EFFECT OF FINANCIAL RISK MANAGEMENT ON OPERATIONAL EFFICIENCY OF TIER ONE COMMERCIAL BANKS IN KENYA

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DECLARATION

I declare that this dissertation is my original work and has not been previously published or submitted elsewhere for award of a degree. I also declare that this contains no material written or published by other people except where due reference is made and author duly acknowledged.

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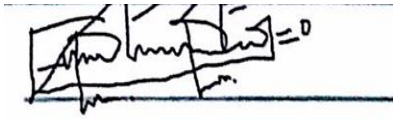
Sign:  Date: 22/10/2024

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ABSTRACT

Commercial banks are vital for the socioeconomic growth of nations and therefore their operational efficiency is critical. A study by Kenya Bankers Association indicated that though bank's profitability has improved over the years, their operational efficiency has deteriorated from 2019 to 2023. The main objective of the study is to determine the effects of financial risk management on the operational efficiency of Tier One commercial banks in Kenya. The research's specific objectives are to examine the effect of credit risk management on operational efficiency of Tier One commercial banks in Kenya, to assess the effect of capital adequacy risk management on operational efficiency of Tier One commercial banks in Kenya, to investigate the effect of lending risk management on the operational efficiency of Tier One commercial banks in Kenya and to examine the effect of liquidity risk management on the operational efficiency of Tier One commercial banks in Kenya. The study was anchored on modern portfolio theory enterprise risk management theory and buffer theory of capital adequacy. This study applied the correlational research design. Tier 1 commercial banks in Kenya who are registered with the Central Bank of Kenya and have been in business for five years running between 2019 and 2023 made the study's population. This study adopted a census technique with all the nine Tier 1 commercial banks in Kenya participating in the study. This study used secondary data which was gathered from the audited annual financial statements of the commercial banks and CBK annual bank supervision reports. The study analysed the data using panel regression analysis through the Stata statistical software. The analysis was preceded by diagnostic tests that included Hausman test, and tests of homoscedasticity, multicollinearity, serial correlation, and normality. The findings of the study indicate that financial risk management practices have varying impacts on the operational efficiency of Tier One commercial banks in Kenya. The regression analysis revealed significant insights into the effects of financial risk management on the operational efficiency of Tier One commercial banks in Kenya. Capital Risk Management (CRM) emerged as a strong positive influence on operational efficiency, with a coefficient of 2.51 ($p < 0.01$), highlighting its critical role. Lending Risk Management (LRM) also positively impacted efficiency, evidenced by a coefficient of 0.26 ($p < 0.05$). Conversely, Credit Adequacy Risk (CAR) and Liquidity Risk Management (LR) displayed less significant relationships, with CAR showing a marginally positive effect and LR exhibiting a negative impact. Overall, the findings underscore the importance of effective capital and lending risk management practices in enhancing operational efficiency within the banking sector, while suggesting that improvements are needed in liquidity and credit adequacy strategies. The study concludes that banks should refine their risk management strategies, emphasizing data-driven approaches and integrating risk management with operational practices. Recommendations include adopting advanced analytics for credit assessments and optimizing capital allocation strategies. Future research should explore a broader range of financial institutions and employ mixed-methods approaches to capture qualitative insights, as well as longitudinal studies to understand the evolving impacts of risk management over time.

Key Words: Capital Adequacy Risk Management, Credit **Risk Management**, **Financial Risk Management, Lending Risk Management**, Liquidity **Risk Management**, **Operational Efficiency**, Tier **One commercial banks**

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DEDICATION

I dedicate this research to my husband Mike, my two nations Charles and Kate, their belief in me kept my spirits high and highly motivated during this process.

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ACRONYMS AND ABBREVIATIONS

NPL	Non-Performing Loans
UAE	United Arab Emirates
CAR	Capital Adequacy Ratio
LDR	Loan-To-Deposit Ratio
CBK	Central Bank of Kenya
MPT	Modern Portfolio Theory
ERM	Enterprise Risk Management
FP	Financial Performance
ALR	Average Lending Rate
CER	Cost-Efficiency Ratio
ROE	Return on Equity
ROA	Return on Assets
OEOI	Operating Expenses to Operating Income
GMM	Generalized Method of Moments
LCR	Liquidity Coverage Ratio
CTD	Cash to Deposit
ETA	Equity to Total Asset Ratio
OLS	Ordinary Least Squares

LSDV	Least Squares Dummy Variable
ANOVA	Analysis of Variance
VIF	Variance Inflation Factor

OPERATIONAL DEFINITION OF TERMS

Capital adequacy risk management - Reducing investment risks by monitoring a bank's available equity to its risk-weighted assets (Van Greuning & Brajovic, 2020)

Credit risk management - Reducing financial losses by evaluating borrowers' credit risk, which includes their payment history and capacity to repay debts (Van Greuning & Bratanovic, 2020).

Financial Risk Management - The identification, analysis, and mitigation or acceptance of uncertainty in financial and investment choices and it involves monitoring and managing the financial risks related to investments (Ikwara, 2021).

Lending risk management - Ensuring that a commercial bank adopts optimum aggressiveness in lending the funds at their disposal (Kiemo & Kamau, 2023).

Liquidity risk management - Ensuring an entity’s capacity to fulfil cash flow requirements in both regular and challenging circumstances without impacting daily operations, financial standing, or public perception adversely (Van Greuning & Bratanovic, 2020).

Operational Efficiency - Ability of an organization to minimize waste of time, effort, and resources while preserving high-quality of service or products (Ta, Doan, Tran, Dam, & Pham, 2022).

Tier One commercial banks - Large banks in Kenya that control over 75% of the market share (CBK, 2023).

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Commercial banks are vital for the socioeconomic growth of nations, regardless of their level of development. Through efficient allocation of financial resources, commercial banks contribute significantly to economic growth (Lotto, 2019). Due to their essential part in the economy, commercial banks' efficiency is considered a crucial element influencing their success or failure (Barr, Killgo, Siems, & Zimmel, 2022). Given the present global integration of the banking industry, it is crucial for commercial banks to have effective business operations to prevent potential collapse (Ta et al., 2022). Operating efficiency refers to a bank's capacity to lower operating expenses by using the appropriate mix of streamlined processes, skilled personnel, and advanced technology to achieve its goals (Berger & Humphrey, 2023). By using the appropriate mix of resources, a commercial bank may improve the efficiency of its operations and raise the productivity of the services or products it provides (Berger & Mester, 2023).

Efficient operations may free up resources, allowing for the allocation of savings expenses to new value-adding possibilities inside the organisation. Efficient organisations are more likely to enhance and sustain the stability of their production and operational performance compared to less efficient enterprises in the industry (Giokas, 2018). Banks effectively allocate resources from depositors to enterprises with high anticipated social and economic benefits. Banks oversee these resources after lending them to ensure they are used effectively and efficiently. Commercial banks that are inefficient in directing savings might hinder economic progress and societal welfare (Mester, 2021). A well-functioning banking system makes it easier to distribute financial resources

to the most productive economic sectors. Maudos, Pastor, Pérez y Quesada (2022) contend that the effectiveness of the financial system in allocating financial resources across the economy is associated with economic growth and high productivity.

The subject of the influence of financial risk management on operational efficiency has been the subject of significant empirical research in recent years. The extensive series of following studies indicate the significance that the financial system of a nation plays as the fundamental basis of a well-functioning and effective economy (Sathyamoorthi, Mapharing, Mphoeng, & Dzimiri, 2020). Central to the financial system of an economy is the banking sector, which, in developing nations, assumes the primary function of financial intermediation (Wood & Mcconney, 2021). Nevertheless, Ikwara (2021) argues that every bank function within unpredictable and delicate surroundings and faces different risks that might ultimately result in the failure of a commercial bank due to its incapacity to fulfil its financial responsibilities. More significantly, Baraza (2020) states that inside the financial system, there exist a minimum of three overarching classifications of risks, namely financial risk, business risk, and operational risk. Moreover, as noted by Siagian (2023), these risk exposures have transformed banking into a risk-based industry, such that effective risk management is crucial for the survival of commercial banks.

Notwithstanding the supposed beneficial impact of financial risk management on enhancing operational efficiency, research in this field have shown inconclusive findings. At one extreme of the range are studies that claim a positive correlation, among other findings (Arbelo, Arbelo-Pérez, & Pérez-Gómez, 2020). The beneficial impact of financial risk management on bank efficiency is evident in terms of optimized fund management and the reduction of superfluous expenses, such as questionable loans (Baraza, 2020). At the other extreme are studies that emphasize the existence of a negative correlation (Lotto, 2018; Maudos, Pastor, Pérez, & Quesada,

2022). The negative correlation may be attributed to a decrease in leverage and risk-taking, as risk management practices become more stringent, therefore impeding bank efficiency (Girardone, Molyneux, & Gardener, 2024).

Numerous studies have been undertaken on the variables influencing bank efficiency in both developed and emerging nations. These factors include bank specific and economic factors such as management efficiency, bank size, economic growth (Maudos et al., 2022), prudential regulations, financial risk management practices (Lotto, 2018), income levels, leverage ratio, and inflation rate (Kwan & Eisenbeis, 2023). Financial risk management is often indicated as a key factor influencing operational efficiency as it can enable banks to strategically position themselves to achieve a competitive edge by properly managing calculated risks. Financial risk management in a bank encompasses management of various risks including capital adequacy, liquidity, credit and lending risks (Mester, 2021). These risks were considered in this study as they have been indicated as vital in enabling efficient of banks by various scholars such as Bonin, Hasan, and Wachtel (2020), Berger and DeYoung (2023), and Kiemo and Kamau (2023).

Globally, studies have been conducted to examine the influence of financial risk management on operational efficiency of commercial banks. A study in Indonesia by Siagian (2023) determined that capital adequacy and lending risk management had significant effect on operational efficiency. Commercial banks with high capital adequacy and loans to deposits ratio, a measure of lending risk, performed better than their peers with lower ratios. However, non-performing loans (NPLs), which were used as a measure of credit risk management, had no significant effect on operational efficiency. In the United Arab Emirates (UAE), Oudat et al. (2023) established that capital risk management indicated by NPLs negatively influences operational efficiency of banks whereas liquidity risk management had no effect on the operational efficiency

of banks. In Barbados, Wood and Mcconney (2021) established that liquidity risk management, credit risk management and capital risk management have statistically significant effects on bank efficiency.

In Africa, operational efficiency of banks is low and various aspects including financial risk management influence banks' operational efficiency. A study in Nigeria by Fadun and Oye (2020) determined that commercial banks in the country were experiencing more losses due to insufficient financial risk management practices. methods, which negatively affects their profitability. The research determined that effective financial risk management appertaining to liquidity risk management, credit risk management, and capital risk management had a beneficial effect on banks' profitability. Sathyamoorthi, Mapharing, Mphoeng, and Dzimiri (2020) established that lending risk management, measured by the loans to deposit ratio, had a significant negative effect on efficiency and performance of banks in Botswana. In Tanzania, Lotto (2019) established that bank liquidity risk management, capital adequacy and credit risk management had significant effect on operational efficiency of commercial banks in the country.

The Kenyan commercial banking sector according has experienced stagnant operational efficient from 2018 to 2022 (Kiemo & Kamau, 2023). Financial risk experienced by the commercial banks in Kenya continues to endanger their financial stability and long-term capacity to continue operating (Ikwara, 2021). This is demonstrated by the various challenges encountered by commercial banks such as inadequate commercial bank loans for long-term infrastructure projects, high non-performing loan ratios, and decreasing profitability. Moreover, banks in Kenya encounter heavy reliance on savings from small depositors, biassed lending towards government and large entities, and high interest rate spreads (Baraza, 2020). The study by Baraza (2020) indicated that liquidity risk management had a positive influence while credit risk management

had a negative influence on bank performance and efficiency. Another study by Mwania and Suva (2022) determined that credit risk management indicated by the ratio of NPLs to gross loans, had a negative effect on commercial banks' efficiency and performance, while liquidity risk management had a positive effect. Since commercial banks in Kenya continue to have low efficiency, it is essential to determine how management of their financial risks affects operational efficiency of the banks in Kenya.

1.1.1 Financial Risk Management

Financial risk management entails the identification, analysis, and mitigation or acceptance of uncertainty in financial and investment choices and it involves monitoring and managing the financial risks related to investments (Ikwara, 2021). Financial risk management involves analysing and quantifying possible financial and investment losses, such as moral hazards, to take suitable actions or inactions based on financial goals and risk tolerance (Oudat et al., 2023). Financial risk management entails management of various risks relating to liquidity, capital adequacy, lending, credit, and leverage (Fan & Shaffer, 2024). In this study, financial risk management measures that was included are credit risk management ratio, capital adequacy ratio, loan-to-deposit ratio and liquidity risk management ratio.

Credit risk management involves reducing financial losses by evaluating borrowers' credit risk, which includes their payment history and capacity to repay debts (Van Greuning & Bratanovic, 2020). Assessing risk at the individual customer and portfolio levels is the first step in fully understanding a bank's overall credit risk (Mwaura, 2020). Comprehensive risk assessments are necessary for banks to make sure that loan loss reserves are enough to cover potential short-term credit losses and capital reserves suitably account for risks. The liquidity and performance of the bank may suffer from possible financial losses brought on by inadequate credit risk

management (Oudat et al., 2023). The asset quality ratio, or the proportion of nonperforming to gross loans, shows how well credit risk management is working.

The capital adequacy risk management entails reducing investment risks by monitoring a bank's available equity to its risk-weighted assets (Van Greuning & Brajovic, 2020). The capital adequacy risk management is measured using the capital adequacy ratio (CAR) which indicates whether a bank has sufficient capital to cover losses and maintain solvency under challenging financial situations. As its CAR rises, a bank's capacity to meet its financial obligations under pressure also does. Under Basel II, the CAR requirements are 8.0%; under Basel III, they are 10.5% and contain a conservation buffer of 2.5% (Mester, 2021). CAR is calculated as the ratio of Tier 1 and Tier 2 capital to the bank's risk-weighted assets (Ikwara, 2021).

The lending risk management entails ensuring that a commercial bank adopts optimum aggressiveness in lending the funds at their disposal. The loan-to-deposit ratio (LDR) is a valuable indicator for assessing the lending risk management effectiveness of banks and credit markets (Kiemo & Kamau, 2023). It indicates the of a bank's total deposits that are given out as loans. A high ratio of the loan-to-deposit ratio (LDR) suggests that the bank is taking on greater risk since it has fewer cash reserves to cover unanticipated losses (Lotto, 2019). This implies that the bank's lending activities are mostly reliant on borrowing from other institutions, which might be risky in uncertain economic times. A high loan to deposits ratio indicates insufficient liquidity to meet unexpected financing needs, whereas, when the ratio is too low, the bank may not be optimizing its earnings and intermediation capacity (Berger & DeYoung, 2023).

