. The study did not consider other credit risk variables of variables - Net Charge-offs and Pre-provision profit or loss.

Kaaya and Pastory (2013), conducted a study to investigate the relationship between credit risk and bank performance which employed panel data from 11 banks in Tanzania. The results concluded that an increase in credit risk tends to lower firm performance. Loan losses to gross loans, loan loss to net income, and non-performing loans have a negative and significant effect on the profitability of banks. The current study was conducted in Tanzania and may not apply in Kenya.

Zainal (2013), in his study on credit risk management and its effect on the profitability of the service sector listed on Bursa Malaysia was conducted on sixty selected firms covering the three-year period 2010, 2011 and 2012. The credit risk variables used were non-performing loan rate, net charge-off rate, and the pre-provision profit as a percentage of net total loans and advances. Using regression analysis, the credit risk had a positive and significant relationship with the firm’s profitability for each year.

This study was conducted in Malaysia and the results may not apply in Kenya.

Kolapo *et al*. (2012), using a panel data regression model did research to examine the quantitative effect of credit risk on the performance of Nigeria commercial banks. Guided by traditional profit theory the study used return on asset (ROA) to measure bank performance and Non-performing ratio; loan to loan and advances ratio; Loan loss provision ratio and Total loan and Advances to Total deposit ratio and to measure credit risk. Data was analyzed by use of a Panel model analysis. The research found bank performance was affected by NPL and LLP. The results showed that the amount of credit and nonperforming loans do not influence bank performance, indicating that other variables affect profits. The current study was conducted in Nigeria and may not apply in Kenya.

Afriyie and Akotey (2011), did an examination in Ghana on the impacts of credit risk on the profitability of rural community banks. The research used a panel regression model for estimation. Secondary data was sourced from ten rural banks. The study used ROE as an indicator of profitability and non-performing loans and capital adequacy and as indicators of credit management. This finding shows a connection between credit risk management affects bank profitability. This study was done in Ghana therefore its recommendation may not apply to Kenyan banks.

Kithinji (2010), in his study on credit risk management and the profitability of commercial banks in Kenya, used the credit risk variables of amount of Credit/ Total Assets, Non-performing loans/Total Loans, and ROA as financial performance variables. The results of the study were that there was no association between profits and credit risk. This study has been the backbone of much research in Kenya.

2.3.1 Non-performing Loan Rate and Financial Performance

Studies on the impact of non-performing loans on bank financial performance have been conducted within and across countries showing mixed results. Khan, Siddique, & Sarwar (2020), supposed that ROA had a positive association with NPLs. Anggriani, & Muniarty, (2020) results proved that non-performing loans partially do not affect the return on assets.

The empirical studies showed a negative relationship between non-performing loans and financial performance: Mueni, 2019; Serwadda, 2018; Bhattarai, 2016; Muriithi, Waweru, & Muturi, 2016; Kaaya & Pastory, 2013; and Boahene *et al*., 2012, and empirical studies which showed a positive relationship of credit risk and financial performance included Marshal & Onyekachi, 2014; Li & Zou, 2014; and Afriyie & Akotey, 2011. Further, empirical results with results point out to no significant relationship; Kolapo *et al*. (2012), and Kithinji (2010).

Mueni (2019), in her study, established the effect of credit risk on the performance of Kenyan commercial banks. The research adopted a descriptive research design utilizing panel data covering the period from 2009-2017. The population is comprised of all the 41 commercial banks operating in Kenya. This study used secondary data, which was collected from published annual financial statements of the commercial banks. Using descriptive and inferential statistics obtained from panel linear regression analysis. The findings showed that non-performing loans had a negative significant effect on the performance of banks in Kenya, measured for ROE and ROA.

Kumar and Kishore (2019), studied various banking and microeconomic factors as elements of NPLs in the banking system of the UAE and revealed that ROA has an insignificant association with NPLs.

Dimitrios, Helen, and Mike (2016), investigated various determinants of NPLs in the euro banking system. The banks' performance indicators, ROA and ROE, were found to be negatively related to NPLs in most models. However, only ROE was found to be significant.

Ahmad and Bashir (2013), affirmed that return on asset (ROA) ratio as a measure of financial performance and non-performing loan level have a direct association.

Rachman *et al.*, (2018), examined various banking factors that affected the NPLs in Indonesia and concluded that the high financial performance of banks has lower NPLs due to their better advancing activity and effective credit supervision system.

Ozurumba (2016), concluded in the study examined the impact of Non-performing Loans on the Performance of Selected Commercial Banks in Nigeria covering the period 2000-2013; that financial performance measured by return on asset and return on equity have an inverse relationship with non-performing loans.

In Kenya, non-performing loans have a negative significant effect on the financial performance of commercial banks in Kenya for example; Om'mbongo (2020); Isabwa & Mabonga (2020); and Ongore & Kusa (2013). Anggriani and Muniarty (2020) analyzed whether there was an influence between non-performing loans and capital adequacy ratio both partially and simultaneously on the Profitability (ROA) of PT. Bank Central Asia, TBK. The approach taken in this research was associative and quantitative. The population of this study was all subjects at PT. Bank Central Asia (BCA), TBK for 44 years, namely 1974-2018 with a total sample of 9 years, namely 2010-2018. The results of this study proved that non-performing loans do not affect the return on assets. However, the capital adequacy ratio has a significant effect on the return on assets. While simultaneously this study proved that non-performing loans and

capital adequacy ratio affect the return on assets.

Om'mbongo (2020), in analyzing non-performing loans discussed that this would result in a bank increasing provisions for NPLs, which negatively affects interest income, operating profit and loanable funds, and capitalization levels in commercial banks resulting in non-performing loans negative impact on the variables (operating profits, and capitalization levels of commercial banks, among other variables).

Isabwa and Mabonga (2020), the study concluded that non-performing loans have a negative significant effect on the profitability of the Kenyan banking industry. Kirui (2014) stated that the impact of NPLs on the profitability of commercial banks in Kenya was negative, and NPLs decreased the profitability of the banks from 2004 to 2013. Ongore and Kusa (2013) indicate that poor asset quality or high nonperforming loans are related to poor bank performance.

2.3.2 Net Charge Off Rate and Financial Performance

The empirical studies on the relationship between net charge-offs and the financial performance of banks show mixed findings.

Bandara *et al.,* (2021), in their study on the impact of credit risk on the profitability of the banking sector in Sri Lanka; where profitability was measured by return on assets ratio, and credit risk by non-performing loan ratio, loan to deposit ratio, net charge-off ratio and capital adequacy ratio. With data from thirteen banks over eight years from 2010 to 2017 was analyzed using a panel regression analysis; which determined that net charge-offs were not important variables for expanding the bank's profitability. The net charge-off ratio was found not to be an important variable for expanding profitability. This study was conducted in Sri Lanka and the results may not apply in Kenya.

Kutum (2017), in his study of the impact of credit risk on the profitability of banks listed on the Palestine Exchange; found that return on equity as a measure of profitability cannot be explained by credit risk. Credit risk was measured by net charge-offs to total loans and advances, non-performing loans to total loans and advances, and pre-provision profit to total loans and advances. The study found a weak but positive relationship between credit risk and profitability as measured by return on assets. The study was conducted in Palestine and may not apply to Kenya.

Zainal (2013), in his study on credit risk management and its effect on the profitability of the service sector listed on Bursa Malaysia; found that credit risk (non-performing loan rate, net charge off rate, and the pre-provision profit as a percentage of net total loans and advances) had a positive and significant relationship with firm profitability for each year. Credit risk was measured by non-performing loans rate, pre-provision profit rate, net charge-off rate, and return on equity (ROE) was used to measure profitability. This study was conducted in Malaysia and the results may not apply in Kenya. The study analyzed against ROE and not ROA.

The conclusion therefore is that the effects of credit risk, looking at the determinants of the net charge-off rate on commercial banks' performance is not conclusive.

2.3.3 Pre-Provision Profit or Loss Rate and Financial Performance

The empirical studies on the concept of financial performance showing a relationship with pre-provision profit or loss rate show mixed findings.

Gupta and Mahakud (2020); in their study focused on assessing the role of various bank-specific, industry-specific and, macroeconomic determinants in Indian commercial bank's performance. The performance of the Indian banks was measured by return on assets (ROA), return on equity (ROE), net interest margin (NIM) and, Pre-

provision profit ratio. The study analysed the impact of various bank-specific factors like bank size, capital ratio, risk, cost-to-income ratio, funding cost, revenue diversification, labour productivity, and bank age on bank performance. It also tried to assess the relationship between various bank-specific and industry-specific variables like bank concentration, inflation rate and, GDP growth rate with bank performance. Fixed effects estimation model and Generalized Method of Moments (GMM) were used on panel data of 19 years for 64 commercial banks of India. This study analyses the pre-provision profit ratio as a variable to measure bank performance and not as a determinant of bank performance.

Kutum (2017), in his study of the impact of credit risk on the profitability of banks listed on the Palestine Exchange; found that return on equity as a measure of profitability cannot be explained by credit risk. Credit risk was measured by net charge-offs to total loans and advances, non-performing loans to total loans and advances, and pre-provision profit to total loans and advances. The study found a weak but positive relationship between credit risk and profitability as measured by return on assets. The study was conducted in Palestine and may not apply to Kenya.

Zainal (2013), in his study on credit risk management and its effect on the profitability of the service sector listed on Bursa Malaysia; found that credit risk (non-performing loan rate, net charge-off rate, and the pre-provision profit as a percentage of net total loans and advances) had a positive and significant relationship with firm profitability for each year. Credit risk was measured by non-performing loans ratio, pre-provision profit ratio, net charge-off ratio, and return on equity (ROE) was used to measure profitability. This study was conducted in Malaysia and the results may not apply in Kenya. The study analyzed against ROE and not ROA.

Boahene *et al*. (2012), conducted a study on the relationship between credit risk and profitability of some selected banks in Ghana, and measured credit risk using the variables of non-performing loans, loan impairment, loan loss reserve, pre-provision profit, and loan loss provision. Panel data from six selected commercial banks covering the five-year period (2005-2009) was analyzed within the fixed effects framework. From the results, the net charge-off rate had a positive and significant relationship with bank profitability. This study was conducted in Ghana and the results may not apply in Kenya. The conclusion therefore is that the effects of credit risk, looking at the determinants of pre-provision profit or loss rate on commercial banks' performance, is not conclusive.

2.3.4 Capital Adequacy and Financial Performance

According to Adeusi, Kolapo, and Aluko (2014), profitability can be determined as the excess of return on capital employed, which is obtained from the effectiveness of management and the efficiency of resources utilization at its disposal. Because of the fact that bank financial performance and the adherence of capital adequacy ratio are both crucial determinants, there are a number of researches studying the effect of one variable on the other.

Given the international prudential regulation, capital ratio was considered an important tool for assessing capital adequacy and should capture the general safety and soundness of banks. Consequently, highly capitalized banks might reduce their funding costs, which affect positively their profitability. On the other hand, highly capitalized banks usually have a reduced need for external funds, which has again a positive effect on their profitability. However, if we consider the conventional risk-return hypothesis, we have to expect banks with lower capital ratios to have higher returns in comparison to better-capitalized financial institutions (Ameur & Mhiri, 2013).

Empirical results might vary according to regional areas as well with results pointing out mixed results of a positive, negative, or no significant relationship, between capital adequacy and financial performance. Examples of a positive relationship include: Lee and Hsieh (2013) examined the impacts of bank capital on profitability and risk for 42 Asian countries over the period 1994 to 2008. Their results point out a positive and significant relationship between capital adequacy and performance (proxied by ROA, NIM, and Net Profit) for the overall Asian banking system. Demirguc-Kunt, Detragiache, and Merrouche (2013) stated that in the time of the financial crisis of 2007-2008, higher capital ratios had a positive effect on bank stock returns. Further, Ozili (2017) studied some African banks and remarked that regulatory capital has a significant positive impact on the profits of listed banks, while higher regulatory capital thresholds have a reciprocal influence on the profits of non-listed banks.

Velnampy and Niresh (2012) conducted a study assessing the relationship between capital structure and profitability of ten (10) listed SriLankan banks for the period (2002 to 2009). The results showed that there is a negative association between capital structure, and profitability. Furthermore, the results also suggest that 89% of total assets in the banking sector of Sri-Lanka are represented by debt, confirming the fact that banks are highly geared institutions. The findings of this study support the findings from the previously conducted studies.

As demonstrated by Akande (2016), there was a significant positive relationship between capital adequacy and ROA among Nigerian banks, and one percentage change in ROA leaded to a 40 percent change in total equity-to-total assets ratio. Research by Lee, Ning, and Lee (2015) on Chinese commercial banks revealed that bank capital strongly impacts banks' profit even though the effect varies depending on bank size. On the other hand, Moh'd Al-Tamimi and Obeidat (2013) also found a statistically

strong and positive relationship between ROA and capital adequacy.

A study by (Saeed, 2013) which assessed the impact of capital structure on the performance of banks in Pakistani for the period (2007-2011) found a positive relationship between determinants of capital structure and the performance of the banking industry. The performance was measured by return on assets (ROA), return on equity (ROE), and earnings per share (EPS). The determinants of the capital structure included long-term debt-to-capital ratio, short-term debt-to-capital ratio and total debt-to-capital ratio.

A study (Awunyo & Badi, 2012) evaluating capital structure and performance of listed Banks in Ghana in the period (2000-2010) discovered that banks listed on the Ghana Stock Exchange are highly geared. This can be attributed to their over dependency on short-term debt as a result relatively high Bank of Ghana lending rate and low level of bond market activities and there is a negative relationship between gearing and the banks performance.