Liquidity risk management is ensuring an entity’s capacity to fulfil cash flow requirements in both regular and challenging circumstances without impacting daily operations, financial standing, or public perception adversely. It is the management of the potential risk faced by a bank

when it is unable to fulfil its financial responsibilities, which might jeopardise its financial status or even lead to its collapse (Van Greuning & Bratanovic, 2020). Examining a bank's effectiveness in managing its liquidity entails analysing its interest rate risk sensitivity, availability of liquid assets, competency in managing assets and liabilities and reliance on short-term variable financial resources. Liquidity of banks is measured by the total liquidity ratio, which is total assets divided by total liabilities after deducting conditional reserves. The financial institution may be having financial problems if its liquidity ratio is low, while it may be strong if it is high (Mwaura, 2020).

1.1.2 Operational Efficiency

Operational efficiency is the ability of an organization to minimize waste of time, effort, and resources while preserving high-quality of service or products (Ta et al., 2022). Financially, operational efficiency is the relationship between the resources needed to sustain the organisation and the results it delivers. Input in a business context includes people, expenses, and time needed for operation, whereas output refers to the results or benefits received, such as quality, revenue, customer acquisition, speedy development times, and customer retention (Barr et al., 2022). Operational efficiency involves optimising procedures and systems in a bank to increase production and income, while minimising expenses and errors. Operational efficiency in a corporation is achieved by efficiently optimising its core activities and removing unnecessary procedures and waste (Berger & Humphrey, 2023).

Measuring and quantifying operational efficiency is a crucial aspect of corporate management (Drake & Hall, 2023). Efficiency indicators provide valuable insights into a business's health and facilitate making adjustments that may positively affect profits. Measuring operational efficiency has three main advantages as it enables enhancing corporate processes, enabling informed decision-making, and increasing control over business outcomes (Hsiao,

Chang, Cianci, & Huang, 2020). Operational efficiency is measured as a ratio of the value of inputs to the value of output. Kiemo and Kamau (2023) indicate that the operational efficiency ratio is indicated as the ratio of operational expenses to total revenue, with a reducing ratio showing increasing efficiency. In this study, operational efficiency was measured by the ratio of annual operational expenses to annual revenue.

1.1.3 Tier One commercial banks in Kenya

The commercial banking sector in Kenya consists of 42 banks, with 29 being locally held and 13 being foreign owned. Three locally held banks have significant ownership by the Kenyan government and state enterprises. The Central Bank of Kenya (CBK) has categorised the banks in Kenya into three tiers (Ikwara, 2021). The CBK developed this categorization system to differentiate banks based on their asset basis, market share, and value of deposits by customers. Tier 1 has nine commercial banks with tier 2 having 12 commercial banks while tier 3 has 21 banks. Banks in tier 1 are the largest which holds the majority of the market share in the financial sector (Baraza, 2020). Compared to other Eastern African nations, Kenya's banking sector has been recognised for its size and variety for many years.

In 2023, the private credit to GDP ratio was 23.7%, which is higher than the Sub-Saharan Africa average of 12.3% (Kiemo & Kamau, 2023). However, the intermediation and operational efficiency of banks in Kenya remains low as demonstrated by the ratio of overheads to total profits and the ratio of personnel expenses (including Directors' emoluments) to total earnings. Both of these ratios have significantly deteriorated since reaching their highest point in 2014 (Omete, 2023). According to Getugi, Osoro, and Kihara (2023), the low efficiency by commercial banks may hinder the banks' effectiveness in their roles in enabling economic growth. This study focused

on Tier 1 Banks because they have more than 75% of the market share in Kenya and their reduced efficient adversely affected intermediation efficiency and their contribution to the economy.

1.2 Statement of the Problem

To support economic growth, Tier 1 commercial banks in Kenya must achieve high operational efficiency, as this is essential for the effective movement of loanable funds. Research shows that this efficiency can be boosted by proper implementation of financial risk management hence cutting transaction and operating costs for the banks (Getugi et al., 2023; Kiemo & Kamau, 2023). However, while returns have improved the operating risk of Kenyan banks has increased, driven mostly by high non-performing loans and liquidity, credit and capital risks being inadequately managed. Such deterioration affects their capacity to act as vehicles of efficient distribution of resources and allocation of investments (Barr et al., 2022).

The Kenyan banking sector faces substantial challenges, including operational inefficiency, increased competition, and a rise in non-performing loans, all of which contribute to higher financial service costs. operational efficiency has improved from 39% in 2019 to 54% in 2023 (Kiemo & Kamau, 2023). The collapse of the National Bank of Kenya highlights the dire consequences of inadequate financial risk management strategies, where ineffective corporate governance and a dwindling capital base led to its acquisition by KCB Bank. This situation underscores the urgent need for robust financial risk management practices to enhance the operational efficiency of banks, enabling them to better support economic growth.

The prior empirical studies supporting the conceptual gap need refinement. For instance, Siagian (2023) focused on operational efficiency and risk management strategies but did not address liquidity and credit risks. Oudat et al. (2023) examined market risks and their influence on bank performance but overlooked specific liquidity challenges. Lotto (2019) analysed risk management frameworks but failed to incorporate lending risk management, revealing significant gaps. Additionally, there are contradicting findings in existing literature regarding the impact of various risk management practices on performance, which creates confusion in the field. Contextual gaps also exist, particularly concerning the unique challenges faced by Tier One commercial banks in Kenya. This study addressed these issues by evaluating the impact of integrated financial risk management practices on the performance of these banks, thereby enriching the current theoretical and practical literature in the banking industry.

1.3 Objectives of the Study

The main objective of the study is to determine the effects of financial risk management on the operational efficiency of Tier One Commercial Banks in Kenya.

1.3.1. Specific Objectives

i) To examine the effect of credit risk management on operational efficiency of Tier One Commercial Banks in Kenya.

ii) To assess the effect of capital adequacy risk management on operational efficiency of Tier One Commercial Banks in Kenya.

iii) To investigate the effect of lending risk management on the operational efficiency of Tier One Commercial Banks in Kenya.

iv) To examine the effect of liquidity risk management on the operational efficiency of Tier One Commercial Banks in Kenya.

1.4 Research Hypothesis

H01: Credit risk management has no statistically significant effect on operational efficiency of Tier One Commercial Banks in Kenya

H01: Capital adequacy risk management has no statistically significant effect operational efficiency of Tier One Commercial Banks in Kenya

H01: Lending risk management has no statistically significant effect on the operational efficiency of Tier One Commercial Banks in Kenya

H01: Liquidity risk management has no statistically significant effect on the operational efficiency of Tier One Commercial Banks in Kenya?

1.5 Justification of the Study

This research is significant when examining the relationship between financial risk management on operational performance of the Tier One commercial banks in Kenya. Banking of the financial sector is crucial for economic development, but the sector suffers from various operation problems that hinder the banking function as an intermediary. Through revealing gaps in existing literature especially on the roles of credit, capital adequacy, lending, and managing liquidity risk this research sought to fill the existing empirical research space. If the best practice is not followed, the banking sector will continue to face allocative inefficiency which will disrupt economic growth and stability. In contrast, if conducted, the study objectives will be useful in enlightening policymakers, bank management, and scholars on the best strategies to undertake. The practice implications are that the findings are expected to advance theory by enhancing existing models of financial risk management. In fact, this study responds to practical questions to improve methods

of decision making and management strategies that needs to be implemented to improve the efficiency of the banking sector to foster economic progress in Kenya.

1.6 Significance of the Study

The objective of this study is to provide empirical evidence about how financial risk management affects Kenya's tier 1 banks' operational efficiency. The results are important as Kenya's banking industry has been losing operational efficiency, which has harmed their capacity to carry out their function as financial intermediaries. The general public, scholars, researchers, top management in the banking industry, and policy officials will find the findings of this study useful.

1.6.1 Policy Makers

To the policymakers such as the Ministry of Finance, and the Central Bank of Kenya, their primary # concern is to ensure that banking sector operates optimally to play its rightful role in economic growth of the country. This will be accomplished by policy intervention aimed at increasing the operational efficiency of the tier one banks, which in turn is projected to promote economic development in the country. Therefore, to achieve this, policymakers would need to have in-depth insights into how financial risk management affects operational efficiency in order to select the most suitable policy interventions that would lead to improved effectiveness of financial management practices towards operational efficiency of tier 1 banks.

1.6.2 Management in Commercial Banks

The main objective of the study would be to determine how financial risk management affects Kenya's tier 1 commercial banks' operational efficiency. The research results should help managers and executives of Kenyan commercial banks by pointing up the financial risk management elements that significantly affect operational efficiency and allowing them to improve these elements in their own institutions. Furthermore, the study may reveal the financial risk

management aspects that have little impact on the operational efficiency of tier one commercial banks in Kenya, therefore providing management with valuable insights on the appropriate actions to undertake.

1.6.3 Academia and Future Researchers

The study will provide academics and researchers additional scholarly information about how financial risk management affects Kenya's tier one commercial banks' operational efficiency. This will add to the amount of theoretical and empirical research already in publication on the topic. Academics will therefore have actual data from the study about how financial risk management affects the operational efficiency of Kenya's tier one commercial banks. Hence, these realizations may be used in many contexts to raise the operational effectiveness of commercial banks. Furthermore, there will be constraints to this study that might provide future researchers important information to improve their own research. Furthermore, the paper will provide recommendations for future studies that academics may use to promote further study on operational efficiency and financial risk management in commercial banks.

1.7 Scope of the Study

This study examined how financial risk management affects Tier one commercial banks' productivity in Kenya. It is crucial to understand how credit, capital sufficiency, lending, and liquidity risk management strategies affect operating efficiency for this object. This scope fits current trends for improving operational efficiency in Kenyan banks that have struggled recently. Data was collected from Kenya's nine Central Bank of Kenya-listed tier one commercial banks over six months. The main goal is to establish how credit, capital adequacy, lending, and liquidity risk management techniques affect operational efficiency. This scope addresses Kenyan banks' urgent need for operational efficiency after years of problems. The research collected data from

all nine Tier One commercial banks registered with the Central Bank of Kenya over six months. Using a census approach for this small group allowed for more intensive analysis. To accurately capture all financial parameter variables, secondary data was acquired from the sample firms' last three audited annual financial statements and Central Bank of Kenya Annual Supervision Reports. Panel regression analysis was performed on 45 observations from five years of data using Stata statistical software. This method allowed strong inferences regarding financial risk management's implications on operations. The research is based on many financial theories and contributes to Kenyan banking tactics and scholarship. More objective limits were considered when determining study scopes: resource and data feasibility and availability

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CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The different aspects of financial risk management and their impact on operational efficiency are thoroughly evaluated in this chapter along with the amount of research that is currently available. The chapter contains an outline of earlier empirical studies on the proposed correlations, a detailed examination of relevant theories that provide the basis for the research, and an identification of the research gaps that this work seeks to fill. Moreover, the chapter offers an extensive analysis of the operationalization and measurement of the independent and dependent variables as well as the conceptual framework.

2.2 Theoretical Review

A theoretical framework was used in this study, including two well-established theories: modern portfolio theory and enterprise risk management theory. This section provides a thorough assessment of the aforementioned theories, including their proponents, main assertions, and their application in the study.

2.2.1 Modern Portfolio Theory

Modern Portfolio theory better known as MPT was developed by Harry Markowtiz in 1952. Markowitz suggested that given required risk investors can obtain the portfolio with maximum expected return. This inspired theory formed the base through which people could contemplate on risk and return within markets of finance. Forcing diversification, MPT all also questioned conventional wisdom, and offered a coherent approach for portfolio selection. Elton and Gruber (1997) argued that Markowitz's model postulated two principles; where an optimal portfolio is

made not only from an understanding of the expected return on each asset but also the correlation between these expectations.

As a theoretical concept, MPT has been in existence for the last few decades but has evolved tremendously in theory. Thanks to Markowitz, its initial concepts were developed by other scholars, including William Sharpe who extended the model in the 1960s with the creation of the Capital Asset Pricing Model (CAPM), which relate expected return to systematic risk. In addition, progress in computational facilities and quantitative approach has improved portfolio optimization. Further, the appearance of multi-factor models and the concept of behavioural finance has put into questions, and at the same time expanded, the base axioms of MPT. These enhancements enable investors to factor in many elements that impact the returns of their demanded assets besides the risk-return parities thus enriching the methods used in constructing a portfolio (Schulmerich et al., 2015).

These are systematic in nature and the way MPT addresses risk and emphasis on diversification as core competencies in its operation. In embracing the methods, it deploys in showing how precise portfolio design can be achieved, it offers a general guideline to investors about improving on their investment strategies. However, the theory has been criticized due to the following assumption; Efficient market hypothesis, Normal distribution of returns. Some of the critics say that there is a tendency to find that real world market conditions are different from the assumed markets hence resulting to incorrect assessment of risks. Besides, MPT fails to capture the behavioural aspect of the investor and psychological factors that influence investment decisions (Surtee & Alagidede, 2023). These limitations point towards a more complex management of portfolios.

MPT is relevant to this analysis of evaluating the efficiency impact of financial risk management on Tier One commercial banks in Kenya since it coined the balance between diversification and risk management in garnering maximum return. According to MPT, it will be easier for the banks to determine the risks associated with the choice of assets hence increasing operational efficiency. The theory also trains the eye on the fact that banks ought to maintain a spread risk profile across its assets as indicated in the credit, liquidity, capital adequacy, and risk on lending in the study. This theoretical framework offers a basis on which the subsequent discussion on how sound management of financial risk can contribute to better throughput and financial health of the banking industry can be grounded (Elton & Gruber, 1997).

2.2.2 Enterprise Risk management Theory

ERM theory started arising at the end of the 1990s as the work of Nocco and Stulz regarding this subject. They described ERM as a system that encapsulates risk management in an organization so that firms can be in a position to assess their risks and come up with the mechanisms of dealing with the identified risks. Again, the theory posits that the management of numerous risks should also take into account these risks' interactions. Its main purpose is to strengthen various decisions as well as increase total organizational effectiveness through linking the level of risk-bearing capacity to strategic goals (Nocco & Stulz, 2006).

The development of ERM theory has evolved significantly since its inception. Initially focused on compliance and risk avoidance, ERM has transformed into a strategic management discipline that enhances value creation. The Committee of Sponsoring Organizations of the Treadway Commission (COSO) released frameworks that formalized ERM practices, emphasizing integration with corporate governance. Over the years, researchers have expanded ERM to include various risk categories, such as operational, financial, and reputational risks. Additionally, the

theory has been enriched by advancements in risk quantification and modeling techniques, which enable organizations to better understand and mitigate risks. This comprehensive evolution underscores ERM's critical role in contemporary organizational management (Nocco & Stulz, 2022).

Another advantage of ERM theory is that these principles are aimed at a comprehensive analysis of risks at any organization, thus allowing considering the interdependence between them and making the right decision. ERM, when implemented by organisations, helps to increase organisational adaptability when considering risks within strategic planning. Nevertheless, the theory is criticized for its potentiality to proliferate the complexity of process and increase resource consumption, thus could be a challenge when being implemented in practice, particularly in organizations of a small scale. Thirdly, pundits opine that ERM could create a risk phobia natural which means that organizations can avoid certain opportunities merely due to risk management implications. Ever since, this balance between risk and opportunity continues to present a challenge in the application of ERM (Saeidi et al., 2021).

In the context of examining the effects of financial risk management on the operational efficiency of Tier One commercial banks, ERM theory is highly relevant. It provides a structured framework for understanding how banks can identify and manage various financial risks, such as credit, liquidity, and capital adequacy risks, while aligning these efforts with their operational strategies. By applying ERM principles, banks can enhance their resilience, improve decision-making processes, and ultimately optimize their operational efficiency. This alignment is crucial for Tier One commercial banks as they navigate complex regulatory environments and competitive landscapes, ensuring they remain agile and responsive to emerging risks (Hassan Al-Tamimi & Mohammed Al-Mazrooei, 2007).

2.2.3 Buffer Theory of Capital Adequacy

The Buffer Theory of Capital Adequacy was relatively put forward by Al-Tamimi and Al-Mazrooei in 2007. This theory suggested that banks should hold more capital than the legal requirements to meet any potential losses, and to deal with any surprise volatile capital shocks. The foundation of such a claim is that when an institution has sufficient capital, it creates a buffer, which when it comes to financial institutions is their depositors' safety. This approach differs from the simple objective of achieving minimum regulatory capital to drive the improvement of factors that will produce a sounder banking industry that is stable for more than a year at a time and is capable of enduring variations in economic fortunes. With this buffer, the theory under consideration also stresses the necessity of constant risk management in the sphere of finance (Al-Tamimi & Al-Mazrooei, 2007).

The Buffer Theory of Capital Adequacy however, has since its emergence been through lots of theoretical modification. The subsequent analysis of the logical continuation of the described relationship between the capital buffer and the bank performance demonstrates that the increased volume of capital significantly enhances the ability of the organization to assess risks and make reasonable decisions. Calem and Rob (1996) observe that the effects of financial distortions on operational efficiency can be prevented through retaining excess capital. Moreover, behaviours of capital buffers on lending processes and the management of risks have been discussed by other scholars such as Odunga et al. (2013); all these discussions support the application of this theory within the changing environments of regulations. In conclusion, the theory remains under development as new conditions in the banks' economic surrounding and new regulation appear (Wahyuni & Umam, 2023).

The strengths of the Buffer Theory are to emphasize the improvement of financial and operational robustness. Effective risk management, facilitated by arguing for the importance of higher capital reserves, makes the challenges of economic hardships to be handled in a safer fashion by the banks. Nonetheless, skeptics opine that retaining too much capital is closely associated with high risk, low profitability for banks because it confines their capacity to fund their operations through lending. Such trade off relationship between capital adequacy and financial performance often creates some kind of a misfit especially for the small banking institutions. Also, there are some scholarly who argue that capital buffers fail to act as adequate insurance during major calamities with banking structures, and therefore cannot prevent failures in worse case scenarios (Kamande et al. 2016).

In this regard, the Buffer Theory of Capital Adequacy is most suitable when it comes down to understanding the impact of financial risk management on the operational efficiency of Tier One banks. In its turn, it offers an illustration of how the principles of the framework are applied and how the sufficient capital reserves affect the banks' capacity to deal with the financial risks. When sufficient capital is maintained they improve on their running within a period of time and are able to withstand instability in the economy. This alignment is important for Tier One commercial banks because more and more regulation and market forces demand a sound risk management strategy. Finally, the Buffer Theory emphasizes effective capital management to enhance sustainable operational performance and stability in the banking industry extensively (Odunga et al., 2013).

2.3 Empirical Review

This section presents a thorough review of the existing empirical literature about the effect of financial risk management on the operational efficiency of banks. The review is organised into four sections that align with the specific objectives outlined in the study.

2.3.1 Effect of Credit Risk Management on Operational Efficiency

Siddique et al. (2022) analysed the operational and financial performance of the South Asian commercial banks for credit risk management and its impact on selected bank characteristics. I used Porter's five forces in this study together with NPL, ALR, and CER as the bank-related factors. FP indicators on the other hand were return on equity (ROE) and return on assets (ROA). Back in 2009, ten commercial banks five from Pakistan, and five from India were approached to obtain secondary data. In order to address the effects of several endogenous variables, GMM was applied to co-efficient estimation. This meant that Asian commercial banks' financial performance indicators such as ROA & ROE was significantly negatively correlated with NPLs. This study created a contextual hole as it was conducted in South Asia and the results should not be generalize to the Kenya.

In Pakistan, Husnain et al. (2021) examined the operational efficiency as an intermediate function in the relationship between credit risk and bank financial performance. For this research, 29 Pakistani banks made up the sample. The information for this study came from bank financial statements that were made public and covered the years 2011 through 2018. The research employed simple mediation analysis within the framework of structural equation modelling. The results of this research showed that credit risk and financial performance are significantly and negatively correlated, with operational efficiency partially serving as a mediator. This study has a

conceptual gap as it did not incorporate other financial risk management aspects such as lending risk management.

A study in Indonesia by Buchory (2015) evaluated how credit risk management affects lending organizations' profitability and operational effectiveness. Return on assets (ROA), operating expenses to operating income (OEOI), and non-performing loans (NPLs) are among the indicators of credit risk, operational efficiency, and banking profitability. Multiple linear regression was utilized for data analysis of secondary data derived from the financial accounts of 26 regional development banks in Indonesia. The research results showed a statistically significant and favourable correlation between NPLs and ROA and OEOI. On the other side, the OEOI reduces ROA negatively and statistically significantly. This study was on development banks and the findings may not apply to commercial banks due to the operational and contextual differences.

In Ethiopia, Getahun et al. (2015) examined how commercial bank performance and credit risk management related. Nine commercial banks in all provided secondary data for the investigation. The secondary data was gathered from the National Bank of Ethiopia, the yearly reports of the selected commercial banks, and other relevant publications. Panel data regression models were used in an investigation that lasted six years, from 2009 to 2014. The performance variables employed in this study were ROA and ROE. In this research, NPL ratio was one of the factors taken into account for credit risk management. The findings show a strong link between credit risk management and Ethiopian commercial banks' performance; NPL showed a negative relationship with both ROE and ROA. This study did not incorporate other critical financial risk management dimensions such as capital adequacy risk management.

In Kenya, Odunga et al. (2013) investigated the impact on commercial banks' operational efficiency of credit risk and bank-specific performance measures. The objective of the research

was to investigate how NPL ratio and other credit risk measures unique to banks affect their operational effectiveness. The panel data was evaluated using fixed effects regression in the explanatory study design. The study results showed a positive and statistically significant correlation between the bank's operational effectiveness and the NPLs ratio from the prior year. According to the regression analysis, 41.35% of the variation in banks' operational efficiency may be attributed to credit risk management. This study only considered credit risk management and excluded other vital financial risks such as liquidity risk management.

2.3.2 Effect of Capital Risk Management on Operational Efficiency

Wahyuni and Umam (2023) undertook a study in Indonesia to examine the influence of capital risk management on operational efficiency and profitability of commercial banks in Indonesia. Capital risk management was measured using the CAR whereas operational efficient and profitability were measured using revenues to expenses ratio and ROA respectively. The methodology used for data analysis was panel data regression. The population for the study was companies engaged in banking activities from 2019 to 2021. The results showed that, as gauged by ROA, operational efficiency has a major effect on banks' financial success. However, the effect of capital adequacy, denoted by CAR, on operational effectiveness was not statistically significant. This study provided findings that contradicted various previous studies which justifies another study to determine the role played by capital risk management on operational efficiency.

Pradhan and Shrestha (2017) examined how bank operating efficiency and capital sufficiency affected Nepali commercial banks' financial results. This paper investigated the connection between core capital, total capital ratio, risk-based capital ratio, and bank operating efficiency using secondary data. Data collected covered the years 2005–2006 to 2012–2013 and came from reliable sources such the Banking and Financial Statistics, the yearly reports of certain

banks, and the bank supervision report that Nepal Rastra Bank published. Regression models were used in the research, and the results show that two important factors the ratio of total deposits to total assets and the operational efficiency of commercial banks in Nepal primarily affect the financial performance of the banks. Operating efficiency of commercial banks is one of the main determinants of their financial performance. The risk weighted, total, and core capital ratios all have a negative impact on the efficiency and financial performance of Nepalese commercial banks. This study is not current and another study is justified to determine the influence of capital risk management on operational efficiency in the changing banking environment.

Odekina (2019) looked at how capital adequacy affected commercial bank performance and operational effectiveness in Nigeria. Secondary panel data was gathered by the study from the Central Bank of Nigeria and annual bank reports. The panel random effect regression technique was the one used for data analysis. The study results showed a statistically significant and positive effect of the capital adequacy ratio on the financial and operational performance of the commercial banks. The results of the research show that commercial banks in Nigeria may improve and grow their operational efficiency and financial performance by a major and proactive role played by capital adequacy. This study was undertaken in Nigeria and the findings may not appropriately apply in Kenya due to the contextual differences between the two countries.

Siddique et al. (2022) found that capital risk management improved South East Asian commercial banks' financial performance. The results of Getahun et al. (2015), who found that capital risk management using the CAR significantly improved commercial banks' financial performance, were consistent with these ones. These results also supported a different study carried out in Kenya by Odunga et al. (2013) which found a positive and statistically significant correlation between the operational efficiency of Kenya's commercial banks and the capital adequacy ratio,

which was the measure for capital risk management. The study by Odunga et al. (2013) was undertaken over 10 years from the time of the current study and there are many factors that could have changed to warrant the current study.

2.3.3 Effect of Lending Risk Management on Operational Efficiency

A study by Siagian (2023) investigated a range of variables that impact operational efficiency and its effect on market pricing of a bank's shares in Indonesia. A total of 28 banking institutions were selected from the pool of all banks listed on the Indonesia Stock Exchange throughout the period of 2016 to 2021. The data gathering procedure included purposive sampling, while the data processing involved the utilisation of linear multiple regression. The results indicated a statistically significant correlation between a bank's loan-to-deposit ratio with operational efficiency. This study has a conceptual gap as it did not incorporate other vital financial risk management aspects such as liquidity risk management.

The study by Hapsari (2018) investigated the influence of lending risks management on efficiency, while considering size as a moderating variable. Lending risk management was measured through loan to deposit ratio. The study focused on the commercial banking sector in Indonesia from 2012 to 2016. A purposive selection strategy was used to select 65 data observations from 13 institutions affiliated with the Business Group Commercial Banking. The study utilised a moderating regression analysis with absolute difference approach. The results show a positive correlation between financial success and the loan to deposit ratio. This study has a contextual gap as it was undertaken in Indonesia which has contextual differences with Kenya.

Isik (2022) conducted an empirical study of the relationship between the loan-to-deposit ratio (LDR) and bank performance as determined by operational efficiency throughout the period of 2010–2019. In this work, the relationship between 15 Pakistani listed banks and 24 Chinese

listed banks was examined using the fixed effects generalized method of moments (GMM) dynamic panel data regression method. Expenses to revenue ratio and LDR of Pakistani listed banks were found to correlate in a non-linear U-shaped manner. Results for publicly traded Chinese banks indicated a non-linear inverted U-shaped relationship between operational efficiency and LDR. The study has a conceptual gap as it did not include credit risk management which is vital in the banking sector.

In Kenya, Kamande et al. (2016) examined, over a five-year period starting in 2011 and ending in 2015, the effect of bank-specific features on operational efficiency of Kenyan commercial banks. The ratio of costs to income was the outcome variable under examination whereas predictor variables that were considered in this research included loans to deposit ratio. The selection of the five-year timeframe was determined by the rapid expansion of the banking industry in the country and the accessibility of comprehensive data for that specific duration. This study included all the 11 banks that were publicly listed on the NSE. The study findings indicated a notable increase in loans to deposit ratio throughout the course of the five-year duration. Additionally, the study results portrayed those loans to deposits ratio had a significant negative effect on operational efficiency of commercial banks. There have been various changes in the banking sector in Kenya and the findings from this study may not reflect the situation currently and thus a new study is justified.

2.3.4 Effect of Liquidity Risk Management on Operational Efficiency

In India, Sidhu, et al. (2023) investigated the impact of the liquidity coverage ratio (LCR) on the operational efficiency of Indian banks between 2010 and 2019. The relationship between the LCR and efficiency was examined in this study in relation to internal bank characteristics like ownership structure, openness and disclosure, and technical innovation. Data envelope analysis was used to

evaluate bank efficiency, more especially technological efficiency. The researchers determined, via the use of panel data regression, that the LCR improves banks' technical efficiency while preserving a consistent return to scale. The LCR and the technical efficiency are non-linearly related at varying return to scale. First, banks become more efficient as their liquid assets increase. After it peaks, however, efficiency starts to decline.

Hacini et al. (2021) looked at how liquidity risk management affected the financial results of a particular set of Saudi Arabian conventional banks between 2002 and 2019. Liquidity risk was evaluated by the cash to deposit ratio (CTD), and financial performance by the ROE. In this work, the equity to total asset ratio (ETA) served as the control variable. The study examined the research hypothesis by utilizing the panel data approach, more precisely the fixed-effects model. The results show that liquidity risk (CTD) significantly depresses the operational efficiency of Saudi Arabian institutions. This study was conducted in Saudi Arabia and the findings may not be generalizable to the banking sector in Kenya due to the contextual differences between the two countries.

With a particular attention on Kenya and Sierra Leone, Kanu and Azimli (2022) evaluated the impact of liquidity risk management on the operational efficiency of commercial banks. Twenty five of the 35 commercial banks that operated in Kenya and Sierra Leone between 2009 and 2018 were the subject of this research. This work assessed the relationship between liquidity risk management and commercial banks' efficiency using panel multiple regression models using the GMM and descriptive statistical analysis. An adverse association of statistical significance was found between the operational efficiency of commercial banks in Kenya and Sierra Leone and their liquidity risk management. According to the study results, 26.7% of the variance in operational returns seen over the study period was caused by the management of liquidity risk. The expansion in total revenues was largely responsible for the notable increase in the ratios of

liquid assets to total assets. Further findings of this study show that the operational efficiency of commercial banks is negatively correlated with the ratio of liquid assets to total assets. Though this study provides valuable findings, it did not include credit risk and lending risk management which are vital in the banking sector.

In Kenya, Amira et al. (2023) evaluated how liquidity risk management affected the country's commercial banks' operational efficiency. The study was predicated on the positivist philosophy. This study employed both longitudinal and explanatory research designs. The research's target population included thirty-two Kenyan commercial banks. Panel data spanning ten years, from 2010 to 2019, including both time series and cross-sectional data was collected. Descriptive and inferential statistics were used to the obtained data analysis in Eviews. Liquidity risk management and operational efficiency were shown to be statistically significantly negatively correlated. This study, however, has a methodological gap as it used multiple linear regression and correlation analyses instead of using panel regression analysis which is more robust.

2.4 Literature Gaps

From the literature on credit risk management and its impact on operations efficiency, it is apparent that there is a number of research gaps, especially in terms of the regional and financial risk perspectives. Husnain et al. (2021) and Siddique et al. (2022) highlight credit risk for the South Asian countries although they did not incorporate lending risk and capital adequacy into the financial risk management framework. Buchory (2015) operational also found that the distinction between development and commercial banks occurring in Indonesian context, thus study’s result may not be generalized. Furthermore, in Ethiopia, Getahun et al. (2015) focus on non-performing loans’ influence on financial performance and exclude others kinds of risk. Subsequently, the same authors studying the Kenyan context revealed that there is a positive relationship between

operation efficiency and prior year NPLs but, again, without regard for the risks associated with liquidity. These gaps suggest that there is a lack of extended research that considers various types of financial risks and that is, to an extent, applicable to various banking systems.