However, Dietrich and Wanzenried (2011), found no significant effect of capital ratio on bank profitability before the crisis in Switzerland. Nevertheless, it has a negative and significant impact on the bank's profitability as measured by return on assets during the financial crisis 2007–2009. Again, anticipating the net impact of changes in this ratio is complex.

In empirical studies identifying the relationship between capital structure and bank performance, the bank performance was indicated by return on asset as the dependent variable and was regressed against the components of capital structure using multiple regression models; in Tanzania (Pastory, Marobhe, & Kaaya, 2013). The study concluded that the relationship between the capital structure and performance of the

banks was negative, the results were significant at a 5% level.

In Kenya, Kagecha (2016), in his research on the effect of bank size on commercial bank performance in Kenya, evaluated bank profitability being a function of one-period lagged profits, size, liquidity, age, capital adequacy, asset quality, market concentration, inflation and GDP growth. Ongore and Kusa (2013) found a positive and statistically significant association between capital adequacy and bank performance in Kenya. The conclusion therefore is that the effects of capital adequacy on commercial banks' performance is not conclusive as it has a positive, positive and significant, positive and insignificant, negative and significant, and no relationship.

2.3.5 Capital Adequacy Ratio, Credit risk and Financial Performance

There have been previous empirical studies analyzed on capital adequacy ratio, credit risk, and financial performance. The results show mixed outcomes and thus are inconclusive.

Empirical studies with positive results for both credit risk and capital adequacy ratio on the financial performance of commercial banks, for example; Ogboi & Unuafe (2013) did a study in Nigeria to establish the impact of capital adequacy and credit risk on banks' financial performance in 2004-2009. Secondary data was obtained from selected banks' annual reports and accounts. in Nigeria. A panel data model was used to estimate the relationship that exists among loan loss provisions, loans and advances, non-performing loans, capital adequacy, and return on asset. Results showed that the relationship for non-performing loans was negative and insignificant; and for capital adequacy impacted positively on return on asset.

Despite having one different measure for determining financial performance as those for (Ogboi, & Unuafe, 2013; Muriithi *et al.,* 2016), in their study was to assess the effect

of credit risk on financial performance of commercial banks in Kenya. The study covered the period between years 2005 and 2014. Credit risk was measured by capital to risk-weighted assets, asset quality, loan loss provision, loan and advance ratios, and ROE. The study used the balance sheet components and financial ratios for 43 commercial banks in Kenya registered by the year 2014. From the results, credit risk has a negative and significant relationship with the bank's profitability. Poor asset quality or high non-performing loans to total asset is related to poor bank performance both in the short run and long run. The current study used ROA as a financial performance measure.

Similar results were seen in Isanzu, 2017, in which the study aim was to empirically examine the impact of credit risk on the financial performance of Chinese banks (Isanzu, 2017). Secondary data was collected from the five largest commercial banks in the country for a period of 7 years from 2008 to 2014. The study used non-performing loans, capital adequacy ratio, impaired loan reserve, and loan impairment as measures of credit risk and return on asset as a measure of financial performance. Data analysis was done using a balanced panel data regression model, and the study findings revealed that non-performing loans and capital adequacy had a significant impact on financial performance of Chinese commercial banks.

Mwangi (2012); study sought to review the effect of credit risk management on the financial performance of commercial banks. The research design used was descriptive research design. Secondary data collected from the commercial bank's annual reports (2007-2011) was used. Of the 43 commercial banks in Kenya, full data was attained from 26 banks and thus the study concentrated on the 26 banks. The data collected from the annual reports of the banks was analyzed using multiple regression analysis. In the model ROE was used as the profitability indicator while the NPL and CAR as credit

risk management indicators. This study showed that there is a significant relationship between financial performance (in terms of profitability) and credit risk management (in terms of loan performance and capital adequacy). The results of the analysis stated that both NPL and CAR had a negative and relatively significant effect on ROE, with NPL a having higher significant effect on ROE in comparison to CAR.

There are empirical studies with mixed (positive and negative results) for either one, where credit risk was found negative relationship and capital adequacy was positively relationship on the financial performance of commercial banks, for example; (Heydari & Abdoli, 2015; and Mushtaq, Ismail, & Hanif, 2015).

Heydari & Abdoli (2015) examined the effect of credit risk management and capital adequacy on the financial performance of business banks from 2009 to 2014. The statistical population of the research is all the state and private banks and final sample volume was 25 banks based on available information. In this research, number of loans, previous maturity of credits, loss reserve on loans and previous maturity of credits, liquidity ratio and capital adequacy of banks were used to study their effects on the performance of banks (return on asset ratio). The results of data analysis using multi-variate linear regression at a 95% confidence level indicated that there was a negative relationship between loss reserve on loans and previous maturity of credits and banks' performance. On the other side, the results indicated that there was a positive relationship between the liquidity ratio, and capital adequacy ratio with banks' performance.

Mushtaq, Ismail, & Hanif (2015), concluded that credit risk is one of the major risks in banking operations in their study to investigate how credit risk and capital adequacy affect the performance of commercial banks in Pakistan. They concluded that credit risk, and default rate (non-performing loans, cost on loans, loans and advances) are

negatively associated with return on assets ratio. High credit risk was deteriorating the financial performance of banks in Pakistan. However, capital adequacy had a positive impact on the performance of the banks.

Previous empirical studies analyzed the relationship between the capital adequacy and asset quality of commercial banks in Tanzania. The study employed a panel secondary data obtained from 33 banks in the period (2006-2011) and a linear regression model was used. When capital adequacy, measured by comparative core capital to RWA and Off-Balance Sheet Exposure is used as a dependent variable, the results show that non-performing loans to gross loans and non-performing loans to core capital, tends to increase the level of capital adequacy as they had the positive coefficient but large exposure to core capital analysis had a negative coefficient which means it tends to decrease the level of capital adequacy (Pastory & Marobhe, 2013). The NPL to gross loan and NPL net of provision to core capital were positive as they tend to increase the level of capital adequacy; meanwhile, large exposure to core capital was negative which indicated that it tends to reduce the value of capital adequacy.

Qin and Pastory (2012), previous study examined commercial banks' profitability in Tanzania for the period of ten years (2000-2009). The study used the National Microfinance Bank (NMB), National Bank of Commerce (NBC) and, CRDB as case study. The study employed the profitability measures of commercial banks, and the evidence of performance in terms of profitability was established based on return on average asset, net interest income to average bearing assets, and non-interest expenses to average assets. The paper utilized panel secondary data whose findings revealed that there was no significant difference on profitability among the commercial banks, in the context of regression model and that capital adequacy showed negative impact on profitability.

Ogboi and Unuafe (2013), used panel data model to estimate the relationship that exists among Loan Loss Provisions (LLP), Loans and Advances (LA), NPL, CAR and ROA. The results showed that sound credit risk management and capital adequacy impacted positively on banks' financial performance with the exception of loans and advances which was found to have a negative impact on selected commercial banks' profitability in Nigeria in the period between 2000-2009.

Irawati *et al.*, (2019), researched on Good Corporate Governance factors and other regulatory driven factors that is Capital Adequacy Ratio (CAR) and Non-Performing Loan (NPL) and bank Size data from 30 Indonesian banks in 2011-2015. Capital Adequacy Ratio, Managerial Ownership, and Size Variable have positive influence and significantly on the financial performance, while other variables that is Audit Committee had a positive but not significant influence on financial performance. The CAR had a positive influence on financial performance and suggests that the bank with more capital equity would have more advantage in managing its operation in facing financial risk.

Boahene *et al.* (2012), conducted a study on the relationship between credit risk and profitability of some selected banks in Ghana and in the study also analyzed impact of bank capital. It found that capital influences the bank's profitability positively and significantly.

2.4 Control variables

The study incorporated several firm-specific variables that affect bank performance as suggested by empirical literature to isolate the effect of the predictor variables and the moderating variable.

2.4.1 Firm size and Financial performance

For large-size banks, it is easy to raise capital due to their reputation and long-term existence in the market. The cost of raising funds is relatively low for them. Therefore, we may assume that the role of bank-specific factors in determining bank performance varies across the size of the banks.

In comparison to small banks, large banks most typically exhibit economies of scale (improved operational efficiency) and economies of scope (greater degree of product and loan variety). Therefore, in line with research like Pasiouras and Kosmidou (2007) and Smirlock (1985), it is expected that size may have a beneficial impact on bank profitability. According to Short (1979), large banks' excellent profitability position is a result of their access to less expensive capital. Large banks, according to Djalilova and Piesse (2016), can lower their risk by diversifying their offerings, which boosts their operational effectiveness and profitability. Issa *et al.,* (2021) studied a sample comprising of 80 individual banks, and 640 firm-year observations for the fiscal years 2011–2018, and found a positive and significant relation between the banks' size and banks' performance measured by (ROE and ROA). It thus applies that the size of banks in the MENA countries has a significant impact on their financial performance.

When employing panel data set of 32 banks that operated in Ghana over the period between 2000 to 2015, Duho, KOnumah and Owodo (2020) found that the size had a positive effect on the banks' performance. The authors concluded that older banks were more efficient in generating profit due to economies of scale. However, using a sample of 635 banks from 48 countries in Africa between 2000 to 2016, Kyei, Werner and Appiah (2022) found a negative relationship between the banks' size and financial performance.

2.4.2 Firm age and Financial performance

Studies suggest that older banks are unable to benefit from their long-established brand reputation and vice versa. Younger banks are presumed to be more successful and have the ability to take advantage of new revenue streams. Additionally, younger banks may have more advanced IT infrastructure and managerial oversight (Dietrich & Wanzenried, 2011). Gupta and Mahakud (2020), used panel data from 19 years for 64 commercial banks of India. Luu *et al.,* (2020) found a negative relationship between firm age and bank performance. The study used a sample of 255 bank-year observations of 39 banks over the entire time period of 2007–2017. In contrast, analyzing data drawn from 32 banks that operated in Ghana over the period between 2000 to 2015, Duho *et al.,* (2020) revealed that the bank's age had a positive impact on profitability, profit efficiency and financial stability of banks. Using a sample of 76 commercial banks of four countries, i.e., Pakistan, India, Bangladesh and Sri Lanka for the period 2009–2018, Hunjra *et al.,* (2020) found that the firm's age positively affects the financial performance of banks. According to the authors, older banks experience rising levels of profits, productivity, and larger growth in size.

2.4.3 Diversification and financial performance

The Kenyan banking industry has witnessed notable developments in the last 20 years. Because of shifting away from traditional banking activities like lending towards non-traditional banking activities like brokerage and mutual fund services, security underwriting, real estate investments, insurance, and other non-interest income-generating activities, many banks across the continent have broadened their horizons and diversified their assets during this time. The issue of whether regulators should permit banks to diversify is the subject of a raging discussion. Some claim that income diversification has an impact on performance. Adesina (2021), using a sample

of 400 commercial banks operating in 34 African countries over the 2005–2015 period, found that higher diversification reduces bank performance. Using annual financial information from Malaysian banks over the period of 2005-2015, Brahmana, Kontesa and Gilbert (2018) studied the effect of income diversification effect on bank's performance. They found that income diversification increases bank performance. Employing a sample of 53 East African banks and a panel dataset for the period 2010–2018, Githaiga (2023) found that income diversification has a negative and significant effect on bank performance in the East Africa region.

2.5 Summary of Major Empirical Studies and Research Gaps on Credit Risk, Capital Adequacy and Financial Performance

Table 2.1 Summary of Major Empirical Studies and Gaps

Researchers	Study Focus	Methodology	IVs	DV	Major Findings	Gap
Bandara *et al.*, (2021)	Impact of credit risk on the profitability of the banking sector in Sri Lanka; thirteen banks over eight years; 2010 to 2017.	Panel regression analysis	Credit risk was measured by non-performing loan ratio, loan to deposit ratio, net charge off ratio and capital adequacy ratio.	Profitability was measured by return on asset ratio	The study determined that net charge-off were not important variables for expanding the bank's profitability. The study further found that the non-performing loans have a negative and significant return on assets. Net charge off and loans to deposit ratios are not important variables for expanding profitability. CAR positively expands return on assets.	The finding shows that the profitability of the banking sector in Sri Lanka has been determined by important determinants such as credit risk.
Kutum (2017)	The Impact of Credit Risk on the Profitability of Banks Listed on five banks on the Palestine Exchange	Panel regression analysis	Credit risk was measured by net charge-offs to total loans and advances, non-performing loans to total loans and advances and pre-provision profit to total	Return on equity and Return on assets	Return on Equity as a measure of profitability cannot be explained by credit risk. The study found a weak but positive relationship between credit risk as measured by non-performing loans and pre-provisioning profit to total loans and advances and	The study was conducted in Palestine and may not apply to Kenya.