This study uncovers some existing research limitations in empirically investigating the influence of capital risk on operation output especially regarding to its contextual application and changing banking paradigm. Wahyuni and Umam (2023) gave significant evidence of the relationship between operational efficiency and financial profitability in Indonesian but showed insignificant between CAR and operational efficiency which was contrary to previous literature. Similarly, Pradhan and Shrestha also pointed out the negative relationship of various capital ratios with the performance of Nepali banks but they used the data which is not so contemporary and recommended to carry out further research. Odekina (2019) affirmed a significant relationship between capital adequacy and operational performance in Nigeria, but evidence may not hold in the Kenyan situation because economic and regulatory factors are not suited. While Siddique et al. (2022) and Odunga et al. (2013) noted positive linkages between capital risk management and financial performance in Southeast Asia and Kenya respectively, the temporal changes require new research works that address these emerging scenarios in capital risk management and operations efficiency.

A number of research gaps are identified in analyzing the prior lending risk management literature and its impact on business operational efficiency: a lack of contextual sensitivity, and missing contextual information regarding other financial risks. In his study, Siagian (2023) established a positive relationship between LDR and operating efficiency but, in so doing, failed to consider other important dimensions of financial risks, including liquidity risks in Indonesian banks. Similarly, Hapsari (2018) took LDR as an aspect of lending risk management but it relied

heavily on measuring Indonesian banks and thus did not enjoy the generalized applicability. While Isik (2022) analysed the non-linear interaction between LDR and bank performance in Pakistani and Chinese banks, credit risk management, which is important in banking analysis, was overlooked. Kamande et al. (2016) stated that layout constraint reduced operational efficiency in Kenyan banks over the five-year period, but shifts in the banking landscape since that study require reconsideration of them. Altogether these works suggest an urgent need for newer research that takes into account different forms of financial risks and the changing nature of the banking business in various areas.

The following gaps are evident from the literature on liquidity risk management and its impacts on organisational operational efficiency. In this study, Sidhu et al. (2023) have identified that the relationship between the LCR and the technical efficiency is not direct as the efficiency increases with the accumulation of liquid assets up to optimal level. Hacini et al. (2021) indicated gradation evidence of a negative relationship between the cash to deposit ratio and the operation efficiency of Saudi banks The current research cannot directly adopt the findings since the economic environments of Saudi and Kenyan banks are different. While Kanu and Azimli (2022) observed a strong element of negativity in the relationship between liquidity risk management and operational efficiency in Kenyan and Sierra Leonean banks they omitted crucial risk factors like credit and lending risk factors. Similarly, Amira et al. (2023) used regression models in establishing a negative relationship between liquidity risk management and operational efficiency in Kenyan banks but their models where not so robust hence merit less reliable results. Combined, these gaps suggest that there is a need for large scale research that takes into account the multi-dimensional nature of liquidity risk and which draws on more

sophisticated methods in an effort to gain an improved understanding of changes in the patterns of liquidity risk management across different banking settings.

2.5 Conceptual Framework

Figure 1 illustrates the conceptual framework, outlining the relationships between the dependent variable, operational efficiency, and the predictor variables: credit risk management, capital adequacy risk management, lending risk management, and liquidity risk management, all crucial to financial risk management.

FIGURE 1

Conceptual Framework

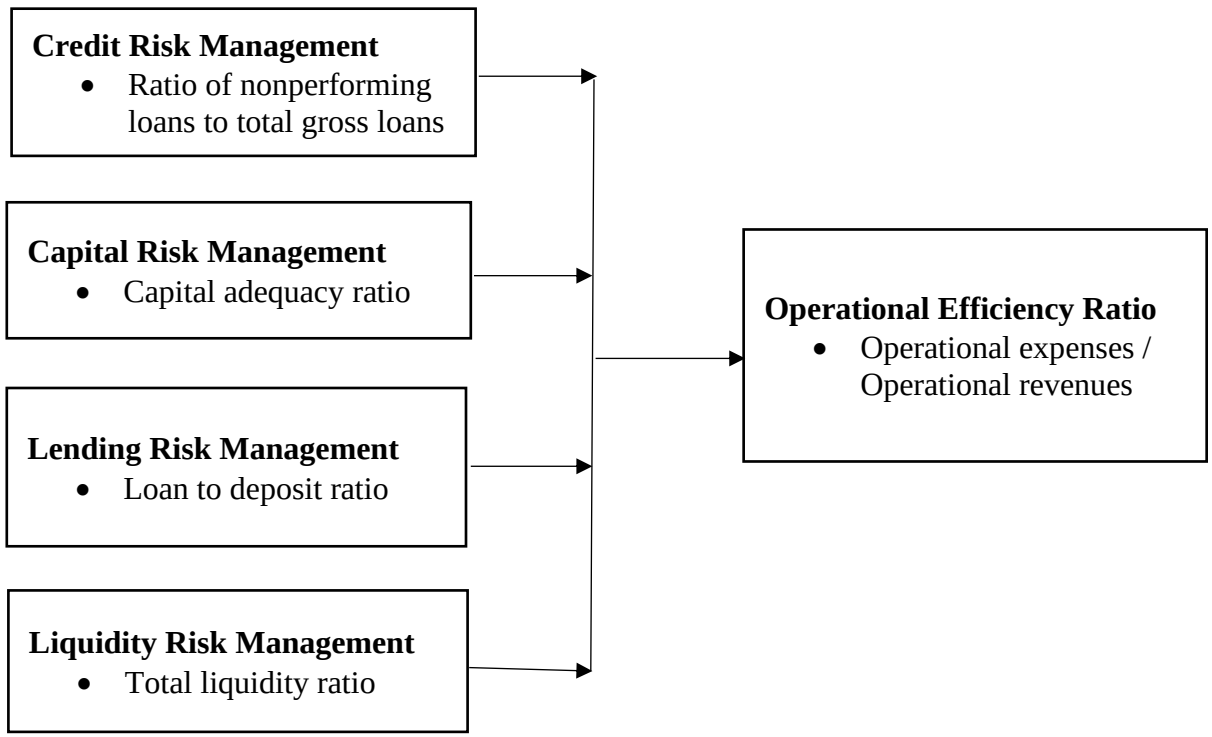


Figure 1 Conceptual Framework

Independent Variables **Dependent Variable**

2.6 Operationalization of Variables

This section provides a comprehensive explanation of how the dependent and predictor variables will be measured and operationalized in the study. The measurements, indications, and levels of measurement are shown in Table 1.

TABLE 1

Table 1 Operalization of Variables.

Variable	Measurement	Supporting literature	Level of measurement
Credit risk management	Asset Quality Ratio • Nonperforming loans / Total gross loans	• Van Greuning & Bratanovic (2020) and (Oudat et al. (2023).	Ratio scale of measurement
Capital risk management	Capital Adequacy Ratio • (Tier 1 Capital + Tier 2 Capital)/ Risk-Weighted Assets	• Mester (2021) and Ikwara (2021).	Ratio scale of measurement
Lending risk management	Loan To Deposit Ratio • Total loans / Total deposits	• Kiemo and Kamau (2023) and Berger and DeYoung (2023).	Ratio scale of measurement

Liquidity risk management	Total Liquidity Ratio • Total assets / (total liabilities - conditional reserves)	• Mwaura (2020) and Van Greuning and Bratanovic (2020).	Ratio scale of measurement
Operational Efficiency Ratio	• Operational expenses / Operational revenues	• Drake and Hall (2023) and Ta et al. (2022).	Ratio scale of measurement

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This section addresses the research methodology and research techniques that was used in collecting and analyzing the data. The analyzed data enabled the attainment of the study's research objectives. This section covers research design, study population, sampling methods and procedures, data collecting procedures, and data processing and analysis methodologies.

3.2 Research Design

The strategy and organization of research to achieve research goals or find answers to research questions is referred to as research design. The plan is the general structure or program of the study and it describes everything the researcher does, from formulating goals to practical consequences to the analysis of the data at the end. It is economically necessary to be able to accomplish goals related to the study aim via empirical evidence (Kothari & Garg, 2019). Descriptive (correlational, survey, evaluative, meta-analysis), exploratory, explanatory, and causal comparative research strategies are among the many available (Creswell & Creswell, 2022). This study applied the correlational research design. This design enabled the study to reveal the relationship between the different financial management risk management aspects and operational efficiency of the Tier 1 commercial banks in Kenya. This design is appropriate as it links study variables, and new realities and meanings and thus broaden the scope of the phenomena under study, in this case, correlation between a collection of factors affecting operational efficiency. Besides, Schindler (2022) observes that a correlational research design investigates relationships between variables without the

researcher controlling or manipulating any of them. This was the case in this study and this justifies the appropriateness of the correlational design in this study.

3.3 Target Population

Schindler (2022) observes that when choosing the target population of a research, it should be noted that the chosen group can answer the questions posed to them and offer the necessary information, thereby assisting in determining whether the census or sample is the better option. Tier 1 commercial banks in Kenya who are registered with the Central Bank of Kenya and have been in business for five years running between 2019 and 2023 made up the study's population. The nine Tier 1 commercial banks in Kenya was the whole population for the study (CBK, 2023). The unit of analysis was the nine tier 1commercial banks in Kenya.

3.4 Sampling and Sampling Procedure

Sampling methods provide a researcher an approach to choose the components to be researched scientifically. To generalize the findings, representative elements from the whole population are chosen (Saunders et al. 2019). Probability sampling and non-probability sampling are two categories of sampling methods (Kothari & Garg, 2019). However, when the population is small, manageable and accessible, the study can research the whole population through a census (Schindler, 2022). This adopted a census technique with all the nine Tier 1 commercial banks in Kenya participating in the study. The census technique is suitable to use since the study population is manageable accessible and small.

3.5 Data Collection Procedure

According to Creswell and Creswell (2022), the techniques and approaches of data collecting are many. The features of the participants, study topic, research challenge, goals, design, anticipated data, and findings mostly determine the choice of a tool and instrument. This is so because every equipment and tool gather particular information. This utilized secondary data which was gathered from the audited annual financial statements of the commercial banks and CBK annual bank supervision reports. A secondary data collection sheet was used with the specific financial parameters required to measure the study variables. The secondary data collection sheet is provided in Appendix I.

3.6 Data Processing and Analysis

The secondary data gathered was cleaned, coded, labeled, and input into the Stata statistical software for analysis. The Stata statistical software generated frequencies, descriptive statistics, and panel data regression statistics to draw conclusions and generalize about the population. Panel data refers to the data that has cross-sectional and time-series properties (Wooldridge, 2019). The panel data in this study was gathered for the nine Tier 1 commercial banks in Kenya over a period of five years, resulting in a total of 45 observations. The study therefore, conducted panel regression analysis using the gathered panel data.

3.6.1 Panel Regression

To model the data using panel regression, three models can be used which are the pooled ordinary least squares (OLS) model, fixed effects model or the random effects model. To determine the most appropriate model for the data, the study was conducted the Chow test, Breusch Pagan Langrange Multiplier test and a Hausman specification test.

Hausman Test

The Hausman's test of fixed effects or random effects was employed to determine the suitability of either the fixed or random panel data model. The results of the Hausman test determined which of the two models was the most appropriate for analyzing the gathered data. If the p-value from the Hausman test is less than 0.05 the fixed effects model is most appropriate; otherwise, a random effects model is suitable (Stock & Watson, 2019). If the fixed effects model is selected by the Hausman Test, the study conducted the Chow test to establish which model between fixed effects model and pooled OLS model is appropriate. In the test, if the p value is greater than 0.05, the pooled OLS model was selected, and if the p value is less than 0.05, the fixed effects model was selected (Hansen, 2022). The study fitted the selected model.

Breusch Pagan Langrange Multiplier Test

If the Hausman test selects the random effects model, the study conducted the Breusch Pagan Langrange Multiplier test to determine the most appropriate model between the random effects model and the pooled OLS model. When the p value of this test is below 0.05, the random effects model was selected and if the p value is above 0.05, the pooled OLS model was selected (Hansen, 2022). The study fitted the model that was determined as the most appropriate based on the results of the Breusch Pagan Langrange Multiplier test and the Hausman specification tests. The following sections discusses the three possible models.

Pooled OLS Model

The pooled OLS model effectively mixes both time series and cross-sectional data (McCoach & Cintron, 2022). This model does not take into account the dimensions of individual entities and time, thereby assuming that the behavior of each entity's data remains consistent over different time periods (Stock & Watson, 2019). The pooled OLS model is depicted as:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Y = Operational efficiency ratio

X_1 = Credit risk management

X_2 = Capital risk management

X_3 = Lending risk management

X_4 = Liquidity risk management

ε = error term

β_0 = The estimate of the intercept

β_1, β_2, β_3, & β_4, = Regression equation coefficients

Fixed Effects Model

The fixed effects model assumes that the variations across entities may be accounted for by varied intercepts. To estimate a fixed effects model for panel data, a dummy variable approach can be used to reflect the variations in intercepts across organizations. These changes in intercepts might arise from variations in unobserved characteristics. However, there is an interception occurring between the firms and this estimate methodology is often referred to as the Least Squares Dummy Variable (LSDV) approach (Hansen, 2022). Fixed effects suggest that variations among individuals (cross section) can be accounted for by adjusting the intercept. It assumes the variation across entities is related to the predictor or independent variables in the model. Therefore, the fixed-effects model accounts for all unchanging variations across individuals, ensuring that the estimated coefficients of the fixed-effects models remain unbiased due to the absence of any missing time-invariant traits. The equation for the fixed effects model in panel data regression is as follows:

$$Y_{it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \mu_{it}$$

Where;

i = tier I commercial banks (1....8)

t = Year (2019—2023)

μ_{it} = error term

Random Effects Model

The random effects model is designed to estimate panel data in which disturbances may be related across time and entities. The random effects model incorporates the variation in intercepts by including the error terms of each entity. The random effect model differs from the pooled OLS and fixed effect models, particularly in its use of the maximum likelihood or generic least square principles instead of ordinary least squares (Wooldridge, 2019). The rationale for using a random effects model is that it assumes the variation across entities is random and not related to the predictor or independent variables in the model (Stock & Watson, 2019). This is in contrast to a fixed effects model, where the unobserved individual effects are assumed to be correlated with the regressors in the model. One benefit of random effects is the ability to include time-invariant factors. The output of a random effect is as follows:

$$Y_{it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \varepsilon_{it} + \mu_{it}$$

Where;

μ_{it} = between entity error term

ε_{it} = Within entity error term

3.7 Diagnostic Tests

The researcher evaluated the fundamental statistical assumptions for the linear regressions using a number of diagnostic tests prior to doing regression analysis. The diagnostic procedures included homoscedasticity, multicollinearity, serial correlation, normalcy, and linearity.