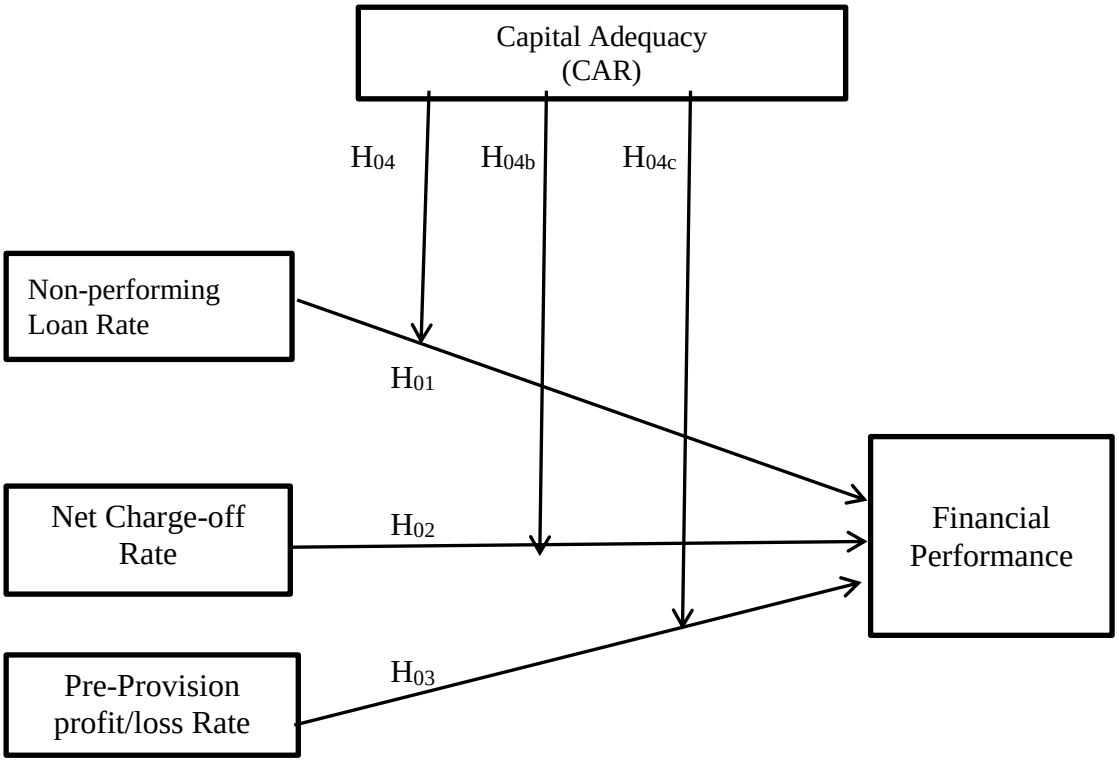
Researchers	Study Focus	Methodology	IVs	DV	Major Findings	Gap
			loans and advances		profitability as measured by return on assets. The study also found that bank size was positively related to profitability.	
Zainal (2013)	Credit risk management and its effect on the profitability of sixty selected firms from service sector in Bursa Malaysia; covering the three-year period from 2010, 2011 and 2012	Panel regression analysis	Non-Performing Loans Ratio, pre-provision profit ratio and Net Charge Off Ratio	Return on Equity (ROE)	Credit risk (non-performing loan rate, net charge off rate, and the pre-provision profit as a percentage of net total loans and advances) had a positive and significant relationship with firm profitability for each year.	This study was conducted in Malaysia and the results may not apply in Kenya. The study analyzed against ROE and not ROA.
Boahene, Dasah, & Agyei (2012)	Relationship between credit risk and profitability of six selected commercial banks covering the five-year period (2005-2009) in Ghana	Panel regression analysis	Non-performing loans, loan impairment, loan loss reserve, pre-provision profit, loan loss provision	Return on Equity (ROE)	Credit risk had a positive and significant relationship with bank profitability or performance, pre-provision profit had a positive and significant relationship with bank profitability. Debt Capital had a positive and significant relationship with bank profitability	This study was conducted in Ghana and the results may not apply in Kenya. The study analyzed against ROE and not ROA

Researcher, 2023

2.6 Conceptual Framework

This model encompasses the Independent Variables (IVs) as well as the Dependent variables presented diagrammatically. This study measured credit risk using the variables of non-performing loan rate, pre-provision profit or loss rate, and net charge-off rate; and investigate the role of the moderator capital adequacy ratio on the relationship between credit risk and financial performance of commercial banks in Kenya.

Independent Variables **Moderating Variable** **Dependent Variable**



Control variables

Firm size
Firm age
Diversification

Figure 2.1 Conceptual Framework

Source: Researcher (2023)

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Overview

This chapter explains the research methodology of the study. The chapter presents the research philosophy, research design, the target population, data types and sources, measurement of the variables, data analysis, and presentation, model specifications, the underlying assumption of the regression model, and test for the regression assumption.

3.1 Research Design

A research design is a frame of procedures and methods for the acquisition of information that is needed (Kothari, 2017). It is an overall plan of conducting the study, answering the research objectives, and eventually achieving the objectives of the study. The study employed both the explanatory and longitudinal research design. Saunders, Lewis and Thornhill (2009) argue that exploratory research design is conducted "when enough is not known about a phenomenon and a problem that has not been clearly defined". Therefore, explanatory research is used to answer cause-effect relationships so as to provide evidence to support or refute an explanation or prediction. This design was ideal because the main purpose of the study examine whether capital adequacy moderated the relationship between credit risk and the financial performance of commercial banks in Kenya.

On the other hand, a longitudinal design is primarily defined by the element of time as the emphasis is on data collected at different time points, generally from the same participants (Cockcroft, Goldschagg, & Seabi, 2019). The suitability of this research design was based on the nature of data that was used to test the hypotheses. Specifically, data was for the period 2011 to 2021 and a number of firms were involved. This means

the study had both cross-sectional observation and time series data.

3.2 Target Population

The target population was the forty-two commercial banks in Kenya over the period 2011 – 2021. The list of the registered commercial banks is provided in the appendix II.

3.3 Inclusion and Exclusion Criteria

The study included all licensed commercial banks in Kenya, and other criteria used were as follows. First, the commercial bank must have been in operation continuously between the years 2011 to 2021. In respect of this, all banks under receivership and statutory management were excluded (for instance Chase Bank, Imperial Bank, Dubai Bank, and Charter House Bank commercial banks). Second, the banks that underwent major restructuring such as mergers and takeovers (NIC, National Bank, Fina Bank, Giro Commercial, KRep Bank, Fidelity Bank, and Habib Bank) may distort the consistency of financial reporting. After employing the said criteria, the final sample comprises 35 commercial banks over a period of 11 years generating 385 firm-year observations.

3.4 Data Types, Instrument and Sources

The data was secondary in nature since it was extracted from commercial banks financial instruments and Central Bank of Kenya reports made available on their websites. A data collection schedule was developed and organized on the basis of the specific objectives (Appendix I). The following secondary data was collected from the websites of the central bank reports and financial statements of commercial banks on profit or loss after tax, total assets, total loans and advances, net total loans and advances, total non-performing loans and advances, total shareholder's equity, total

risk-weighted assets, gross loan provisions, net loans and advances, and total bad debt recoveries across the study period.

3.5 Operationalization and Measurement of Variables

The independent and dependent variables for this study identify and operationalise the key variables of the study. The operationalized was based on how the variable has been used in the current study. The criteria of measurement to be used were also given.

Table 3.1: Operationalization and Measurement of Variables

Variable	Type	Operationalization	Measurement	Hypothesised direction	Empirical study
Financial Performance	Dependent	Return on Asset Ratio (ROAR)	Financial Performance = Return on Assets (Profit After Tax/ Total Assets) of Bank i in time t		Khan *et al*., 2020; Mueni, 2019; Almaqtari, Al-Homaidi, Tabash, & Farhan, 2019; Kumar & Kishore, 2019.
Credit Risk	Independent	Non-Performing Loan Rate (NPLR)	Credit risk = Total Non-performing Loans / Total Loans and Advances of Bank i in time t	Positive/ Negative/ No movement	Boahene *et al*., 2012; Li & Zou, 2014; Afriyie & Akotey, 2011; Kolapo *et al*. 2012; and Kithinji, 2010.
		Net Charge-off Rate (NCOTLAR)	Credit risk = Gross loan loss Provisions-Bad debt recoveries/ Total Loans and Advances	Positive/ No movement	Bandara *et al*., 2021; Boahene *et al*., 2012.
		Pre-Provision Profit/ Loss Rate (PPPTLAR/ PPLTLAR)	Credit risk = Profit/ Loss (Profit/Loss After Tax + Loan loss provision expense) / Total Loans and Advances of Bank i in time t	Positive	Boahene *et al*., 2012.
Capital Adequacy	Moderating	Capital Adequacy Ratio (CAR)	Total Shareholder's Equity/ Total Risk Weighted Assets of Bank i in time t	Positive/ Negative/ No movement	Lee & Hsieh, 2013; Demirguc-Kunt *et al*., 2013; Ozili, 2017; Velnampy & Niresh, 2012; Dao & Nguyen, 2016; Akande, 2016; Lee *et. al*., 2015; Moh'd Al-Tamimi & Obeidat; 2013; Saeed, 2013; Awunyo & Badi, 2012.

Researcher (2021)

3.6 Data Analysis and Presentation

3.6.1 Descriptive Statistics

Descriptive statistics involves the transformation of raw data into a form that would be easily understood (Zikmund, Carr, & Griffin, 2013). The study used descriptive statistics to summarize and describe the population parameters (standard deviation, minimum and maximum variables). Correlation and regression analysis were conducted as part of the inferential statistics. Correlation analysis shows the nature and strength of the relationship. The used the Pearson pairwise correlation. For multiple regression analysis, the extent a variable influences the variability in another, the study applied the fixed effect or the random effect based on the results of the Hausman test. The interpretation of the regression results was made on the basis of the beta coefficients and the significance of the result at 5% significance level. All the analysis was conducted using STAT which is considered the most appropriate to provide several transformations and manipulations of panel data set.

3.7 Model Specification

The hypotheses were tested using hierarchical multiple regression analysis as suggested by Baron and Kenny (1986). The choice of the regression model was informed by the fact that the study sought to determine whether capital adequacy moderated the relationship between credit risk and the financial performance of commercial banks in Kenya. A hierarchical multiple linear regression model was utilized to test the direct effects and the moderating effect.

Model 1. Testing the effect of the control variable of on financial performance.

$$ROA = \beta_0 + \beta_1 FA_{it} + \beta_2 FS_{it} + \beta_3 DIV_{it} + \varepsilon_{it} \ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Model 2. Testing the effect of the independent variables on financial performance.

$$ROA = \beta_0 + \beta_1 FA_{it} + \beta_2 FS_{it} + \beta_3 DIV_{it} + \beta_4 NPL_{it} + \beta_5 NCOR_{it} + \beta_6 PPPL_{it} + \varepsilon_{it} \ldots$$

…….(2)

Where;

ROA_{it} = return on assets ratio at bank i in year t

NPL_{it} = non-performing loan rate at bank i in year t

$NCOR_{it}$ = net charge-off rate at bank i in year t

$PPPL_{it}$ = pre-provision profit/ loss rate at Bank i in year t

FA = firm age at bank i in year t

FS = firm size at bank i in year t

DIV = diversification at bank i in year t

β_{0it} = constant

$\beta_{1it} - \beta_{7it}$ = regression coefficients

ε_{it} = the error terms

i = commercial banks

3.7.1 Moderation Regression Equations

Moderator is a variable that affects the direction and strength of the relationship between an independent and dependent variable (Zhao, Lynch Jr, & Chen, 2010). Moderation suggests that a causal relationship between two variables changes as a function of the moderator variable. This indicates that the statistical test of moderation must measure the differential effect of the independent variable on the dependent variable as a function of the moderator. Moderation effect could increase the effect of the independent variable on the dependent variables, enhancing effect. Additionally, a moderator can decrease the effect of the independent variable on the dependent variable

called buffering moderator or reserve the effect of the independent variable on the dependent variable called antagonistic moderator (Agerström *et al.*,1991). For moderation to take place three important conditions must be fulfilled (Hayes, 2013). The amount of variance accounted for with the interaction should be significantly more than the variance accounted for without the interaction. The coefficient for the interaction terms should be different from Zero. The overall models with and without the interaction should be significant. The study analyzed the moderation effect using a hierarchical linear regression model. This regression method allows each variable to be entered at a time. Therefore, in every stage the change in R2 was determined to show the rate at which the variance change can be accounted for, by the independent variables with an additional predictor (Little, 2012). The method was chosen due to its prediction of the independent variable and the moderator variable and also the interaction of the independent and moderator variable improves prediction.

Model 3. Testing the effect of the moderating variable (capital adequacy) on financial performance.

$$ROA = \beta_0 + \beta_1 FA_{it} + \beta_2 FS_{it} + \beta_3 DIV_{it} + \beta_4 NPL_{it} + \beta_5 NCOR_{it} + \beta_6 PPPL_{it} + \beta_6 CAR_{it} + \varepsilon_{it} \quad (3)$$

First Interaction Effect

Model 4. Introducing the first interaction term between non performing loan and capital adequacy.

$$ROA = \beta_0 + \beta_1 FA_{it} + \beta_2 FS_{it} + \beta_3 DIV_{it} + \beta_4 NPL_{it} + \beta_5 NCOR_{it} + \beta_6 PPPL_{it} + \beta_6 CAR_{it} + \beta_7 NPL * CAR + \varepsilon_{it} \quad (4)$$

Second Interaction Effect

Model 5. Introducing the second interaction term between net charge-off rate and capital adequacy

$$ROA = \beta_0 + \beta_1 FA_{it} + \beta_2 FS_{it} + \beta_3 DIV_{it} + \beta_4 NPL_{it} + \beta_5 NCOR_{it} + \beta_6 PPPL_{it} + \beta_6 CAR_{it} + \beta_7 NPL * CAR + \beta_8 NCOR * CAR + \varepsilon_{it} \ldots\ldots (5)$$

Third Interaction Effect

Model 6. Introducing the third interaction term between pre-provision profit/ loss and capital adequacy.

$$ROA = \beta_0 + \beta_1 FA_{it} + \beta_2 FS_{it} + \beta_3 DIV_{it} + \beta_4 NPL_{it} + \beta_5 NCOR_{it} + \beta_6 PPPL_{it} + \beta_6 CAR_{it} + \beta_7 NPL * CAR + \beta_8 NCOR * CAR + \beta_9 PPPL * CAR + \varepsilon_{it} \ldots\ldots (6)$$

Where;

ROA_{it}	= return on assets ratio at bank i in year t
NPL_{it}	= non-performing loan rate at bank i in year t
$NCOR_{it}$	= net charge-off rate at bank i in year t
$PPPL_{it}$	= pre-provision profit/ loss rate at Bank i in year t
CAR_{it}	= capital adequacy ratio at bank i in year t
FA	= firm age at bank i in year t
FS	= firm size at bank i in year t
DIV	= diversification at bank i in year t
β_{0it}	= constant
$\beta_{1it} – \beta_{7it}$	= regression coefficients
ε_{it}	= the error terms
i	= commercial banks
t	= year, time

3.8 Diagnostic Tests

The study performed several diagnostic tests to suitability of the data before running regression models to test the hypotheses.