3.7.1 Normality Test

An essential requirement for parametric tests to be dependable is that the error term must have an approaching normal distribution. The Shapiro-Wilk test was used to assess the normality of the regression residuals. If the test yields a non-significant result ($p > 0.05$), it indicates that the distribution of the regression residuals is not statistically different from a normal distribution, and so may be considered normally distributed. If the test yields a statistically significant result ($p < 0.05$), it indicates that the distribution of the regression residuals deviates considerably from a normal distribution. Therefore, the condition of normality is violated as the residuals are not normally distributed (Wooldridge, 2019).

3.7.2 Homoscedasticity Test

The assumption that the error term displays equal variation across the range of values of the independent variable is known as homoscedasticity (homogeneity of variance) (Békés & Kézdi, 2021). When the error term for independent variables shows uneven variation over the range, this is known as heteroskedasticity. The research applied the Breusch Godfrey test to see whether the panel data's variance is homogeneous. The test's null hypothesis states that because variance is equal, there is no homoscedasticity. The null hypothesis that the variance is equal and the assumption of homoscedasticity is satisfied is accepted if the Breusch Godfrey test is not significant and p is greater than 0.05. If p value is less than 0.05, then the test is significant and heteroscedasticity is presumed.

3.7.3 Multicollinearity Test

Multicollinearity is an additional postulate of linear regression, which states that the independent variables lack significant correlation. A strong correlation between two or more independent variables constitutes multicollinearity. Multicollinearity diminishes the ability of individual

variables to predict future events. This study used the Variance Inflation Factor (VIF) in the multicollinearity test. A VIF value below 10 for each independent variable signifies the absence of multicollinearity. Conversely, a VIF value exceeding 10 (VIF ≥ 10) suggests the presence of a multicollinearity issue (Wooldridge, 2019).

3.7.4 Serial Correlation Test

In order to provide accurate and efficient findings in linear panel-data models, researchers must detect and address serial correlation in the idiosyncratic error component (Wooldridge, 2019). Various techniques may be used to detect autocorrelation in panel data, which vary depending on the nature and arrangement of the data. For instance, when the panel data is balanced and has a substantial time dimension (T), the Breusch-Godfrey test may be used. However, if the panel data is imbalanced or has a small-time dimension, an alternative approach is to use the Wooldridge test, which relies on the first-differencing transformation. This study applied the Woodridge test since the time dimension is five years.

CHAPTER FOUR

DATA ANALYSIS AND PRESENTATION OF FINDINGS

4.1 Introduction

This chapter presents the results and interpretations of the study, which is guided by the set research objectives. Statistical, descriptive, and panel regression analysis were the methods that were utilized in the data analysis completed. Both descriptive analysis and regression analysis were utilized in order to address the nature of the variables that were evaluated. Regression analysis was utilized in order to identify the influence of financial risk management ratios in Tier One commercial banks in Kenya. Additionally, the diagnostic tests that were utilized to determine whether or not the panel data model that was utilized was an ideal match for the data are highlighted in this part.

4.2 Descriptive Statistics

4.2.1 Descriptive Statistics of Operational Efficiency

The descriptive statistics for the Operational Efficiency Ratio (OER) reveal key insights into the performance of Tier One commercial banks in Kenya. The overall mean OER of 0.5312 indicates that, on average, these banks operate at just over half of their optimal efficiency. The standard deviation of 0.0928 suggests moderate variability in operational efficiency across the banks. The minimum value of 0.3552 indicates that some banks operate with significantly lower efficiency, while the maximum of 0.8313 suggests that others are performing relatively well. The between-group standard deviation (0.0547) is smaller compared to the within-group standard deviation (0.0768), implying that the differences in operational efficiency are more pronounced within individual banks over time than between different banks. These findings underscore the need for

improved risk management practices to enhance operational efficiency across the banking sector in Kenya.

TABLE 3

Table 2 Descriptive Statistics of Operational Efficiency.

Variable		Mean	Std.Dev	Min	Max	Observations	
OER	overall	0.531223	0.092837	0.355186	0.8313285	N	45
	between		0.054742	0.454838	0.6123413	n	9
	within		0.076776	0.367486	0.7669669	T	5

4.2.2 Descriptive Statistics of Liquidity Risk Management

The descriptive statistics for Credit Risk Management (CRM) reveal significant insights into the risk management practices of Tier One commercial banks in Kenya. The overall mean CRM of 0.7754 indicates a relatively high level of credit risk management effectiveness, suggesting that banks are actively managing credit risks. However, the standard deviation of 0.5169 indicates considerable variability in CRM practices among the banks, which may reflect differences in policies or risk appetites. The minimum value of 0.5169 suggests that some banks have room for improvement, while the maximum value of 0.9839 indicates that others are close to optimal management of credit risks. The between-group standard deviation (0.5702) being lower than the within-group standard deviation (0.6446) suggests that variations in CRM are more significant within individual banks over time than across different banks. This variability highlights the need for standardized best practices to ensure consistent risk management across the sector.

TABLE 4

Table 3 Descriptive Statistics of Credit Risk Management.

Variable		Mean	Std.Dev	Min	Max	Observations	
CRM	overall	0.775449	0.516857	0.516857	0.9838715	N	45
	between		0.570176	0.570176	0.9324012	n	9
	within		0.644596	0.644596	0.8503017	T	5

4.2.3 Descriptive Statistics of Capital Adequacy Risk Management

The descriptive statistics for Capital Adequacy Risk Management (CAR) highlight essential aspects of Tier One banks' financial stability in Kenya. The overall mean CAR of 0.1843 suggests that, on average, banks maintain a moderate level of capital adequacy, which is crucial for absorbing potential losses and ensuring regulatory compliance. The standard deviation of 0.0184 indicates low variability in CAR across the banks, reflecting a consistent approach to capital management. The minimum value of 0.1517 implies that some banks may be nearing the lower threshold of acceptable capital levels, while the maximum value of 0.2272 indicates stronger capital positions in others. The between-group standard deviation (0.0120) is notably smaller than the within-group standard deviation (0.0459), suggesting that variations in capital adequacy are more pronounced within individual banks over time rather than among different banks. This uniformity emphasizes the need for all banks to strengthen their capital management practices to ensure resilience against financial shocks.

TABLE 5

Table 4 Descriptive Statistics of Capital Adequacy Risk Management.

Variable		Mean	Std.Dev	Min	Max	Observations	
CAR	overall	o.1843127	0.018422	0.151686	0.227194	N	45
	between		0.01204	0.570176	0.2055613	n	9
	within		0.045935	0.644596	0.227025	T	5

4.2.4 Descriptive Statistics of Lending Risk Management

The descriptive statistics for Lending Risk Management (LRM) provide valuable insights into the risk management practices related to lending in Tier One commercial banks in Kenya. The overall mean LRM of 1.1703 indicates that banks are generally effective in managing their lending risks, maintaining a ratio above the optimal threshold. The standard deviation of 0.0380 reflects low variability in lending risk management practices across the banks, suggesting a consistent approach to lending strategies. The minimum value of 1.0846 indicates that all banks maintain a baseline level of lending risk management, while the maximum value of 1.2452 shows that some banks exceed this baseline significantly. The between-group standard deviation (1.1412) being larger than the within-group standard deviation (1.0846) suggests that differences in LRM are more pronounced between different banks than over time within individual banks. This highlights the importance of adopting effective lending practices across the sector to ensure continued operational efficiency.

TABLE 6

Table 5 Descriptive Statistics of Lending Risk Management.

Variable		Mean	Std.Dev	Min	Max	Observations	
LRM	overall	1.170257	0.038047	1.084591	1.245204	N	45
	between		1.141158	1.141158	1.199477	n	9
	within		1.084591	1.005549	1.234548	T	5

4.2.5 Descriptive Statistics of Liquidity Risk Management

The descriptive statistics for Liquidity Risk Management (LRM) reveal important aspects of how Tier One commercial banks in Kenya handle liquidity risks. The overall mean LRM of 0.1235 suggests that banks maintain a moderate level of liquidity, which is essential for meeting short-term obligations. The standard deviation of 0.0324 indicates relatively low variability in liquidity management practices across the banks, reflecting a consistent approach to managing liquidity risks. The minimum value of 0.0658 suggests that some banks are operating with lower liquidity ratios, while the maximum value of 0.1972 indicates stronger liquidity positions in others. The between-group standard deviation (0.0218) is smaller than the within-group standard deviation (0.0249), suggesting that variations in liquidity risk management practices are more notable within individual banks over time than among different banks. This consistency underscores the importance of effective liquidity management practices to ensure stability and resilience in the banking sector.

TABLE 7

Table 6 Descriptive Statistics of Liquidity Risk Management.

Variable		Mean	Std.Dev	Min	Max	Observations	
LRM	overall	0.123527	0.032427	0.065849	0.1972263	N	45
	Between		0.021822	0.078086	0.1485384	n	9
	Within		0.024872	0.049276	0.1780468	T	5

4.3. Exploratory Analysis

An exploratory analysis of the research variables is presented in this section, featuring panel line plots that illustrate the trends of the independent variables over time, along with superimposed plots for the dependent variable, operational efficiency. Figure 2 specifically showcases the panel data line plots for the Asset Quality Ratio (AQR), which serves as a key indicator of credit risk management. The plot visually captures fluctuations in AQR across different Tier One commercial banks in Kenya, allowing for a clear comparison of performance trends. By overlaying the operational efficiency data, the analysis enables a comprehensive understanding of how changes in asset quality relate to variations in operational efficiency. This exploratory approach facilitates the identification of potential patterns and relationships that warrant further investigation in subsequent analyses.

FIGURE 2

Figure 2 Asset Quality Ratio (AQR)

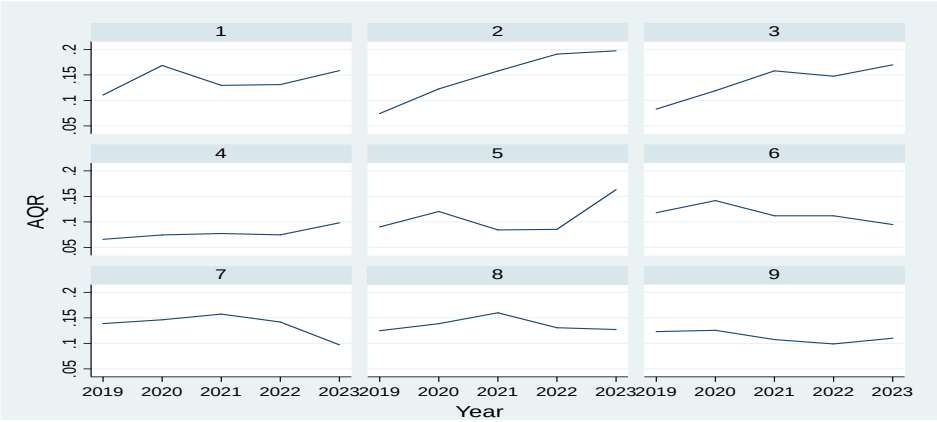


Figure 2 displays panel data line plots that illustrate the variations in the Asset Quality Ratio (AQR) for the nine Tier One commercial banks over the five-year period. The chart reveals that the majority of these banks exhibit an increasing trend in AQR, indicating a general improvement in their credit risk management practices. However, a few banks demonstrate a decreasing trend, suggesting potential challenges in maintaining asset quality. This divergence in performance highlights the need for tailored strategies to address specific weaknesses. Furthermore, the panel data line plots for the Capital Adequacy Ratio (CAR) are presented in Figure 4, allowing for a comparative analysis of capital management practices across the same banks and timeframe. This visual representation facilitates a deeper understanding of how both asset quality and capital adequacy impact overall financial stability.

FIGURE 3

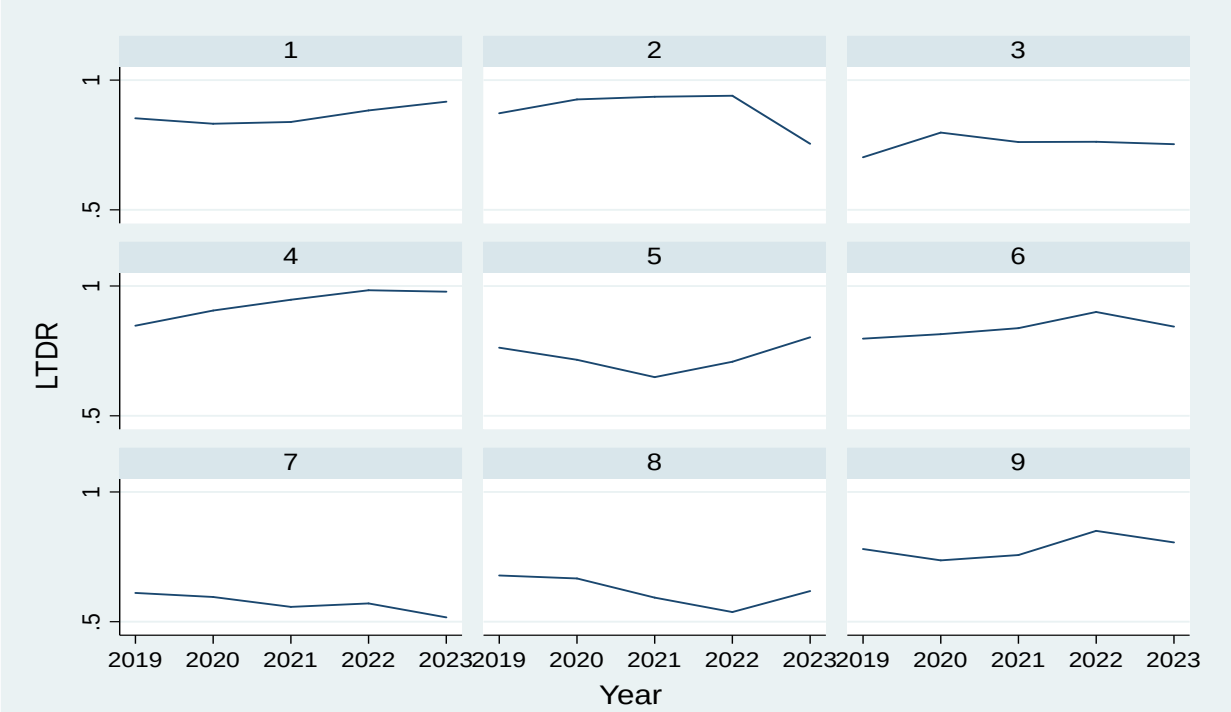
Figure 3 Panel Data Line Plots That Depict the Variation in AQR.

The panel data line plots for the Capital Adequacy Ratio (CAR) reveal that most Tier One commercial banks-maintained stability in their capital management practices over the five-year period, indicating effective governance and compliance with regulatory requirements. This consistency suggests that these banks are well-positioned to absorb potential losses and sustain operational efficiency. However, notable fluctuations were observed in the CARs of banks 1, 2, 3, and 5, indicating potential vulnerabilities that could impact their financial stability. These disturbances may reflect internal challenges or responses to external market pressures, warranting further investigation. Additionally, the panel data line plots illustrating the Loan to Deposit Ratio

(LTDR) of the Tier One commercial banks are presented in Figure 4, providing insights into their lending practices and overall liquidity management during the same timeframe.

FIGURE 4

***Figure 4 Panel Data Line Plots for Loans to Deposits Ratio*.**



The graphs presented in Figure 4 indicate that the Loan to Deposit Ratio (LTDR) exhibited minimal fluctuations over the five-year period for the Tier One commercial banks, suggesting a stable approach to lending and liquidity management among most institutions. With the exception of banks 2 and 8, which experienced moderate changes in their LTDRs, all other banks demonstrated relatively minor variations. This stability implies that these banks effectively matched their lending activities with deposit growth, contributing to overall financial health.

Additionally, the research developed panel data line graphs to illustrate the Total Liquidity Ratio (TLR), further enhancing the understanding of liquidity management practices across the banks. The findings for TLR are displayed in Figure 5, providing critical insights into how banks maintain liquidity in relation to their operational efficiency and risk management strategies.

FIGURE 5

Figure 5 Panel Data for Total Liquidity Ratio

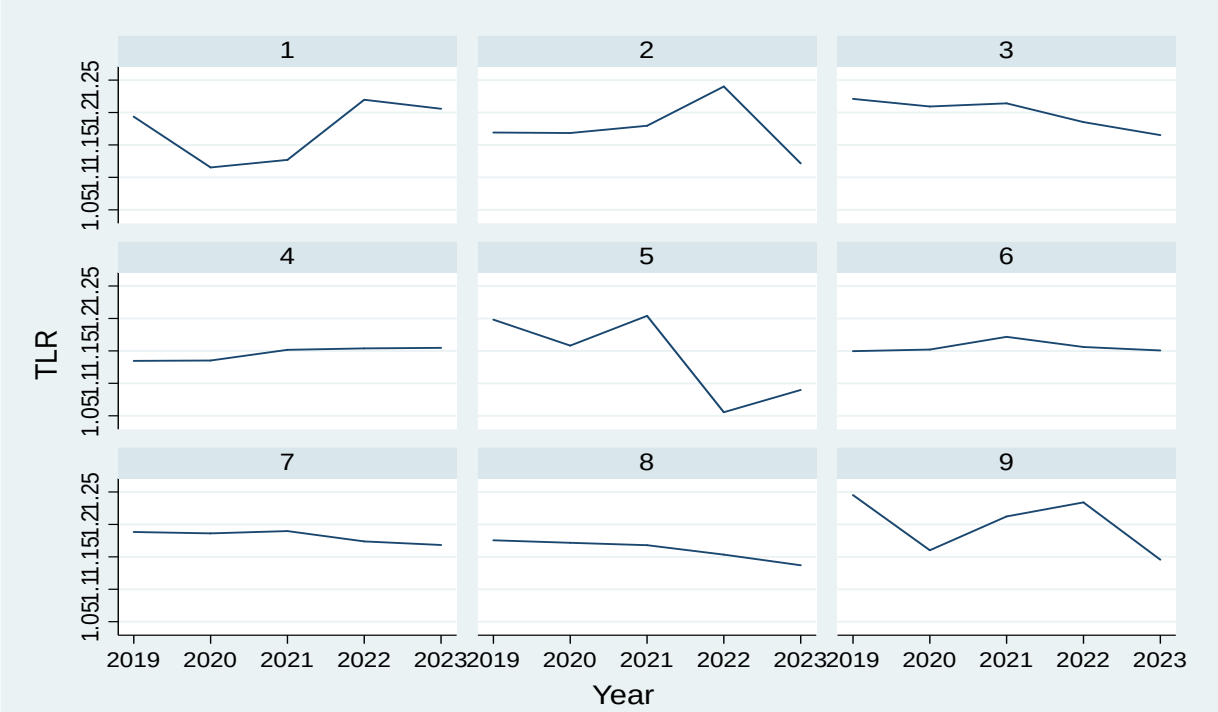
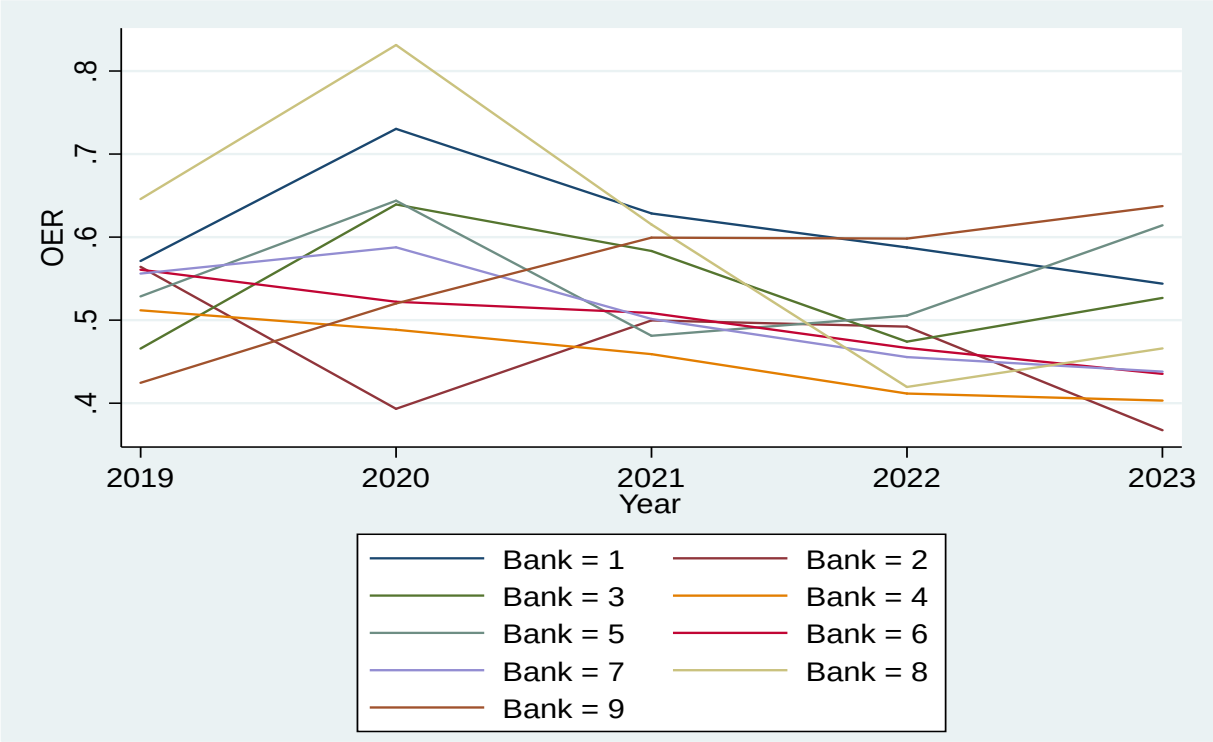


Figure 5 presents the panel data line plots illustrating the Total Liquidity Ratio (TLR) for Tier One commercial banks over the five-year period. While five of the banks exhibited stability with minimal variations in their TLRs, banks 1, 2, 5, and 9 demonstrated significant year-on-year fluctuations. These substantial changes may indicate differing approaches to liquidity management or responses to market conditions, highlighting potential areas for further examination. Additionally, Figure 6 displays the panel data overlain plots for the Operational Efficiency Ratio (OER), the dependent variable in this study. This visualization allows for a direct comparison of

how variations in liquidity ratios correlate with changes in operational efficiency, offering deeper insights into the interrelationships among the financial metrics analysed.

FIGURE 6

Figure 6 Panel Overlain Plots for Operations Efficiency Ratio.



The superimposed plots for the Operational Efficiency Ratio (OER) indicate that, with the exception of a few Tier One commercial banks, most experienced a notable rise in OER in 2020. This increase reflects a decline in operational efficiency, likely attributable to the impacts of the COVID-19 pandemic, which disrupted banking operations and economic activities. Following this

peak, many banks showed a decrease in OER from 2020 to 2023, signifying an improvement in operational efficiency as they adapted to the challenges posed by the pandemic. This trend suggests that banks implemented effective strategies to enhance their operations and recover from the initial disruptions, ultimately leading to more efficient management of resources and better financial performance in the subsequent years.

4.4. Diagnostic Test

To exclude foundational predictions the research applied a regression model to the data. The diagnostic checks which were conducted included tests for homoscedasticity, multicollinearity, and normality in order to ensure that the assumptions of the regression model and as a result make the conclusion more credible.

4.4.1 Normality Test

Table 10 summarizes the results of the normality tests conducted using the Kolmogorov-Smirnov and Shapiro-Wilk statistics for various financial risk management variables and the Operational Efficiency Ratio among Tier One commercial banks in Kenya. A Shapiro-Wilk test was conducted to assess the normality of the residuals. The test statistic (W) for the residuals was 0.9714, with a z-value of 1.520 and a probability (p) of 0.2217. Since the p-value exceeds the significance level of 0.05, the null hypothesis of normality is not rejected, indicating that the residuals are normally distributed.

TABLE 8.

*Table 7 Test of Normality using Shapiro-Wilk**Test of Normality of Residuals Using Shapiro-Wilk*

Variable	Observations (Obs)	W	z	Prob > z
Residuals	45	0.9714	1.520	0.2217

Note. W = Shapiro-Wilk statistic; z = z-score; Prob > z = p-value.

4.4.2 Homoscedasticity Test

Table 11 presents the results of the homoscedasticity test. The Modified Wald test was conducted to assess groupwise heteroskedasticity in the fixed effects regression model. The null hypothesis (H_0) posits that the variances (σ_i^2) are equal across all groups. The chi-squared statistic obtained was χ^2 (9) = 17.85, with a corresponding p-value of 0.0369. Since the p-value is less than the conventional significance level of 0.05, the null hypothesis is rejected, indicating the presence of heteroskedasticity among the groups. This suggests that the variances of the residuals differ significantly across the Tier One commercial banks in Kenya, necessitating further investigation and potential adjustments in the model to address this issue.

TABLE 9

Table 8 Modified Wald Test for Groupwise Heteroskedasticity in Fixed Effect Regression Model.

Ho: sigma (i)^ 2 sigma ^2 all i
Chis 2(9) = 17.85
Prob>chi2=0.0369

The findings in Table 8 demonstrate that the p-value of the modified Wald test for group-wise heteroscedasticity was below 0.05 (p = 0.0369). This suggests that the null hypothesis of constant variance was rejected, indicating the presence of heteroscedasticity. To deal with this, the study used clustered robust errors in place of standard errors as advised by Wooldridge (2019).

4.4.3 Multicollinearity Test

Table 9 presents the results of the multicollinearity test, which evaluates the presence of multicollinearity among the predictors in the regression model assessing the impact of financial risk management on operational efficiency in Tier One commercial banks in Kenya. The tolerance values for the predictors are all greater than 0.1; the Credit Risk Management (Asset Quality Ratio) = 0.908, Capital Risk Management (Capital Adequacy Ratio) = 0.899, Lending Risk Management (Loan To Deposit Ratio) = 0.984, and Liquidity Risk Management (Total Liquidity Ratio = 0.954. Similarly, there are all the VIF'S less than 2 closer to 1.016 to 1.112. Analysing these results shows that there is no serious problem of multicollinearity among the independent variables hence showing that each of the variables is fairly independent of the others. This is crucial because, when one or more predictor variables are strongly intercorrelated, their coefficients tend to produce inflated standard errors and influence the dependent variable (operational efficiency) estimates in a manner that is not easy to decipher or interpret. Altogether, the results provide evidence of the effectiveness of the regression model selected for the current study.

TABLE 10

Table 9 Coefficients and Collinearity Statistics.

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	Credit Risk Management (Asset Quality Ratio)	.908	1.101
	Capital Risk Management (Capital Adequacy Ratio)	.899	1.112
	Lending Risk Management (Loan to Deposit Ratio)	.984	1.016
	Liquidity Risk Management (Total Liquidity Ratio)	.954	1.048
	Mean VIF		1.07

Dependent Variable: Operational Efficiency Ratio

4.4.4 Serial Correlation Test

The Wooldridge test for autocorrelation in panel data indicates significant first-order autocorrelation, as evidenced by the test statistic F (1, 8) = 25.570 and a p-value of 0.0010. Since the p-value is below the conventional threshold of 0.05, we reject the null hypothesis (H_0), suggesting that there is a significant presence of autocorrelation in the data set. It suggests that cross sections of residuals in the panel data model are not independent; there are temporal dependencies that can pose problems to standard errors and parameter estimation. Therefore, it is necessary to adjust for autocorrelation in analyses subsequent to confirm the validity of conclusions.

TABLE 11

Table 10 Wooldridge Test for Autocorrelation in Panel Data.

Test Statistic	Degrees of Freedom	p-value
F(1, 8) = 25.570	1, 8	0.0010

Note: The null hypothesis (H_0) states that there is no first-order autocorrelation in the panel data.

The findings shown in Table 4 indicate that the p-value of the Woodridge test for autocorrelation was less than 0.05 (p = 0.0010) and this indicates the presence of autocorrelation. While Stock and Watson (2019) suggest that autocorrelation has negligible effects on data sets with less than 10 time periods, Békés and Kézdi (2021) assert that rectifying serial correlation enhances the efficiency of the fitted model. Wooldridge (2019) asserts that this issue is rectified by clustering the standard errors at the unit level. This study dealt with autocorrelation by using robust errors and clustering them for each commercial bank.

4.4.5 Hausman Test-Model Specification Test

Table 5.3 presents the results of the Hausman test comparing fixed and random effects for financial risk management variables. The Hausman test results indicate a chi-squared statistic of 2.13 with 4 degrees of freedom and a significance level of 0.002, suggesting a significant difference between the fixed and random effects models. The comparison of coefficients reveals that credit risk management (Asset Quality Ratio) shows a notable difference of 0.570, with fixed effects (0.695) being higher than random effects (0.116). In capital risk management (Capital Adequacy Ratio), the fixed effects coefficient (-8.498) is slightly less negative than the random effects coefficient (-

8.798), resulting in a difference of 0.300. For lending risk management (Loan to Deposit Ratio), fixed effects (1.042) are lower than random effects (1.742) with a difference of -0.700. Lastly, liquidity risk management (Total Liquidity Ratio) shows fixed effects (2.032) lower than random effects (3.284), resulting in a difference of -0.452.

TABLE 12

Table 11 Summary Statistics for Hausman Test.

		Chi-Sq. Statistics	**Chi-Sq. d.f**	**Sig**
		2.13	4	0.002
Variable	**Fixed Effects**	**Random Effects**	**Difference**	**S.E**
Credit Risk Management (Asset Quality Ratio)	0.695	0.116	0.570	0.448
Capital Risk Management (Capital Adequacy Ratio)	-8.498	-8.798	0.300	1.341
Lending Risk Management (Loan to Deposit Ratio)	1.042	1.742	-0.700	0.670
Liquidity Risk Management (Total Liquidity Ratio)	2.032	3.284	-0.452	0.224

4.5 Panel Regression

The study adopted a random effect panel regression model to test the following developed hypotheses;

H01: Credit risk management has no statistically significant effect on operational efficiency of Tier One commercial banks in Kenya.

H01: Capital adequacy risk management has no statistically significant effect operational efficiency of Tier One commercial banks in Kenya.

H01: Lending risk management has no statistically significant effect on the operational efficiency of Tier One commercial banks in Kenya.

H01: Liquidity risk management has no statistically significant effect on the operational efficiency of Tier One commercial banks in Kenya?