3.8.1 Panel Unit Root Test

The study tested for stationarity because the study used time series data. Time series data is considered stationary if statistical properties, such as mean, variance, and covariance, remain constant over time and in any sample of data (Salles *et al.,* 2019). Gujrati (2003) argues that time series must be tested for stationarity in all econometric studies. Nonstationary data leads to spurious regression (Pseudo- regression). Unit root test was tested for the variables using Levin-Lin-Chu, (2002) and Breitung (2001). The null hypothesis for the two tests is that the panels are stationary. The problem of unit root is usually cured through first differencing.

3.8.2 Test for Autocorrelation

Autocorrelation, also known as serial correlation, is an econometric problem that arises whenever two successive error terms in a model are correlated. The study adopted the Wooldridge test for autocorrelation (Wooldridge, 2002). The test is considered suitable since it can be used under general conditions and is easier to implement. The null hypothesis of the test states that ‘there is no first-order autocorrelation’ while the alternative hypothesis states that there is autocorrelation.

3.8.3 Test for Heteroscedasticity

Heteroscedasticity is an econometric problem that arises when the error term in the model has no constant variance (Wamono, von Rosen, & Singull, 2021). Econometrics models requires that the error term should have a constant mean and variance. Heteroscedasticity was tested using Breusch-Pagan/Cook-Weisberg test. The null

hypothesis of this test is homoscedasticity. Therefore, the p-value of the chi2 should be less than 0.05 for the variance of the error term to be constant.

3.8.4 Multicollinearity

Multicollinearity refers to the linear relationship among two or more predictor variables. A higher degree of association between variables may lead to serious problems with the reliability of the estimates of the model, and in certain situations, wrong regression results. This study was tested for multicollinearity using the Variance Inflation Factor (VIF). A VIF value that is greater than 10, is an indicator of multicollinearity problem in the data (Alin, 2010). Similarly, multicollinearity was inspected from the results of pairwise correlation; where it is assumed that a correlation coefficient greater than 0.8 is a sign of multicollinearity.

3.8.5 Linearity

The study used hierarchicall regression model. The main assumption of a linear regression model is that the relationship between the dependent variable and the explanatory variables must be linear. This premise was tested through scatter plots. Similarly, the research variables were log-transformed to ensure this assumption is not violated.

3.8.6 Normality test

Regression models assume that the residual is normally distributed for valid hypotheses testing. This assumption was tested using Shapiro-Wilk test for normality. The test's null hypothesis is that the data is normally distribution.

3.8.7 Model misspecification

Ramsey (1969) advanced the "Regression Specification Error Test" (RESET) for the linear regression model as a conventional misspecification test. This test was developed

to detect both omitted variables and incorrect functional forms. In order to determine whether the model specification is erroneous, the testing approach compared the residuals' distribution under the correct model specification against that under the alternative hypothesis. The null hypothesis of no misspecification conjectures exists as an efficient, consistent, and asymptotically normal estimator of the regression parameters. Conversely, the alternative hypothesis of model misspecification, holds that the estimator was biased and inconsistent (Hausman, 1978).

3.9 Panel Data Regression Technique

The fixed effect approach takes the individual effects to be a specific constant term indicating that the term does not vary over time in the regression model. The individual effects that unobserved but correlate with the repressors (Xit) thus fixed-effect model was used to estimate. The unobservable individual effects can be assumed to be uncorrelated with the variables that formulate random models. While the random effect approach specifies individual effects randomly, the disturbances from error term (εit) except that from each group but a single draw that enters regression identically in each period. To decide which type of test employed, Hausman test was conducted whereby the null hypothesis was the preferred model. Hausman test was used to choose between fixed-effects and random effects and the null hypothesis, there was no significant correlation between the individual effects, and the repressors was rejected at 0.1% significance level in this test. This confirms the argument in favor of the fixed effects model against the random-effects model. In sum, the Hausman test results informed the choice of either the fixed effect model or random effect model.

3.10 Ethical Considerations

The major ethical issues that are addressed in research are privacy, confidentiality, anonymity, and researcher's responsibility. This study did not involve any respondents as the data was secondary in nature and available publicly. This implies that the study posed few, if any, ethical issues. However, the researcher ensured that the data was credible by cross checking it from other available source, particularly the banks' financial reports and CBK annual banks' supervisory reports.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND DISCUSSION OF FINDINGS

4.0 Introduction

This chapter presents the research findings. Specifically, the chapter presents the descriptive statistics, the results of the diagnostic tests, correlation analysis results and finally the regression results used to test the hypotheses.

4.1 Descriptive Statistics

Table 4.1 shows the descriptive statistics for all the variables used in the study. The mean ROA was .0091042 (minimum= -.247927 and maximum = .1234769; standard deviation = .041082). This mean low profitability among Kenyan banks and the mean is related to that of 0.007 reported by Shukla, Narayanasamy and Krishnakumar (2020) among Indian banks. The standard deviation of ROA is an indicator of high-performance variability across banking institutions in Kenya. The mean NPL was 0.140 (minimum= 0.000 and maximum = 0.686; standard deviation = 0.121). This implies that NPLs account for approximately 14% of total loans and advances. Further, net charge off rate had a mean of .057 (minimum= 0.00 and maximum = 0.440; standard deviation = 0.068). The standard deviation is an indicator of large variation in net charge off rate across the Kenyan banks. While pre-provision profit/loss had a mean of 0.035 (minimum= -0.512 and maximum = 0.194; standard deviation = 0.074). The standard deviation of 0.074 show large variation in pre-provision profit/loss across the sample of banks used in the study. The mean capital adequacy was 0.1939 (minimum= -0. 235 and maximum = 0.520; standard deviation = 0.103). The mean firm age was 36.395 (minimum=1 and maximum = 125; standard deviation = 28.765). The mean firm size was 10.544 (minimum=8.288 and maximum = 17.992; standard deviation = 1.015). Besides, the average diversification was at 0.430

(minimum= 0.103 and maximum = 0.4982; standard deviation 0.099). The average diversification is a pointer of the increased importance of non-interest income among Kenyan banks.

Table 4.1 Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	385	.0091042	.041082	-.247927	.1234769
FA	385	36.39535	28.76493	1	125
FS	385	10.54416	1.015988	8.288069	12.37367
DIV	385	.4300527	.0988139	.1029084	.4982
NPL	385	.1402368	.1217051	0	.6857152
NCOR	385	.0570238	.0682473	0	.4396332
PPPL	385	.0345589	.0743803	-.5116119	.1937493
CAR	385	.1938982	.1028608	-.2354	.52

Source: Field data (2023)

4.2 Regression Assumption and Panel Data Diagnostic Tests

Prior to selecting which panel regression models to use, and to eliminate spurious regression problems, some robustness tests, such as a normality tests, multicollinearity, unit root tests, tests for heteroscedasticity, autocorrelation tests, and specification error tests were carried out.

4.2.1 Normality Tests

The null hypothesis of the Shapiro-Wilk test is that the residuals are normally distributed. The results of the Shapiro-Wilk test are shown in Table 4.2. Since the ρ-value (0.0519) is larger than 0.05, the hypothesis of normality cannot be rejected.

Table 4.2: Shapiro Wilk Normality Test

		Shapiro-Wilk W test for normal data			
Variable	Obs	W	V	Z	Prob>z
Res	385	0.97064	1.337	1.261	0.10363

Source: Field data (2023)

4.2.2 Multicollinearity

Multicollinearity means that two or more of the independent variables are highly correlated. The study used the Variance inflation factor (VIF) to test for multicollinearity. Multicollinearity is present if the VIF value is higher than 10 (Gujarati, 2012). The results of the VIF test are shown in Table 4.3. The values range between 5.24 and 1.50; which, are less than 10, implying the research variables do not suffer from multicollinearity.

Table 4.3: Multicollinearity

Variable	VIF	1/VIF
FS	5.24	0.190836
DIV	4.22	0.236851
NPL	2.40	0.416270
NCOR	2.05	0.487113
AGE	1.68	0.594680
PPPL	1.53	0.654000
CAR	1.50	0.666523
Mean VIF	2.66	

Source: Field data (2023)

4.2.3 Unit Root Test

Non-stationary data refers to a data series that does not have a constant mean, variance, and auto-covariance at various lags over time. Testing for stationarity means that the mean and variance of variables are time-invariant. This study used Levin- Lin Chu and Harris-Tzavalis unit-root. The two tests have the following hypotheses;

Null hypothesis (Ho): Panel data contains unit root [non-stationary].

The alternative hypothesis (Ha): Panel data is stationary.

The results presented in Table 4.4, the null hypothesis can be rejected at all conventional significance levels for all the study variables, which means that there is no unit root in the data.

Table 4.4: Results of Unit Root Test

	Levin-Lin-Chu	**Harris-Tzavalis unit-root**
ROA	-8.49	-17.04
Value	0.00	0.00
NPL	-10.07	-9.72
p value	0.00	0.04
NCOR	-15.42	-6.86
p value	0.00	0.00
PPL	-8.20	-7.35
p value	0.00	0.02
CAR	-3.40	-10.28
Pvalue	0.00	0.00
FA	-7.91	-12.88
p value	0.00	0.00
FS	-7.92	-18.08
p value	0.02	0.00
DIV	-9.87	-9.62
p value	0.00	0.05

Source: Field data (2023)

4.2.4 Test for Heteroskedasticity

The Breusch-Pagan/ Cook-Weisberg test was used to test for heteroskedasticity, and the results are presented in Table 4.5. The findings indicate that the Chi2 (1) value is 2.43 *and ρ-value of 0.1194 implying* that the null hypothesis cannot rejected. Thus, the assumption of constant variance was not violated.

Table 4.5: Breusch-Pagan / Cook-Weisberg Test for Heteroscedasticity

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of ROA
chi2(1) = 2.43
Prob > chi2 = 0.1194

Field data (2023)

4.2.5 Autocorrelation Test

The study used the Wooldridge to test for autocorrelation. The test's results presented in Table 4.6 indicate that the null hypothesis cannot be rejected at a 5% significance level. Therefore, there is no autocorrelation in the panel data.

Table 4.6: Wooldridge test for autocorrelation in panel data

Wooldridge test for autocorrelation in panel data
H0: no first order autocorrelation
F(1, 48) = 2.751
Prob > F = 0.1037

Source: Field data (2023)

4.2.6 Specification Error Test

The results of the Ramsey RESET test are presented in table 4.7. From the findings in the table, the p-value of the Ramsey RESET test are more than the threshold value of 0.05; implying that the model has no omitted variables.

Table 4.7: Ramsey RESET (test using powers of the fitted values of ROA)

Ramsey	RESET test using powers of the fitted values of ROA
Ho: model has no omitted variables	
F(3, 478) = 0.72	
Prob > F = 0.5417	

Source: Field data (2023)

4.3 Correlation Analysis

The purpose of correlation analysis is to determine the nature and magnitude of the association between research variables. The pairwise correlation coefficients are shown in Table 4.8. The table show that firm age positively correlated with ROA (*r= 0.4027; ρ< 0.05*). The table further shows that firm size and ROA are positively correlated (*r*

=0.2674; ρ< 0.05). Also, the correlation results indicated that diversification and ROA are positively correlated (*r = 0.2385; ρ< 0.05*). The association between nonperforming loans and ROA is negative and strong (*r = -0.6532; ρ< 0.05*). Net charge-off rate and ROA are positively correlated (*r = 0.2909; ρ< 0.05*). The correlation matrix further indicates a positive correlation between ROA and pre-provision profit or loss (*r = 0.6062; ρ< 0.05*). Also, the correlation between capital adequacy and ROA is positive (*r = 0.4579; ρ< 0.05*).

Table 4.8: Results of Pairwise Correlation Analysis

	ROA	FA	FS	DIV	NPL2	NCOR	PPPL	CAR
ROA	1.0000							
FA	0.4027*	1.0000						
FS	0.2674*	0.3329*	1.0000					
DIV	0.2385*	0.1613*	0.3561 *	1.0000				
NPL	-0.6532*	-0.2056*	-0.2651*	-0.0383	1.0000			
NCOR	0.2909*	0.0716	0.0310	-0.0163	-0.6319*	1.0000		
PPPL	0.6062*	0.3972*	0.4259*	0.0413	-0.3986*	0.2716*	1.0000	
CAR	0.4579*	0.1310*	-01053*	-0.0375	-0.3758*	0.1871*	0.3701*	1.0000

p<0.5

Source: Field data (2023)

4.3.1 Testing the Effect of the Control Variables

Before investigating the effect of the predictor variables on the outcome variable, the study examined the impact of the control variables; firm age, firm size and diversification on ROA. The regression results supported the use of random effect (chi2 (3) = 1.57; prob>chi2= 0.6672).

Table 4.9 shows that firm age had a significantly positive effect on ROA (*β= 0.072, ρ<0.05*). The findings are consistent with those of Richardson and Lanis (2007) however, they contradict Shukla *et al.,* (2020) reported a negative relationship. The

findings suggest that older banks are more profitable compared to smaller ones. Similarly, firm size had a significantly positive effect on ROA ($\beta= 0.041, \rho<0.05$), the results are supported by Shukla *et al*., (2020), AL-Omar and AL-Mutairi (2008) and Asma'Rashidah Idris *et al*., (2011). The positive relationship between bank size and profitability measures may imply that banks are able to derive the benefits of economies of scale due to their high operating costs.

The results conflict with Khemraj and Pasha (2009) who found a positive but insignificant effect among Guyana commercial banks. The effect of diversification on ROA was positive and significant ($\beta= 0.0208, \rho<0.05$) It is consistent with the earlier findings of Anbar and Alper (2011), Van Ommeren (2011), Chiorazzo et al. (2008), Demirguc-Kunt and Huizinga (2010), and Elsas, Hackethal and Holzhäuser (2010) but disagree with Githaiga (2021), where the author found that non-interest activities reduce banks' profitability in the East African region. The findings of this study suggest that non-interest income activities, in the forms of fees and commissions, increase their overall profitability.

Table 4.9: Regression results for control variables and the outcome variable

Random-effects GLS regression	Number of obs	= 385				
Group variable: ID	Number of groups	= 35				
R-sq: within = 0.1013	Obs per group: min	= 11				
between = 0.4448	avg	= 11.0				
overall = 0.2705	Max	= 11				
	Wald chi2(3)	= 65.03				
corr(u_i, X) = 0 (assumed)	Prob > chi2	= 0.0000				
ROA	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
FA	.0720884	.0170559	4.23	0.000	.0386594	.1055173
FS	.0204551	.0047175	4.34	0.000	.0112089	.0297013
DIV	.0208912	.005399	3.87	0.000	.0103094	.0314731
_cons	-.3212655	.0469119	-6.85	0.000	-.4132112	-.2293198
sigma_u	.01931367					
sigma_e	.02737903					
Rho	.33227172	(fraction of variance due to u_i)				

Source: Field data (2023)

4.3.2 Testing the Direct Effect

The study had four direct hypotheses that were tested by regressing the outcome variable (ROA) against all the explanatory variables non-performing loans, pre-provision profit/loss) as well as the controls. The study performed both the Fixed Effect (FE) and the Random Effect (RE) regression and the results of the Hausman test (Chi2 (8) =65.32; p=0.000) shown in Appendix III supported the use of FE to test the direct hypotheses. Based on table 4.9, the control variables and the dimensions of credit risk explain 55.17 % variation in financial performance of commercial banks in Kenya. The model is also statistically significant with F(6,344) = 50.44 and Prob>F = 0.000. The regression results for the FE are shown. The fixed-effect panel data analysis model is presented in table 4.10.

Table 4.10: Regression of Results of financial performance on credit risk

Fixed-effects (within) regression	Number of obs	= 385
Group variable: ID	Number of groups	= 35
R-sq: within = 0.4680	Obs per group: min	= 11
between = 0.6889	Avg	= 11.0
overall = 0.5517	Max	= 11
	F(6,344)	= 50.44
corr(u_i, Xb) = -0.5834	Prob > F	= 0.0000

ROA	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
FA	.0745194	.0163662	4.55	0.000	.0423289	.1067098
FS	.0248997	.0054364	4.58	0.000	.014207	.0355924
DIV	.0262542	.0060053	4.37	0.000	.0144425	.0380659
NPL	-.1802222	.0163341	-11.03	0.000	-.2123496	-.1480949
NCOR	.0740495	.0292424	2.53	0.012	.0165331	.1315659
PPPL	.1411067	.0238438	5.92	0.000	.0942088	.1880047
_cons	-.3579182	.0558344	-6.41	0.000	-.4677381	-.2480984
sigma_u	.02038741					
sigma_e	.02115989					
Rho	.48141376	(fraction of variance due to u_i)				

F test that all u_i=0: F(34, 344) = 5.27 Prob > F = 0.0000

Source: Field data (2023)

4.3.3 Testing direct hypotheses

The study had four null hypotheses that sought to determine the effect of credit risk on financial performance of commercial banks in Kenya.

The first null hypothesis (H_{01}) stated that: *non-performing loan has no significant effect on financial performance of banks*.

The findings in Table 4.11 confirm that the effect of non-performing loans on ROA was significantly negative ($\beta 1 = -0.1802$ *and* ρ*-value*<0.05); therefore, null hypothesis (H_{01}) was rejected. Similar findings were reported in previous studies (Alkurdi & Mardini, 2020; Minnick & Noga, 2010). Bandara *et al.,* (2021) also reported a negative association between NPL and ROA among commercial banks in Sri-Lanka. However, found a positive and significant effect of NPL on profitability proxied by ROA in Ghana. They attributed the positive and significant relationship between NPL and

profitability to the prohibitive lending rates that the banks charge.

The second null hypothesis (H_{02}) stated that; *net charge off has no significant effect on financial performance*. .

The findings in Table 4.11 indicate that NCOR had a positive and significant impact on ROA ($\beta 2= 0.0704, \rho <0.05$); hence H_{02} was rejected. The results suggest that there an increase in NCOR may improve banks' profitability. This finding is inconsistent with the findings of Saeed and Zahid (2016), found a positive relationship between NCOR and profitability. Reda, Rjoub and Alrub (2016) found a negative and insignificant effect among banks operating in Lebanon.

The third hypothesis (H_{03}) stated that; *pre-provision profit/loss has no significant effect on financial performance of commercial banks in Kenya*.

The regression results in Table 4.11 illustrate that pre-provision profit/loss is positively and significantly related with financial performance of commercial banks in Kenya ($\beta 3 = 0.141, \rho<0.05$); thus, H_{03} is rejected. Kutum (2017) studied the association between pre-provision profit/loss rate and financial performance of Palestinian commercial banks also reported a positive, but statistically insignificant association. Boahene, Dasah, and Agyei (2012), looked at the link between credit risk and bank profitability from 2005 to 2009, found similar results in Ghana. The authors concluded that banks in Ghana are highly profitable despite having a significant credit risk. Le (2017) assessed the determinants of commercial bank profitability in Vietnam. Between 2005 and 2015 reported a positive but insignificant relationship between loan loss provision and financial performance (measured by ROA). Gizaw, Kebede and Selvaraj (2015) studied Ethiopian banks over the period between 2003 and 2012 reported a positive association between loan loss provision and ROA. On the contrary, Hamadi and Awdeh (2012) Bhuiya, Miah and Chowdhury (2023) found that pre-provision for loan losses

to gross loans negatively affects bank profitability.

There are three reasons why there is a positive relationship between commercial banks' financial performance and pre-provision profit or loss. The first is that managers may view lending as risky, but it is profitable. The second is that the manager can employ the pre-provision profits/losses as an earnings management approach (Dong, Liu, & Hu, 2012). Third, managers may be aware of the possible hazards associated with lending and taking appropriate credit risk management procedures to reduce such risks.

4.4 The Effect of Capital Adequacy on Financial Performance

The study also tested for the effect of capital adequacy on financial performance. The findings show that the capital adequacy ratio has a significantly positive effect on financial performance of commercial banks in Kenya ($\beta = 0.128;\ \rho < 0.05$). Similar results were reported by Agbeja, Adelakun and Olufemi (2015) among Nigerian banks Chandrasegaran (2020) in Sri Lanka. Mendoza and Rivera (2017) that capital adequacy has no significant impact on the profitability of rural banks in the Philippines, using a sample of 567 banking institutions. Bandara *et al.*, (2021) found that CAR positively impacted on banks' profitability in Sri Lanka. Also, El-Ansary and Hafes (2015), Githaiga (2013), and Tuladhar (2017), who also found a positive and significant relationship between CAR and bank profitability. Bhuiya, Miah and Chowdhury (2023) reported a positive but insignificant relationship between bank capitalization and return on equity in Bangladesh over the period 2009 to 2018. However, Madugu Ibrahim and Amoah (2020) found a negative and significant association between CAR and ROA among Ghanaian banks. The significant and positive relationship between capital adequacy and bank profitability shows that banks with greater equity capital are regarded to be more secure and that this advantage might be converted into higher profitability. A bank's profitability will increase with its capital ratio.

Table 4.11 Regression of capital adequacy on financial performance

Fixed-effects (within) regression	Number of obs	= 385				
Group variable: ID	Number of groups	= 35				
R-sq: within = 0.5213	Obs per group: min	= 11				
between = 0.7451	Avg	= 11.0				
overall = 0.6067	Max	= 11				
	F(7,343)	= 53.36				
corr(u_i, Xb) = -0.5976	Prob > F	= 0.0000				
ROA	Coef.	Std. Err.	T	P>t	[95% Conf.	Interval]
FA	.0732376	.0155489	4.71	0.000	.0426544	.1038207
FS	.026192	.0051686	5.07	0.000	.0160257	.0363582
DIV	.0279653	.0057116	4.90	0.000	.0167312	.0391995
NPL	-.1609054	.0158288	-10.17	0.000	-.1920391	-.1297717
NCOR	.0684582	.0277943	2.46	0.014	.0137896	.1231269
PPPL	.0892272	.0241569	3.69	0.000	.0417129	.1367415
CAR	.1272623	.020595	6.18	0.000	.086754	.1677707
_cons	-.3956534	.0533917	-7.41	0.000	-.5006697	-.2906371
sigma_u	.01896808					
sigma_e	.02010136					
Rho	.47101758	(fraction of variance due to u_i)				

F test that all u_i=0: F(34, 343) = 5.53 Prob > F = 0.0000

Source: Field data (2023)

4.4.1 Regression Results for Moderated Effects

In model 4, the dependent variable was regressed against the control variables, the independent variables, the moderator, and the first interaction (non-performing loans and capital adequacy ratio). In model 5, the dependent variable was regressed against the control variables, the independent variables, the moderator, and the first interaction and the second interaction (net charge-off rate and capital adequacy ratio). In model 6 the dependent variable was regressed against the control variables, the independent variables, the moderator and the first interaction, the second interaction and the third interaction. The Hausman test supported the use of the fixed effect regression results. The model specification confirms the explanatory powers of the predictor variables (F(10,340) = 81.95; Prob>F= 0.0000; R-squared = 0.7715).

H_{05a} stated that; *capital adequacy ratio does not moderate the relationship between*

non-performing loans and financial performance of banks in Kenya. Furthermore, the beta coefficients of the interaction term, as shown in model 6 was β= 0.222 p < 0.05, therefore, the null hypothesis was rejected. The modgraph further shows that with high CAR and high NPL, commercial banks likely to reported higher profits.

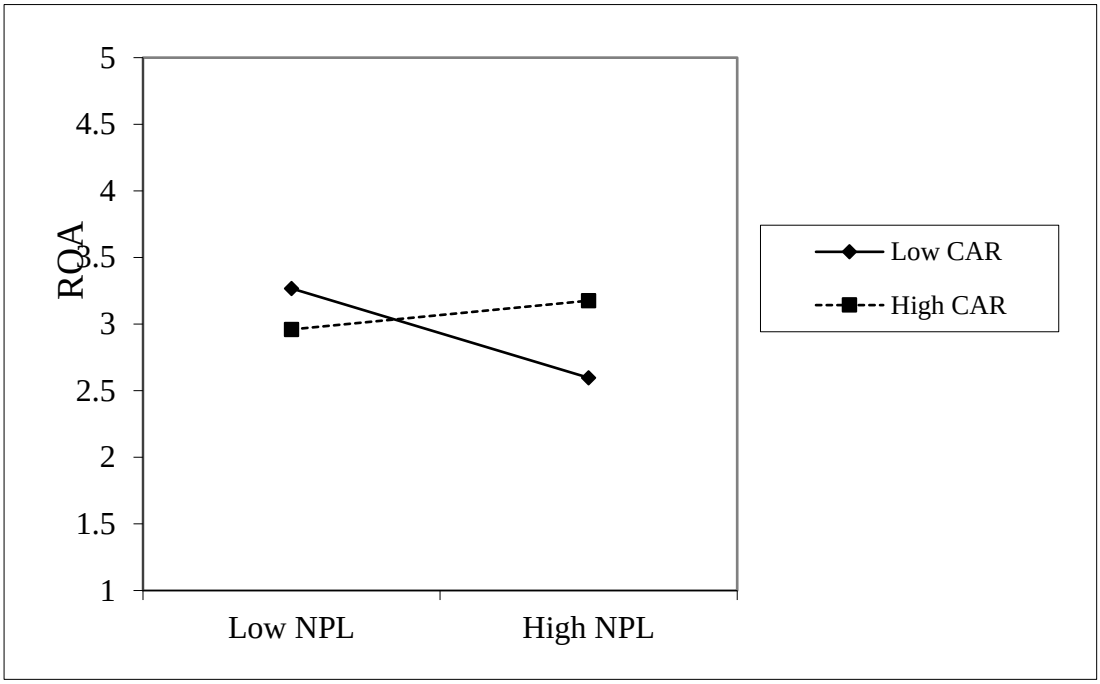


Figure 4.1: Model 4

H_{05b} stated that; *capital adequacy ratio does not moderate the relationship between net charge off rate and financial performance of banks in Kenya*. Furthermore, the beta coefficients of the interaction term, as shown in model 6, was β= 0.357 p-value < 0.05, therefore, the null hypothesis was rejected. The mod graph further shows that banks with high CAR and high net charge are more likely to report higher profits.