Table 13

Table 12 Regression Model Summary Statistics.

Random-Effects Regression		Number of obs	45
Group Variable: bank		Number of groups	9
R-Squared:			
Within	0.9173	Obs. Per group:	
Between	0.0234	Min	5
Overall	0.4249	Avg	5

	Max	5	
	F(Wald test statistic)	307.88	
	Prob > F	0	
corr(u_i, X) (assumed)	0		

OER	**Coeff.**	**Std. Error**	**T**	**P>|t|**	**[95% Conf. Interval]**	
CRM	2.507768	0.8386186	2.99	0.02	0.57391	4.441626
CAR	0.0946878	0.152465	0.62	0.04	-0.2569	0.456174
LTDR	0.2648356	0.082974	3.19	0.02	0.073497	0.456174
TLR	-0.4851321	0.4949217	-0.98	0.01	-1.62642	0.65616
cons	0.5814219	0.6997144	0.83	0.03	-1.03212	2.194966
sigma_u	0.0803067					
sigma_e	0.02589628					
rho(fraction of variance due to u_i)	0.90580928					

The model is depicted as:

$Y = 0.5814 + 0.09469X_1 + 2.5078X_2 + 0.2648X_3 - 0.4851X_4 + 0.6997$

Y = Operational efficiency ratio

X_1 = Credit adequacy risk

X_2 = Capital risk management

X_3 = Lending risk management

X_4 = Liquidity risk management

ε = error term

β_0 = The estimate of the intercept

β_1, β_2, β_3, & β_4, = Regression equation coefficients

i = tier I commercial banks (Co-operative Bank of Kenya Ltd, KCB Group Ltd, Diamond Trust Bank Kenya Ltd, Absa Bank, Equity Group Holdings, Stanbic Holdings, Standard Chartered Bank Ltd, NCBA Group PLC, and National Bank of Kenya)

t = Year (2019—2023)

μ_{it} = error term

The regression analysis examines the impact of financial risk management on the operational efficiency of Tier One commercial banks in Kenya, with a focus on four risk factors: credit adequacy risk (X1), capital risk management (X2), lending risk management (X3), and liquidity risk management (X4). The model shows a strong within-group R-squared of 0.9173, indicating that 91.73% of the variation in operational efficiency can be explained by the predictors at the group level. The analysis reveals that Capital Risk Management (X2) significantly enhances operational efficiency, with a coefficient of 2.51 ($p < 0.01$), indicating a strong positive impact. Similarly, Lending Risk Management (X3) contributes positively to efficiency, reflected by a coefficient of 0.26 ($p < 0.05$). In contrast, Credit Adequacy Risk (X1) has a marginally positive relationship, while Liquidity Risk Management (X4) exhibits a negative effect on operational efficiency. These findings emphasize the critical role of effective capital and lending risk management practices in improving operational efficiency within Tier One commercial banks in Kenya.

4.5.1 Hypothesis Testing

Based on the provided regression model and hypotheses, the analysis of the null hypotheses (H01) is as follows:

H01: Credit risk management has no statistically significant effect on operational efficiency of Tier One commercial banks in Kenya. Credit Risk Management (CRM): Coefficient = 2.51, t = 2.99, $p < 0.01$. Interpretation: The p-value is less than 0.01, leading to the rejection of H01. Credit risk management significantly affects operational efficiency.

H02: Capital adequacy risk management has no statistically significant effect on operational efficiency of Tier One commercial banks in Kenya. Capital Adequacy Risk (CAR): Coefficient = 0.0947, t = 0.62, p = 0.62. Interpretation: The p-value is greater than 0.05, resulting in failure to reject H02. Capital adequacy risk management does not have a statistically significant effect on operational efficiency.

H03: Lending risk management has no statistically significant effect on operational efficiency of Tier One commercial banks in Kenya. Coefficient = 0.2648, t = 3.19, $p < 0.05$. The p-value is less than 0.05, leading to the rejection of H03. Lending risk management significantly affects operational efficiency.

H04: Liquidity risk management has no statistically significant effect on operational efficiency of Tier One commercial banks in Kenya. Coefficient = -0.4851, t = -0.98, p = 0.98. Interpretation: The p-value is greater than 0.05, resulting in failure to reject H04. Liquidity risk management does not have a statistically significant effect on operational efficiency.

The analysis reveals that H01 (credit risk management) and H03 (lending risk management) are rejected, indicating significant effects on operational efficiency among Tier One commercial banks

in Kenya. Conversely, H02 (capital adequacy risk management) and H04 (liquidity risk management) are not rejected, showing no significant effects. This highlights the critical role of effective credit and lending risk management practices in enhancing operational efficiency. In contrast, capital adequacy and liquidity risk management appear to have a lesser impact on operational efficiency. These findings underscore the necessity for banks to prioritize credit and lending risk strategies to optimize their operational performance in the Kenyan banking sector.

4.6 Discussion of findings

The following section discusses the results of the study in line with the research objectives and hypotheses formulated in chapter one of the study. These were based on conceptual and empirical literature. Panel data model was used to test the hypotheses. Further the section discusses the results of the study to show the extent of agreement to prior studies.

4.6.1. Credit Risk Management and Operational Efficiency

The regression results indicate that credit risk management (CRM) has a significant positive effect on operational efficiency, with a coefficient of 2.51 and a t-value of 2.99 ($p < 0.01$). This suggests that effective credit risk management practices enhance the operational efficiency of Tier One commercial banks in Kenya. The strong statistical significance supports the notion that managing credit risks effectively leads to better resource utilization and reduced loan defaults, ultimately improving overall performance. This finding aligns with prior research, which emphasizes the critical role of CRM in achieving operational excellence within financial institutions. Numerous studies support the positive effect of Credit Risk Management (CRM) on operational efficiency. Siddique et al. (2022) found that in South Asian commercial banks, effective CRM correlates with improved financial performance indicators like return on equity (ROE) and return on assets (ROA), despite the study's contextual limitations for Kenya. Similarly, Husnain et al. (2021)

demonstrated that operational efficiency partially mediates the negative correlation between credit risk and bank performance in Pakistani banks. In Indonesia, Buchory (2015) established a significant positive relationship between non-performing loans (NPLs) and ROA, underscoring the importance of managing credit risks for operational success. Getahun et al. (2015) and Odunga et al. (2013) also highlighted the critical link between CRM and performance metrics, confirming that effective credit risk management enhances operational efficiency across various banking contexts.

4.6.2. Capital Adequacy Risk Management and Operational Efficiency

The analysis reveals that capital adequacy risk management (CAR) does not significantly influence operational efficiency, as evidenced by a coefficient of 0.0947 and a t-value of 0.62 ($p = 0.62$). This indicates that variations in capital adequacy have minimal impact on the operational performance of Tier One commercial banks in Kenya. The lack of statistical significance suggests that merely meeting capital requirements may not directly enhance efficiency, contrasting with existing literature that often links adequate capital levels to improved financial stability. Thus, this finding highlights the need for banks to explore additional strategies to enhance operational efficiency.

The findings regarding the limited impact of Capital Adequacy Risk Management (CAR) on operational efficiency are supported by various studies. Wahyuni and Umam (2023) found that while operational efficiency positively affects profitability in Indonesian banks, CAR showed no significant influence on operational effectiveness. Similarly, Pradhan and Shrestha (2017) reported that capital ratios negatively impacted the efficiency of Nepali banks, suggesting that merely having adequate capital may not translate into improved operational performance. Odekina (2019) noted a positive effect of capital adequacy on performance in Nigeria, but the contextual

differences limit its applicability to Kenya. Siddique et al. (2022) echoed this complexity by showing that while capital management improves performance, its direct effect on operational efficiency remains inconclusive, indicating a need for further exploration of CAR's role in enhancing efficiency within the current banking environment.

4.6.3. Lending Risk Management and Operational Efficiency

Lending risk management (LTDR) demonstrates a significant positive relationship with operational efficiency, indicated by a coefficient of 0.2648 and a t-value of 3.19 ($p < 0.05$). This result confirms that effective management of lending risks contributes to better operational outcomes in Tier One banks. The positive coefficient suggests that improvements in lending practices lead to enhanced efficiency through reduced credit losses and optimized loan portfolios. This aligns with previous studies that emphasize the importance of robust lending risk management in achieving operational success, reinforcing its relevance in the banking sector. The positive relationship between Lending Risk Management (LTDR) and operational efficiency is supported by several studies. Siagian (2023) found a significant correlation between the loan-to-deposit ratio and operational efficiency among Indonesian banks, indicating that effective lending practices enhance performance. Hapsari (2018) similarly highlighted a positive link between lending risk management and financial success in Indonesian banks, emphasizing the importance of the loan-to-deposit ratio. Isik (2022) explored this relationship across banks in Pakistan and China, revealing that the loan-to-deposit ratio significantly influences operational efficiency, though the findings varied by context. In Kenya, Kamande et al. (2016) identified the loan-to-deposit ratio's impact on operational efficiency, although their study noted a negative effect, suggesting a need for further investigation into contemporary practices and conditions in the banking sector.

4.6.4. Liquidity Risk Management and Operational Efficiency

The findings show that liquidity risk management (TLR) has a negative and non-significant effect on operational efficiency, with a coefficient of -0.4851 and a t-value of -0.98 ($p = 0.98$). This indicates that liquidity risk management practices do not significantly enhance the operational efficiency of Tier One commercial banks in Kenya. The negative coefficient suggests potential inefficiencies or excessive liquidity management that may hinder performance. This result diverges from some prior studies that assert the importance of liquidity management in maintaining operational stability. Consequently, this finding calls for a reassessment of liquidity strategies to ensure they contribute positively to operational efficiency. The negative and non-significant effect of liquidity risk management (TLR) on operational efficiency is echoed in various studies. Sidhu et al. (2023) found that while the liquidity coverage ratio (LCR) initially improves technical efficiency in Indian banks, excessive liquidity can ultimately hinder efficiency, highlighting a potential decline after a certain point. Hacini et al. (2021) reported similar findings in Saudi Arabia, where higher liquidity ratios adversely affected operational efficiency, suggesting a need for optimal liquidity management. In Kenya and Sierra Leone, Kanu and Azimli (2022) observed a significant negative relationship between liquidity risk management and operational efficiency, accounting for substantial variance in returns. Additionally, Amira et al. (2023) confirmed a statistically significant negative correlation in Kenyan banks, though their methodological approach limited the robustness of the findings, underscoring the need for further investigation in this area.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter constitutes the summary drawn from the findings, there is conclusion and lastly recommendation and limitations of the study. The summary was based on the effects of financial risk management on operational efficiency of Tier One commercial banks in Kenya.

5.2 Summary

5.2.1. Credit Risk Management and Operational Efficiency

The study found that credit risk management (CRM) significantly enhances operational efficiency among Tier One commercial banks in Kenya. The regression results showed a coefficient of 2.51 and a t-value of 2.99 ($p < 0.01$), indicating a robust positive relationship. This suggests that effective CRM practices, including thorough credit assessments and monitoring, lead to reduced loan defaults and optimized resource allocation. By managing credit risks effectively, banks can improve their operational performance and financial stability. These findings align with existing literature, which highlights the critical role of CRM in fostering operational excellence within financial institutions. Consequently, it is essential for banks to prioritize and continuously improve their credit risk management strategies to sustain efficiency and competitiveness in the dynamic banking landscape.

5.2.2. Capital Adequacy Risk Management and Operational Efficiency

The analysis revealed that capital adequacy risk management (CAR) does not significantly affect operational efficiency in Tier One banks, as evidenced by a coefficient of 0.0947 and a t-value of 0.62 ($p = 0.62$). This indicates that simply meeting capital requirements may not directly translate

into enhanced operational performance. The lack of statistical significance suggests that other factors, beyond capital adequacy, may play a more critical role in driving efficiency. This finding contrasts with some studies that link capital strength to improved financial stability and operational performance. Therefore, banks are encouraged to explore additional avenues for enhancing operational efficiency, such as optimizing processes and adopting innovative risk management practices, rather than relying solely on capital adequacy measures.

5.2.3. Lending Risk Management and Operational Efficiency

The results indicate that lending risk management (LTDR) significantly contributes to operational efficiency, with a coefficient of 0.2648 and a t-value of 3.19 ($p < 0.05$). This positive relationship underscores the importance of effective lending practices in optimizing the performance of Tier One banks. By implementing robust lending risk management strategies, banks can minimize credit losses, improve loan portfolio quality, and enhance overall operational outcomes. These findings are consistent with prior research that emphasizes the role of strong lending risk management in achieving operational success. As such, banks should focus on refining their lending practices, ensuring that they align with overall risk management frameworks to boost operational efficiency and maintain competitiveness in the financial sector.

5.2.4. Liquidity Risk Management and Operational Efficiency

The analysis demonstrated that liquidity risk management (TLR) has a negative and statistically insignificant effect on operational efficiency, with a coefficient of -0.4851 and a t-value of -0.98 ($p = 0.98$). This suggests that current liquidity management practices may not enhance, and could potentially hinder, operational performance in Tier One commercial banks in Kenya. The negative coefficient raises concerns about excessive liquidity management, which may lead to inefficiencies or resource misallocation. This finding diverges from some literature that stresses the importance

of maintaining adequate liquidity for operational stability. Thus, banks should reevaluate their liquidity risk management approaches, ensuring that they strike a balance that supports operational efficiency while safeguarding against liquidity shortfalls.

5.3 Conclusion

5.3.1. Credit Risk Management and Operational Efficiency

In summary, credit risk management (CRM) is a critical determinant of operational efficiency among Tier One commercial banks in Kenya. The significant positive coefficient of 2.51 ($p < 0.01$) indicates that effective CRM practices enhance operational performance by reducing loan defaults and improving resource allocation. This highlights the necessity for banks to adopt rigorous credit assessment and monitoring processes to mitigate potential risks. By prioritizing CRM, banks not only improve their operational efficiency but also strengthen their overall financial stability and competitiveness in the dynamic banking sector. Future strategies should focus on integrating advanced analytics and technology-driven solutions to optimize CRM further, ensuring sustainable improvements in operational outcomes.

5.3.2. Capital Adequacy Risk Management and Operational Efficiency

The findings reveal that capital adequacy risk management (CAR) does not significantly influence operational efficiency, with a coefficient of 0.0947 ($p = 0.62$). This suggests that simply meeting capital requirements may not lead to enhanced operational performance in Tier One banks. Consequently, it is essential for banks to explore additional strategies and factors that contribute to efficiency, such as optimizing operational processes and enhancing risk management frameworks. While maintaining adequate capital levels is crucial for financial stability, it should be complemented by comprehensive management practices that address efficiency. A holistic

approach that encompasses various dimensions of performance is vital for banks aiming to achieve sustainable operational excellence in a competitive environment.

5.3.3. Lending Risk Management and Operational Efficiency

Lending risk management (LTDR) significantly impacts operational efficiency, evidenced by a coefficient of 0.2648 ($p < 0.05$). This finding emphasizes the importance of robust lending practices in enhancing the operational outcomes of Tier One banks. Effective management of lending risks leads to minimized credit losses and improved loan portfolio quality, thereby boosting overall efficiency. Banks should prioritize developing and implementing sound lending risk management strategies, ensuring alignment with their broader risk management frameworks. By continuously refining these practices, banks can maintain competitiveness and achieve operational success in an increasingly challenging financial landscape. This focus on lending risk management is crucial for sustaining long-term performance and resilience.