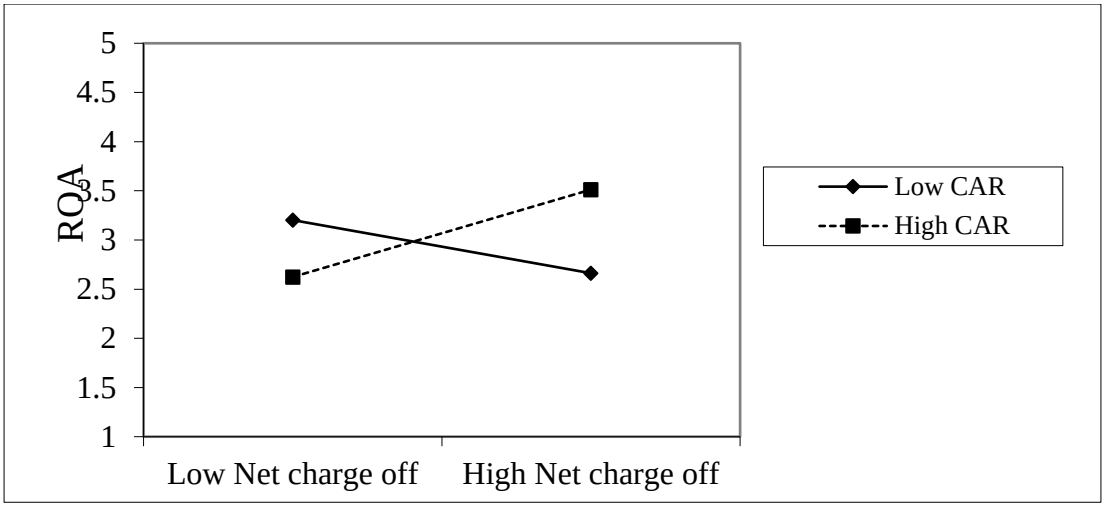


Figure 4.2: Model 5

H_{05c} stated that; *capital adequacy ratio does not moderate the relationship between pre-provision profit/loss and financial performance of banks in Kenya*. Furthermore, the beta coefficients of the interaction term, as shown in model 6, was $\beta = 0.295$ $p < 0.05$, therefore, the null hypothesis was rejected. The modgraph further shows that banks with high CAR and high pre-provision profit/loss charge are more likely to report higher profits.

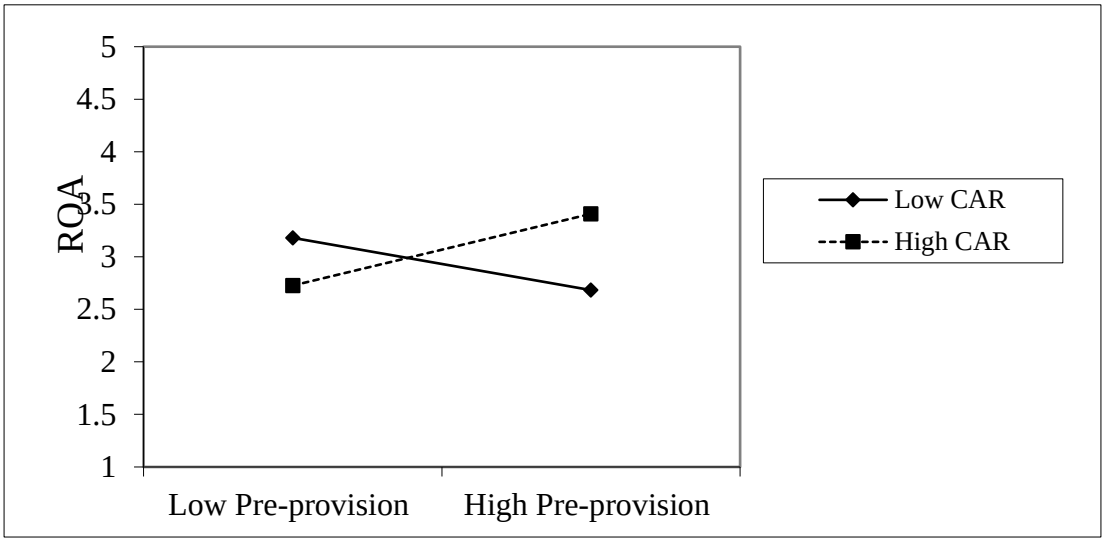


Figure 4.3: Model 6

Fixed-effects (within) regression	Number of obs	=	385
Group variable: ID	Number of groups	=	35
R-sq: within = 0.7068	Obs per group: min	=	11
between = 0.8532	avg	=	11.0
overall = 0.7715	max	=	11
	F(10,340)	=	81.95
corr(u_i, Xb) = -0.3791	Prob > F	=	0.0000

ROA	Coef.	Std. Err.	T	P>t	[95% Conf.	Interval]
FA	.0856967	.0123491	6.94	0.000	.0614064	.109987
FS	.0136322	.0041566	3.28	0.001	.0054563	.0218081
DIV	.0136763	.0046007	2.97	0.003	.004627	.0227257
NPL	-.1136824	.0129639	-8.77	0.000	-.139182	-.0881828
NCOR	.0869637	.0224738	3.87	0.000	.0427586	.1311689
PPPL	.0461696	.0198685	2.32	0.021	.0070889	.0852502
CAR	.0678178	.0169621	4.00	0.000	.0344539	.1011816
CAR*NPL	.2216046	.0583605	3.80	0.000	.1068115	.3363978
CAR*NCOR	.3571866	.1110547	3.22	0.001	.1387458	.5756274
CAR*PPPL	.2950664	.0725187	4.07	0.000	.1524246	.4377082
_cons	-.2670329	.0430514	-6.20	0.000	-.3517136	-.1823522
sigma_u	.01196844					
sigma_e	.01580209					
Rho	.36453423	(fraction of variance due to u_i)				

F test that all u_i=0: F(34, 340) = 4.38 Prob > F = 0.0000

Source: **Field data (2023)**

Table 4.12: Regression Results

	Model 1 Coef. (Std. Err.)	**Model 2 Coef. (Std. Err.)**	**Model 3 Coef. (Std. Err.)**	**Model 4 Coef. (Std. Err.)**	**Model 5 Coef. (Std. Err.)**	**Model 6 Coef. (Std. Err.)**
_cons	0.466(0.092)**	0.457(0.108)**	0.657(0.108)	0.607(0.091)**	0.522(0.110)**	0.515(0.109)**
Firm size (FS)	-0.018 (0.005)**	-0.016 (0.006)**	-0.015(0.005)**	-0.015(0.005)**	-0.012(0.005)**	-0.013(0.005)**
Firm age (FA)	0.041(0.013)**	0.050(0.016)**	0.053(0.015)**	0.037(0.012)**	0.060(0.015)**	0.062(0.015)**
Diversification	0.034(0.016)**	0.025(0.017)**	0.025(0.016)	0.044(0.015	0.031(0.016	0.029(0.016)*
Non performing loans		-0.123(0.032)**	-0.110(0.031)**	-0.074(0.027)**	-0.085(0.030)**	-0.083 (0.030)**
Net charge off		-0.210 (0.057)**	-0.178(0.05)*	-0.079(0.028)**	-0.140(0.054)**	-0.145 (0.054)**
Pre-provision profit/loss		-0.117 (0.028)**	-0.107(0.027)**	-0.076(0.020)**	-0.120(0.027)**	-0.110 (0.027)**
Capital adequacy ratio			-0.059(0.009)**	-0.033(0.009)**	-0.040(0.010)**	-0.037(0.010)
CAR*NPL				-0.199(0.049)**	-0.144(0.051)**	**-0.134(0.051)****
CAR*NCOR					-0.189(0.061)**	**-0.171(0.061)****
CAR*PPPL						**-0.070(0.035)****
R-square	0.115	0.307	.853	.902	.902	.915
R-square change	-	.689	.006	.049	0	.013
F	55.92	23.926 777	12.05	15.78	15.47	62.810
Prob > F	.000	.000	.000	.000	.000	.000
Hausman Test						
chi2	31.06	45.80	57.55	60.01	64.38	66.31
Prob>chi2	0.000	0.000	.000	0.000	0.000	0.000

***significant at 0.05 level; Figures in parenthesis are t –statistics;*

Source: Field data (2023)

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter presents the summary of the findings, the conclusion, recommendations, limitations of the study and areas for further research.

5.1 Summary of Findings

The general objective of the study was to determine whether the capital adequacy ratio moderates the relationship between credit risk and the financial performance of commercial banks in Kenya. The study found that capital adequacy ratio significantly moderates the relationship between credit risk and the financial performance of commercial banks in Kenya.

5.1.1 Effect of non-performing loans on financial performance of commercial banks in Kenya

The first specific objective is to determine the effect of credit risk on the financial performance of commercial banks in Kenya. The results showed a significantly negative relationship between non-performing loans and the financial performance of commercial banks in Kenya ($\beta = -0.176$ $\rho<0.05$). Therefore, high non-performing loans adversely affects financial performance of commercial banks in Kenya

5.1.2 Effect of net charge off rate on financial performance of commercial banks in Kenya

The second objective sought to assess the effect of net charge-off rate on the financial performance of commercial banks in Kenya. The study found that a positive and significant relationship between net charge-off rate and financial performance of commercial banks in Kenya ($\beta =0.079$, $\rho< 0.05$); implying that firms with high level of

net charge-off rate are more likely to report improved financial performance.

5.1.3 Effect of Pre-provision profit/loss on financial performance of commercial banks in Kenya

The third objective sought to examine the effect of pre-provision profit/loss on the financial performance of commercial banks in Kenya. The findings show a positive and significant relationship between pre-provision profit/loss and the financial performance of commercial banks in Kenya ($\beta = 0.138$, $\rho < 0.05$).

5.1.4 Effect of capital adequacy ratio on financial performance of commercial banks in Kenya

The main objective was to establish whether the capital adequacy ratio moderates the relationship between credit risk and the financial performance of commercial banks in Kenya. Therefore, the capital adequacy ratio and the financial performance of commercial banks in Kenya were analyzed and findings revealed that capital adequacy ratio is significantly and positively related to a bank's financial performance ($\beta = 0.127$; $\rho < 0.05$).

5.1.5 The moderating effect of capital adequacy ratio on the relationship credit risk and financial performance of commercial banks in Kenya.

The study tested for moderation through hierarchical multiple regression. The findings showed that capital adequacy ratio significantly moderate the relationship between; non-performing loans ($\beta = 0.222$, $\rho < 0.05$); net charge-off rate ($\beta = 0.357$, $\rho < 0.05$), pre-provision profit/loss ($\beta = -0.073$, $\rho < 0.05$) and the financial performance of commercial banks in Kenya.

5.2 Conclusion

The study sought to determine the moderating effect of the capital adequacy ratio on the relationship between credit risk and on the financial performance of commercial banks in Kenya. To test the relationship, a sample of 35 licensed commercial banks in Kenya and data for the period 2011 to 2021 was used. The findings show that the dimension of credit risk (NPL, net charge-off rate and pre-provision profit/loss) are significant determinants of financial performance of commercial banks in Kenya and that capital adequacy ratio moderates the relationship. The study concludes that bank managers, regulators and other stakeholders should consider credit risks as key drivers of banks profitability.

5.3 Recommendations

5.3.1 Implications

The study's findings suggest that banks should establish and execute a robust credit strategy, which includes setting a maximum credit limit and credit length, as well as maintaining a strong recovery team, in order to effectively manage credit risk. Banks should also monitor the implementation of credit regulations and standards that comply with legal requirements and the overall objectives of the financial institution. Furthermore, the findings suggest that commercial banks ought to develop and execute strategies to decrease their vulnerability to credit risks. The results of this study emphasize the significance of regulatory supervision and evaluation of cautious rules on capital needs, credit risk management principles, and the ongoing performance of banks through permissible alternative business activities. The regulator must establish stress testing frameworks and procedures for banks that include factors such as capital sufficiency, asset quality, and alternative scenarios. These frameworks should also account for the impact of the bank's size, age, and income unpredictability. Bank

boards should formulate and authorize strategic business plans that incorporate the expansion of gross loans while taking into account available capital, lending restrictions, and internal risk monitoring measures for credit, capital sufficiency, and performance.

Additionally, bank management should contemplate the creation and evaluation of bank policies and procedures to ensure the stability of lending, the assessment of creditworthiness, and the effectiveness of debt recovery and collection operations. This should encompass the establishment of credit limits in order to prevent problems related to moral hazard and information asymmetry. In addition, managers must consistently oversee adherence to risk management and compliance principles and standards on credit risk and capital adequacy. Bank managers must consider the significant relation between increased capital needs and credit risk, and how this association impacts the profitability of their institutions. This would involve ensuring that the banks possess sufficient capital to prevent any potential negative impacts of credit risk on bank performance.

5.3.2 Limitations of the study and suggestions for further research

The study's focus was on commercial banks in Kenya. Since banks operating in other jurisdictions may be subject to differing regulatory environments, particularly with regard to capital requirements, the findings cannot be extended to banks operating in such jurisdictions. Therefore, studies in the future might look at banks in various countries. Second, ROA was used to gauge bank performance. Future research can examine other financial performance indicators like ROE and net interest margins. Additionally, future studies can examine whether firm specific factors such as size as well as corporate governance dimensions may moderate the relationship between credit

risk and financial performance of commercial banks. Finally, this study excluded macro-economic factors. Future studies may take into account additional factors including inflation, the exchange rate, and the money supply in the case of Kenyan commercial banks.

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APPENDICES

Appendix I: Data Collection Schedule

Part 1: Financial Performance

a) **Return on Asset Ratio (ROAR)**

Ratios	**'11**	**'12**	**'13**	**'14**	**'15**	**'16**	**'17**	**'18**	**'19**	**'20**	**'21**
Profit or Loss After Tax Total Assets											
Total Assets											
ROAR = Profit/ Loss After Tax/ Total Assets											

Part 2: Credit Risk

a) **Non-Performing Loan Rate (NPLR)**

Ratios	**'11**	**'12**	**'13**	**'14**	**'15**	**'16**	**'17**	**'18**	**'19**	**'20**	**'21**
Total Non-Performing Loans											
Total Loans and Advances											
NPLR = Total Non-Performing Loans / Total Loans and Advances											

Source: Researcher, 2023

b) Net Charge-off Rate (NCOTLAR)

Ratios	**‘11**	**‘12**	**‘13**	**‘14**	**‘15**	**‘16**	**‘17**	**‘18**	**‘19**	**‘20**	**‘21**
Gross loan loss provisions											
Total Loans and Advances											
Bad Debts Recovered											
NCOTLAR = Gross loan loss provisions- Bad debt recovered/ Total Loans and Advances											

Source: Researcher, 2023

c) Pre-Provision Profit/ loss Rate (PPPTLAR/ PPLTLAR)

Ratios	**‘11**	**‘12**	**‘13**	**‘14**	**‘15**	**‘16**	**‘17**	**‘18**	**‘19**	**‘20**	**‘21**
Profit/loss after tax											
Loan loss provision expense											
Total Loans and Advances											
PPPTLAR/ PPLTLAR = Profit / Loss after tax + Loan loss provision expense) / Total											

Ratios	'11	'12	'13	'14	'15	'16	'17	'18	'19	'20	'21
Loans and Advances											

Source: Researcher,2023

Part 3: Capital adequacy

Capital Adequacy Ratio (CAR)

Ratios	'11	'12	'13	'14	'15	'16	'17	'18	'19	'20	'21
Total Shareholder's Equity											
Total Risk Weighted Assets											
CAR = Total Shareholder's Equity/ Total Risk Weighted Assets											

Researcher (2023)

Part 4: Control variable

a) **Firm age (log on number of years)**

Measure	'11	'12	'13	'14	'15	'16	'17	'18	'19	'20	'21
Years											
Natural log of years											

Researcher (2023)

b) **Firm size (log on assets)**

Measure	'11	'12	'13	'14	'15	'16	'17	'18	'19	'20	'21
Total asset											
Log of asset											

Researcher (2023)

c) Diversification (HHI)

Ratios	**‘11**	**‘12**	**‘13**	**‘14**	**‘15**	**‘16**	**‘17**	**‘18**	**‘19**	**‘20**	**‘21**
Total income											
Interest income											
Non interest income											
DIV =(1-HHI)											

Researcher (2023)

Appendix II: Target Population

No.	Commercial Banks
(1)	KCB Bank Kenya Limited
(2)	Equity Bank Kenya Limited
(3)	NCBA Bank Kenya PLC
(4)	The Co-operative Bank of Kenya Limited
(5)	Absa Bank Kenya Plc
(6)	Standard Chartered Bank (K) Limited
(7)	Diamond Trust Bank Kenya Limited
(8)	I&M Bank Limited
(9)	Stanbic Bank Kenya Limited
(10)	Bank of Baroda (K) Limited
(11)	Prime Bank Limited
(12)	National Bank of Kenya Limited
(13)	Citibank N.A. Kenya
(14)	Family Bank Limited
(15)	Bank of India
(16)	Ecobank Kenya Limited
(17)	IBM Bank Kenya Limited
(18)	HFC Limited
(19)	Bank of Africa Limited
(20)	Victoria Commercial Bank Limited
(21)	Guaranty Trust Bank Limited
(22)	Gulf African Bank Limited

No.	Commercial Banks
(23)	African Banking Corporation Limited
(24)	Sidian Bank Limited
(25)	Habib Bank A.G Zurich
(26)	Credit Bank Limited
(27)	Guardian Bank Limited
(28)	First Community Bank Limited
(29)	Development Bank of Kenya Limited
(30)	UBA Kenya Bank Limited
(31)	M Oriental Commercial Bank
(32)	Consolidated Bank of Kenya
(33)	Paramount Bank Limited
(34)	Transnational Bank Limited
(35)	DIB Bank Kenya Limited
(36)	Middle East Bank (K) Limited
(37)	Mayfair Bank Limited
(38)	Jamii Bora Bank Limited
(39)	Spire Bank Limited
(40)	Charterhouse Bank Limited *
(41)	Imperial Bank Limited **
(42)	Chase Bank (K) Limited **
	*** Bank under statutory management**
	*** *Banks in Receivership**

Researcher (2023)

Appendix III: Regression Output

Random-effects GLS regression	Number of obs	= 385
Group variable: ID	Number of groups	= 35
R-sq: within = 0.1013	Obs per group: min	= 11
between = 0.4448	avg	= 11.0
overall = 0.2705	Max	= 11
	Wald chi2(3)	= 65.03
corr(u_i, X) = 0 (assumed)	Prob > chi2	= 0.0000

ROA	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
FA	.0720884	.0170559	4.23	0.000	.0386594	.1055173
FS	.0204551	.0047175	4.34	0.000	.0112089	.0297013
DIV	.0208912	.005399	3.87	0.000	.0103094	.0314731
_cons	-.3212655	.0469119	-6.85	0.000	-.4132112	-.2293198
sigma_u	.01931367					
sigma_e	.02737903					
Rho	.33227172	(fraction of variance due to u_i)				

Source: Field data (2023)

Fixed-effects (within) regression	Number of obs	= 385
Group variable: ID	Number of groups	= 35
R-sq: within = 0.1016	Obs per group: min	= 11
between = 0.4413	avg	= 11.0
overall = 0.2687	max	= 11
	F(3,347)	= 13.08
corr(u_i, Xb) = -0.1229	Prob > F	= 0.0000

ROA	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
FA	.0707805	.0207703	3.41	0.001	.0299289	.1116321
FS	.0232878	.006841	3.40	0.001	.0098328	.0367429
DIV	.0234655	.0075467	3.11	0.002	.0086226	.0383085
_cons	-.350317	.0688157	-5.09	0.000	-.4856654	-.2149685
sigma_u	.02073617					
sigma_e	.02737903					
Rho	.36452069	(fraction of variance due to u_i)				

F test that all u_i=0: F(34, 347) = 6.14 Prob > F = 0.0000

Source: Field data (2023)

	---- Coefficients ----			
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	fe	re	Difference	S.E.
FA	.0707805	.0720884	-.0013079	.0118534
FS	.0232878	.0204551	.0028327	.0049542
DIV	.0234655	.0208912	.0025743	.0052728

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg
Test: Ho: difference in coefficients not systematic
chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 1.57
Prob>chi2 = 0.6672

Source: Field data (2023)

Fixed-effects (within) regression	Number of obs	= 385
Group variable: ID	Number of groups	= 35
R-sq: within = 0.4680	Obs per group: min	= 11
between = 0.6889	Avg	= 11.0
overall = 0.5517	Max	= 11
	F(6,344)	= 50.44
corr(u_i, Xb) = -0.5834	Prob > F	= 0.0000

ROA	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
FA	.0745194	.0163662	4.55	0.000	.0423289	.1067098
FS	.0248997	.0054364	4.58	0.000	.014207	.0355924
DIV	.0262542	.0060053	4.37	0.000	.0144425	.0380659
NPL	-.1802222	.0163341	-11.03	0.000	-.2123496	-.1480949
NCOR	.0740495	.0292424	2.53	0.012	.0165331	.1315659
PPPL	.1411067	.0238438	5.92	0.000	.0942088	.1880047
_cons	-.3579182	.0558344	-6.41	0.000	-.4677381	-.2480984
sigma_u	.02038741					
sigma_e	.02115989					
Rho	.48141376	(fraction of variance due to u_i)				

F test that all u_i=0: F(34, 344) = 5.27 Prob > F = 0.0000

Source: Field data (2023)

Random-effects GLS regression	Number of obs	= 385
Group variable: ID	Number of groups	= 35
R-sq: within = 0.4567	Obs per group: min	= 11
between = 0.7280	Avg	= 11.0
overall = 0.5819	Max	= 11
	Wald chi2(6)	= 373.07
corr(u_i, X) = 0 (assumed)	Prob > chi2	= 0.0000

ROA	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
FA	.0604474	.0129073	4.68	0.000	.0351496	.0857452
FS	.012366	.0034805	3.55	0.000	.0055444	.0191876
DIV	.012959	.0040258	3.22	0.001	.0050687	.0208494
NPL	-.1755067	.0157384	-11.15	0.000	-.2063534	-.1446601
NCOR	.079626	.0279494	2.85	0.004	.0248462	.1344057
PPPL	.1382166	.0228745	6.04	0.000	.0933834	.1830499
_cons	-.2002087	.0353601	-5.66	0.000	-.2695133	-.1309041
sigma_u	.01216673					
sigma_e	.02115989					
Rho	.24846728	(fraction of variance due to u_i)				

Source: Field data (2023)

	---- Coefficients ----			
	(b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
FA	.0745194	.0604474	.0140719	.0100625
FS	.0248997	.012366	.0125337	.0041762
DIV	.0262542	.012959	.0132951	.0044561
NPL	-.1802222	-.1755067	-.0047155	.0043712
NCOR	.0740495	.079626	-.0055764	.0085995
PPPL	.1411067	.1382166	.0028901	.0067292

= consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg
Test: Ho: difference in coefficients not systematic
chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 16.42
Prob>chi2 = 0.0117
(V_b-V_B is not positive definite)

Source: Field data (2023)

Fixed-effects (within) regression	Number of obs	= 385
Group variable: ID	Number of groups	= 35
R-sq: within = 0.5213	Obs per group: min	= 11
between = 0.7451	avg	= 11.0
overall = 0.6067	max	= 11
	F(7,343)	= 53.36
corr(u_i, Xb) = -0.5976	Prob > F	= 0.0000

ROA	Coef.	Std. Err.	T	P>t	[95% Conf.	Interval]
FA	.0732376	.0155489	4.71	0.000	.0426544	.1038207
FS	.026192	.0051686	5.07	0.000	.0160257	.0363582
DIV	.0279653	.0057116	4.90	0.000	.0167312	.0391995
NPL	-.1609054	.0158288	-10.17	0.000	-.1920391	-.1297717
NCOR	.0684582	.0277943	2.46	0.014	.0137896	.1231269
PPPL	.0892272	.0241569	3.69	0.000	.0417129	.1367415
CAR	.1272623	.020595	6.18	0.000	.086754	.1677707
_cons	-.3956534	.0533917	-7.41	0.000	-.5006697	-.2906371
sigma_u	.01896808					
sigma_e	.02010136					
Rho	.47101758	(fraction of variance due to u_i)				

F test that all u_i=0: F(34, 343) = 5.53 Prob > F = 0.0000

Source: Field data (2023)

Random-effects GLS regression	Number of obs	=	385
Group variable: ID	Number of groups	=	35
R-sq: within = 0.5155	Obs per group: min	=	11
between = 0.7569	avg	=	11.0
overall = 0.6195	max	=	11
	Wald chi2(7)	=	445.73
corr(u_i, X) = 0 (assumed)	Prob > chi2	=	0.0000

ROA	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
FA	.0529628	.012553	4.22	0.000	.0283594	.0775662
FS	.0181415	.003502	5.18	0.000	.0112777	.0250053
DIV	.0194839	.0040302	4.83	0.000	.0115849	.0273828
NPL	-.1543956	.0153545	-10.06	0.000	-.1844899	-.1243012
NCOR	.0741564	.0266252	2.79	0.005	.0219721	.1263408
PPPL	.0908754	.0230527	3.94	0.000	.0456929	.1360578
CAR	.1134582	.0179032	6.34	0.000	.0783686	.1485478
_cons	-.2758987	.0362277	-7.62	0.000	-.3469037	-.2048936
sigma_u	.01239463					
sigma_e	.02010136					
Rho	.27546931	(fraction of variance due to u_i)				

Source: Field data (2023)

	---- Coefficients ----			
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	fe	re	Difference	S.E.
FA	.0732376	.0529628	.0202748	.0091755
FS	.026192	.0181415	.0080505	.0038014
DIV	.0279653	.0194839	.0084814	.0040472
NPL	-.1609054	-.1543956	-.0065098	.0038455
NCOR	.0684582	.0741564	-.0056982	.0079763
PPPL	.0892272	.0908754	-.0016482	.00722
CAR	.1272623	.1134582	.0138041	.0101798

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg
Test: Ho: difference in coefficients not systematic
chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 21.17
Prob>chi2 = 0.0035
(V_b-V_B is not positive definite)

Source: Field data (2023)

Fixed-effects (within) regression	Number of obs	= 385
Group variable: ID	Number of groups	= 35
R-sq: within = 0.6458	Obs per group: min	= 11
between = 0.8535	avg	= 11.0
overall = 0.7393	max	= 11
	F(8,342)	= 77.93
corr(u_i, Xb) = -0.4307	Prob > F	= 0.0000

ROA	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
FA	.0710652	.0133968	5.30	0.000	.0447148	.0974156
FS	.0167039	.0045361	3.68	0.000	.0077817	.0256261
DIV	.0170704	.0050199	3.40	0.001	.0071966	.0269441
NPL	-.1196558	.0141461	-8.46	0.000	-.1474802	-.0918314
NCR	.0976337	.0240921	4.05	0.000	.0502463	.1450211
PPPL	.0657455	.020921	3.14	0.002	.0245954	.1068956
CAR	.0938558	.0180023	5.21	0.000	.0584466	.129265
CAR*NPL	.5220111	.0476222	10.96	0.000	.4283419	.6156804
_cons	-.2843484	.0471042	-6.04	0.000	-.3769988	-.1916981
sigma_u	.01237345					
sigma_e	.01731724					
Rho	.33798219	(fraction of variance due to u_i)				

F test that all u_i=0: F(34, 342) = 3.93 Prob > F = 0.0000

Source: Field data (2023)

Random-effects GLS regression	Number of obs	= 385
Group variable: ID	Number of groups	= 35
R-sq: within = 0.6427	Obs per group: min	= 11
between = 0.8640	avg	= 11.0
overall = 0.7478	max	= 11
	Wald chi2(8)	= 817.04
corr(u_i, X) = 0 (assumed)	Prob > chi2	= 0.0000

ROA	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
FA	.0585077	.0101081	5.79	0.000	.0386963	.0783191
FS	.0127641	.0027797	4.59	0.000	.007316	.0182122
DIV	.013093	.0032405	4.04	0.000	.0067416	.0194443
NPL	-.1106566	.0133555	-8.29	0.000	-.136833	-.0844802
NCOR	.0899708	.0224046	4.02	0.000	.0460586	.133883
PPPL	.0656197	.0193936	3.38	0.001	.027609	.1036305
CAR	.0781787	.0148538	5.26	0.000	.0490658	.1072916
CAR*NPL	.543112	.0430603	12.61	0.000	.4587153	.6275087
_cons	-.2202609	.0287522	-7.66	0.000	-.2766142	-.1639076
sigma_u	.00870072					
sigma_e	.01731724					
Rho	.20155674	(fraction of variance due to u_i)				

Source: Field data (2023)

	---- Coefficients ----			
	(b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
FA	.0710652	.0585077	.0125575	.0087921
FS	.0167039	.0127641	.0039398	.0035846
DIV	.0170704	.013093	.0039774	.0038338
NPL	-.1196558	-.1106566	-.0089992	.0046629
NCOR	.0976337	.0899708	.0076629	.008858
PPPL	.0657455	.0656197	.0001258	.0078472
CAR	.0938558	.0781787	.015677	.0101709
CAR*NPL	.5220111	.543112	-.0211009	.0203392

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg
Test: Ho: difference in coefficients not systematic
chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 17.38
Prob>chi2 = 0.0263

Source: Field data (2023)

Fixed-effects (within) regression	Number of obs	= 385
Group variable: ID	Number of groups	= 35
R-sq: within = 0.6925	Obs per group: min	= 11
between = 0.8573	avg	= 11.0
overall = 0.7672	max	= 11
	F(9,341)	= 85.32
corr(u_i, Xb) = -0.3663	Prob > F	= 0.0000

ROA	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
FA	.0829105	.0126082	6.58	0.000	.0581109	.1077101
FS	.0139828	.0042494	3.29	0.001	.0056244	.0223412
DIV	.0139598	.0047039	2.97	0.003	.0047075	.0232121
NPL	-.1185162	.0132005	-8.98	0.000	-.1444809	-.0925515
NCOR	.105448	.0225062	4.69	0.000	.0611795	.1497166
PPPL	.068517	.0195249	3.51	0.001	.0301126	.1069215
CAR	.0636701	.0173133	3.68	0.000	.0296158	.0977244
CAR*NPL	.2365662	.0595582	3.97	0.000	.1194184	.353714
CAR*NCOR	.6389764	.0887728	7.20	0.000	.4643653	.8135876
_cons	-.2664951	.0440222	-6.05	0.000	-.3530844	-.1799058
sigma_u	.01168523					
sigma_e	.01615849					
Rho	.34338628	(fraction of variance due to u_i)				

F test that all u_i=0: F(34, 341) = 3.99 Prob > F = 0.0000

Source: Field data (2023)

	---- Coefficients ----			
	(b) fe	(B) Re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
FA	.0829105	.0662158	.0166947	.0085021
FS	.0139828	.0107447	.0032381	.0034116
DIV	.0139598	.0108242	.0031356	.003648
NPL	-.1185162	-.1089949	-.0095213	.0043532
NCOR	.105448	.0969042	.0085439	.0083094
PPPL	.068517	.0640732	.0044439	.0074541
CAR	.0636701	.0588623	.0048078	.0103365
CAR*NPL	.2365662	.2552653	-.0186991	.0214494
CAR*NCOR	.6389764	.6557935	-.016817	.0143539

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg
Test: Ho: difference in coefficients not systematic
chi2(9) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 23.68
Prob>chi2 = 0.0048
(V_b-V_B is not positive definite)

Source: Field data (2023)

Random-effects GLS regression	Number of obs	=	385
Group variable: ID	Number of groups	=	35
R-sq: within = 0.6885	Obs per group: min	=	11
between = 0.8760	avg	=	11.0
overall = 0.7796	max	=	11
	Wald chi2(9)	=	1013.08
corr(u_i, X) = 0 (assumed)	Prob > chi2	=	0.0000

ROA	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
FA	.0662158	.0093102	7.11	0.000	.0479681	.0844636
FS	.0107447	.0025335	4.24	0.000	.0057791	.0157104
DIV	.0108242	.0029696	3.64	0.000	.0050039	.0166446
NPL	-.1089949	.0124621	-8.75	0.000	-.1334201	-.0845696
NCR	.0969042	.0209161	4.63	0.000	.0559093	.137899
PPPL	.0640732	.018046	3.55	0.000	.0287036	.0994428
CAR	.0588623	.0138891	4.24	0.000	.0316402	.0860844
CAR*NPL	.2552653	.0555617	4.59	0.000	.1463663	.3641644
CAR*NCOR	.6557935	.0876046	7.49	0.000	.4840916	.8274954
_cons	-.2060251	.0261448	-7.88	0.000	-.257268	-.1547822
sigma_u	.00742385					
sigma_e	.01615849					
rho	.17429406 (fraction of variance due to u_i)					

Source: Field data (2023)

Fixed-effects (within) regression	Number of obs	= 385
Group variable: ID	Number of groups	= 35
R-sq: within = 0.7068	Obs per group: min	= 11
between = 0.8532	avg	= 11.0
overall = 0.7715	max	= 11
	F(10,340)	= 81.95
corr(u_i, Xb) = -0.3791	Prob > F	= 0.0000

ROA	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
FA	.0856967	.0123491	6.94	0.000	.0614064	.109987
FS	.0136322	.0041566	3.28	0.001	.0054563	.0218081
DIV	.0136763	.0046007	2.97	0.003	.004627	.0227257
NPL	-.1136824	.0129639	-8.77	0.000	-.139182	-.0881828
NCOR	.0869637	.0224738	3.87	0.000	.0427586	.1311689
PPPL	.0461696	.0198685	2.32	0.021	.0070889	.0852502
CAR	.0678178	.0169621	4.00	0.000	.0344539	.1011816
CAR*NPL	.2216046	.0583605	3.80	0.000	.1068115	.3363978
CAR*NCOR	.3571866	.1110547	3.22	0.001	.1387458	.5756274
CAR*PPPL	.2950664	.0725187	4.07	0.000	.1524246	.4377082
_cons	-.2670329	.0430514	-6.20	0.000	-.3517136	-.1823522
sigma_u	.01196844					
sigma_e	.01580209					
Rho	.36453423	(fraction of variance due to u_i)				

F test that all u_i=0: F(34, 340) = 4.38 Prob > F = 0.0000

Source: Field data (2023)

Random-effects GLS regression	Number of obs	=	385
Group variable: ID	Number of groups	=	35
R-sq: within = 0.7028	Obs per group: min	=	11
between = 0.8702	avg	=	11.0
overall = 0.7830	Max	=	11
	Wald chi2(10)	=	1052.38
corr(u_i, X) = 0 (assumed)	Prob > chi2	=	0.0000

ROA	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
FA	.068344	.0092351	7.40	0.000	.0502435	.0864444
FS	.011151	.002517	4.43	0.000	.0062178	.0160842
DIV	.0113415	.0029462	3.85	0.000	.0055672	.0171159
NPL	-.1050834	.0123242	-8.53	0.000	-.1292385	-.0809283
NCOR	.0801603	.0211486	3.79	0.000	.0387098	.1216109
PPPL	.0444032	.0186116	2.39	0.017	.0079252	.0808811
CAR	.0575359	.0137373	4.19	0.000	.0306112	.0844605
CAR*NPL	.2394131	.0548952	4.36	0.000	.1318205	.3470057
CAR*NCOR	.4171722	.1085542	3.84	0.000	.2044099	.6299345
CAR*PPPL	.2548049	.0707158	3.60	0.000	.1162044	.3934054
_cons	-.2128422	.0259991	-8.19	0.000	-.2637996	-.1618848
sigma_u	.00744743					
sigma_e	.01580209					
Rho	.18174844	(fraction of variance due to u_i)				

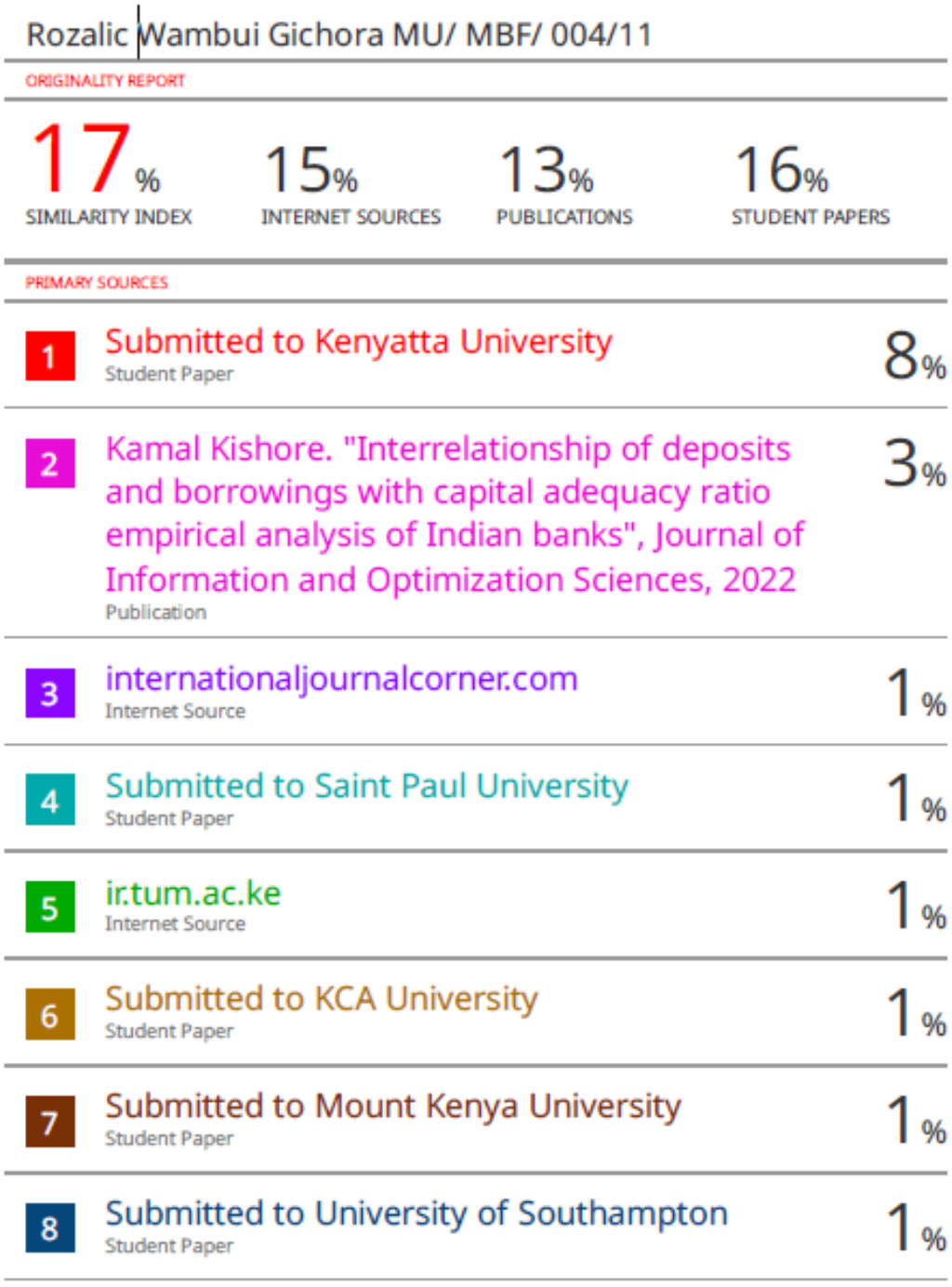
Source: Field data (2023)

	---- Coefficients ----			
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	fe	re	Difference	S.E.
FA	.0856967	.068344	.0173527	.0081984
FS	.0136322	.011151	.0024812	.0033079
DIV	.0136763	.0113415	.0023348	.0035336
NPL	-.1136824	-.1050834	-.008599	.004022
NCOR	.0869637	.0801603	.0068034	.0076031
PPPL	.0461696	.0444032	.0017664	.0069547
CAR	.0678178	.0575359	.0102819	.0099498
CAR*NPL	.2216046	.2394131	-.0178085	.0198109
CAR*NCOR	.3571866	.4171722	-.0599856	.0234338
CAR*PPPL	.2950664	.2548049	.0402615	.0160696

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg
Test: Ho: difference in coefficients not systematic
chi2(10) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 21.89
Prob>chi2 = 0.0157
(V_b-V_B is not positive definite)

Source: Field data (2023)

Appendix IV: Plagiarism Similarity Index



Rozalic Wambui Gichora MU/ MBF/ 004/11

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