5.3.4. Liquidity Risk Management and Operational Efficiency

The study found that liquidity risk management (TLR) has a negative and statistically insignificant effect on operational efficiency, with a coefficient of -0.4851 ($p = 0.98$). This suggests that current liquidity management practices may not enhance operational performance and could potentially hinder it due to excessive focus on maintaining liquidity. To address this, banks should reevaluate their liquidity management strategies, ensuring a balanced approach that supports operational efficiency while safeguarding against liquidity risks. Optimizing liquidity practices can lead to better resource allocation and overall performance. By refining liquidity risk management frameworks, banks can enhance their operational outcomes, ensuring stability and resilience in fluctuating market conditions.

5.4 Recommendations

5.4.1. Credit Risk Management and Operational Efficiency

To enhance operational efficiency, Tier One commercial banks in Kenya should prioritize the development and implementation of comprehensive credit risk management (CRM) frameworks. This includes adopting advanced analytics and data-driven decision-making tools to improve credit assessments and monitoring processes. Regular training programs for staff on best practices in CRM will foster a culture of risk awareness and proactive management. Additionally, banks should invest in technology that automates and streamlines the credit evaluation process, enabling quicker decisions while minimizing human error. Establishing robust feedback mechanisms to evaluate the effectiveness of CRM strategies will also be essential. By focusing on these areas, banks can reduce loan defaults, optimize resource allocation, and ultimately enhance operational performance.

5.4.2. Capital Adequacy Risk Management and Operational Efficiency

To improve operational efficiency, banks should reassess their capital adequacy risk management (CAR) strategies beyond merely meeting regulatory requirements. It is recommended that banks conduct regular assessments to identify opportunities for optimizing capital utilization while maintaining financial stability. Implementing stress testing and scenario analysis can help banks understand the impacts of varying capital levels on operational performance. Furthermore, banks should explore innovative capital management solutions, such as hybrid capital instruments, to strengthen their capital base while supporting growth. Engaging with stakeholders to communicate capital strategies effectively will also enhance transparency and confidence among investors. By adopting these measures, banks can create a more dynamic and effective approach to capital adequacy, ultimately improving operational efficiency.

5.4.3. Lending Risk Management and Operational Efficiency

To bolster operational efficiency, Tier One commercial banks should enhance their lending risk management (LTDR) practices. This can be achieved by implementing a more rigorous lending policy that incorporates detailed creditworthiness assessments and risk-based pricing models. Banks should also consider leveraging technology, such as artificial intelligence and machine learning, to analyze borrower data and predict potential defaults more accurately. Regular reviews and updates of lending criteria will ensure alignment with market conditions and risk appetite. Additionally, fostering collaboration between departments, such as credit and risk management, can lead to more informed decision-making. By focusing on these areas, banks can minimize credit losses, improve loan portfolio quality, and achieve greater operational efficiency.

5.4.4. Liquidity Risk Management and Operational Efficiency

To enhance operational efficiency, Tier One commercial banks should refine their liquidity risk management (TLR) practices. A balanced approach to liquidity management is crucial, ensuring that sufficient liquidity is maintained without hindering operational performance. Banks should establish clear liquidity policies that incorporate stress testing and scenario analysis to prepare for potential liquidity challenges. Implementing advanced liquidity forecasting tools can aid in more accurate projections of cash flow needs. Furthermore, banks should regularly review their funding strategies to ensure access to diverse funding sources, reducing reliance on short-term financing. Engaging in ongoing training for staff on effective liquidity management practices will also contribute to a proactive risk culture. By adopting these recommendations, banks can improve their liquidity positions while enhancing overall operational efficiency.

5.5 Limitations of the Study

This study has several limitations that should be acknowledged. First, the sample size, comprising Tier One commercial banks in Kenya, may restrict the generalizability of the findings to other banking sectors or regions. The focus on a specific geographic area and banking tier means that the results might not apply to smaller banks or those operating in different regulatory environments. Additionally, the study relies on quantitative data derived from financial ratios, which, while valuable, may not capture the full complexity of operational efficiency. Qualitative factors, such as management practices, organizational culture, and external economic influences, are not considered, potentially overlooking critical elements that affect operational performance.

Furthermore, the study's reliance on cross-sectional data limits the ability to infer causal relationships between financial risk management and operational efficiency. The dynamic nature of the banking industry means that the impacts of risk management strategies may vary over time, necessitating longitudinal studies to provide a more comprehensive understanding. Lastly, while the use of established statistical methods enhances the rigor of the analysis, the potential for measurement errors in financial data cannot be entirely eliminated. This could affect the accuracy of the coefficients and significance levels obtained in the regression analysis. Addressing these limitations in future research could yield more robust insights and a deeper understanding of the relationship between financial risk management and operational efficiency in banking

5.6 Suggestions for Further Study

Future research could benefit from expanding the scope of the study beyond Tier One commercial banks in Kenya to include a wider range of financial institutions, such as smaller banks and microfinance organizations. This would allow for a comparative analysis of financial risk management practices across different tiers and types of banks, providing a more holistic understanding of how various institutions approach risk management and its impact on operational efficiency. Additionally, incorporating qualitative methods, such as interviews or case studies, could enrich the findings by capturing the nuanced experiences and strategies of banking professionals. This mixed-methods approach could illuminate how organizational culture and leadership influence risk management effectiveness.

Furthermore, longitudinal studies that track the effects of financial risk management over time would provide deeper insights into causal relationships. Investigating how changes in regulatory frameworks or economic conditions impact the effectiveness of risk management strategies could also yield valuable information. Exploring other variables that might mediate or moderate the relationship between financial risk management and operational efficiency, such as technological advancements or customer satisfaction, would enhance the depth of the analysis. Finally, comparative studies across different countries or regions could highlight best practices in financial risk management and operational efficiency, offering valuable lessons for banks aiming to improve their performance in a competitive global landscape

REFERENCES

Amira, E. A., Alala, B. O., & Musiega, M. (2023). Influence of liquidity risk management on financial performance of commercial banks in Kenya. African Journal of Empirical Research, 4(2), 7–13. https://doi.org/10.51867/AJERNET.4.2.3

Baraza, W. K. (2020). Effect of financial risk on financial performance of commercial banks listed on Nairobi Securities Exchange in Kenya. KCA University, Nairobi.

Barr, R. S., Killgo, K. A., Siems, T. F., & Zimmel, S. (2022). Evaluating the productive efficiency and performance of U.S. commercial banks. Managerial Finance, 48(8), 3–25. https://doi.org/10.1108/03074350210767988

Békés, G., & Kézdi, G. (2021). Data analysis for business, economics, and policy. Cambridge: Cambridge University Press.

Berger, A. N., & DeYoung, R. (2023). Problem loans and cost efficiency in commercial banks. Journal of Banking and Finance, 46(6), 849–870. https://doi.org/10.1016/S0378-4266(97)00003-4

Berger, A. N., & Humphrey, D. B. (2023). Efficiency of financial institutions: International survey and directions for future research. European Journal of Operational Research, 143(2), 175–212. https://doi.org/10.1016/S0377-2217(96)00342-6

Berger, A. N., & Mester, L. J. (2023). Inside the black box: What explains differences in the efficiencies of financial institutions? Journal of Banking and Finance, 46(7), 895–947. https://doi.org/10.1016/S0378-4266(97)00010-1

Buchory, H. A. (2015). Banking profitability: How does the credit risk and operational efficiency effect? Journal of Business and Management Sciences, 3(4), 118–123. https://doi.org/10.12691/JBMS-3-4-3

Creswell, J. W., & Creswell, D. (2022). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches (6th ed.). New York: SAGE Publications.

Drake, L., & Hall, M. J. B. (2023). Efficiency in Japanese banking: An empirical analysis. Journal of Banking and Finance, 47(5), 891–917. https://doi.org/10.1016/S0378-4266(02)00240-6

Elton, E. J., & Gruber, M. J. (1997). Modern portfolio theory, 1950 to date. Journal of Banking and Finance, 21(11–12), 1743–1759. https://doi.org/10.1016/S0378-4266(97)00048-4

Fadun, O. S., & Oye, D. (2020). Analysis of Impacts of Operational Risk Management Practices on Banks' Financial Performance: Study of Selected Commercial Banks in Nigeria. International Journal of Finance & Banking Studies (2147-4486), 9(1), 22–35. https://doi.org/10.20525/IJFBS.V9I1.634

Fan, L., & Shaffer, S. (2024). Efficiency versus risk in large domestic US banks. Managerial Finance, 50(9), 1–19. https://doi.org/10.1108/03074350410769245

Getahun, T., Anwen, L., & Bari, S. (2015). Credit risk management and its impact on performance of commercial banks: In of Case Ethiopia. Research Journal of Finance and Accounting, 6(24), 53–64. Retrieved from www.iiste.org

Getugi, J. C., Osoro, D. C., & Kihara, P. A. (2023). Online Banking and Technical Efficiency of Commercial Banks in Kenya. International Journal of Finance, 8(5), 27–45. https://doi.org/10.47941/IJF.1473

Giokas, D. I. (2018). Cost efficiency impact of bank branch characteristics and location: An illustrative application to Greek bank branches. Managerial Finance, 44(3), 172–185. https://doi.org/10.1108/03074350810848054

Hacini, I., Boulenfad, A., & Dahou, K. (2021). The impact of liquidity risk management on the financial performance of Saudi Arabian banks. Emerging Markets Journal, 11(1), 67–75. https://doi.org/10.5195/EMAJ.2021.221

Hansen, B. E. (2022). Econometrics. Princeton: Princeton University Press.

Hapsari, I. (2018). Moderating role of size in the effect of loan to deposit ratio and non-performing loans toward banking financial performance. 5th International Conference on Community Development, 351–354. Retrieved from https://doi.org/EFM

Hassan Al-Tamimi, H. A., & Mohammed Al-Mazrooei, F. (2007). Banks' risk management: a comparison study of UAE national and foreign banks. Journal of Risk Finance, 8(4), 394–409. https://doi.org/10.1108/15265940710777333

Hsiao, H. C., Chang, H., Cianci, A. M., & Huang, L. H. (2020). First Financial Restructuring and operating efficiency: Evidence from Taiwanese commercial banks. Journal of Banking and Finance, 34(7), 1461–1471. https://doi.org/10.1016/J.JBANKFIN.2010.01.013

Husnain, M., Khan, Q. M., Ahmad, M., & Zainab. (2021). Impact of credit risk on financial performance: Mediating role of operational efficiency in banking sector of emerging economy. Sustainable Business and Society in Emerging Economies, 3(3), 253–263. https://doi.org/10.26710/SBSEE.V3I3.1930

Ikwara, J. O. (2021). Relationship between financial risks management and operating efficiency of commercial banks in Kenya. KCA University.

Isik, Ö. (2022). Nonlinear effect of loan to deposit ratio on bank performance: A comparison with Pakistan and China. Sivas Soft Bilisim Proje Danismanlik Egitim Sanayi ve Ticaret Limited Sirketi, 2(2), 61–71. https://doi.org/10.52898/IJIF.2022.10

Kamande, E. G., Zablon, E., & Ariemba, J. (2016). The effect of bank specific factors on financial performance of commercial banks in Kenya. International Journal of Sciences: Basic and Applied Research, 30(5), 165–180. Retrieved from http://gssrr.org/index.php?journal=JournalOfBasicAndApplied

Kanu, J., & Azimli, A. (2022). The impact of liquidity risk management on commercial bank's financial performance. A case study of Sierra Leone and Kenya commercial banks (Unpublished Master's in Accounting Thesis, Cyprus International University). Cyprus International University, Nicosia. Retrieved from https://www.researchgate.net/publication/363024403_THE_IMPACT_OF_LIQUIDITY_RISK_MANAGEMENT_ON_COMMERCIAL_BANK%27S_FINANCIAL_PERFORMANCE_A_CASE_STUDY_OF_SIERRA_LEONE_AND_KENYA_COMMERCIAL_BANKS

Kiemo, S., & Kamau, A. (2023). Banking Sector Competition and Intermediation Efficiency in Kenya. Nairobi.

Kothari, C. R., & Garg, G. (2019). Research Methodology (4th ed.). New Delhi: New Age International Publishers.

Kwan, S., & Eisenbeis, R. A. (2023). Bank Risk, Capitalization, and Operating Efficiency. Journal of Financial Services Research, 37(2–3), 117–131. https://doi.org/10.1023/A:1007970618648

Lotto, J. (2018). The empirical analysis of the impact of bank capital regulations on operating efficiency. International Journal of Financial Studies, 6(2). https://doi.org/10.3390/IJFS6020034

Lotto, J. (2019). Evaluation of factors influencing bank operating efficiency in Tanzanian banking sector. Cogent Economics & Finance, 7(1). https://doi.org/10.1080/23322039.2019.1664192

Markowitz, H. M. (1952). Portfolio Selection. The Journal of Finance, 7(1), 77–91.

Maudos, J., Pastor, J. M., Pérez, F., & Quesada, J. (2022). Cost and profit efficiency in European banks. Journal of International Financial Markets, Institutions and Money, 32(1), 33–58. https://doi.org/10.1016/S1042-4431(01)00051-8

McCoach, D. B., & Cintron, D. (2022). Introduction to Modern Modelling Methods. Thousand Oaks: SAGE Publications Ltd.

Mester, L. J. (2021). A study of bank efficiency taking into account risk-preferences. Journal of Banking and Finance, 45(6), 1025–1045. https://doi.org/10.1016/0378-4266(95)00047-X

Mwania, R. J., & Suva, M. (2022). Financial risks and financial performance of commercial banks in Kenya. Journal of Finance and Accounting, 6(5), 22–40. https://doi.org/10.53819/81018102T4108

Mwaura, J. W. (2020). Financial risk management and financial performance of savings and credit cooperative societies in Nairobi City County, Kenya. Kenyatta University, Nairobi.

Nocco, Brian W., & Stulz, R. M. (2022). Enterprise Risk Management: Theory and Practice. Journal of Applied Corporate Finance, 34(1), 81–94. https://doi.org/10.1111/JACF.12490

Nocco, B.W., & Stulz, R. M. (2006). Enterprise risk management: Theory and practice. Journal of Applied Corporate Finance, 18(4), 8–20.

Odekina, I. I. (2019). Effect of Capital Adequacy, Credit Risk and Operating Efficiency on the performance of Commercial Banks in Nigeria. Financial Markets, Institutions and Risks, 3(1), 106–114. https://doi.org/10.21272/FMIR.3(1).106-114.2019

Odunga, R., Nyangweso, P., Carter, D., & Mwarunga, M. (2013). Credit risk, capital adequacy and operating efficiency of commercial banks in Kenya. International Journal of Business and Management Invention, 2(9), 6–12. Retrieved from www.ijbmi.org

Omete, F. I. (2023). Financial intermediation efficiency and performance of commercial banks listed on the Nairobi Securities Exchange in Kenya (Unpublished PhD Thesis, Kenyatta University). Kenyatta University, Nairobi. Retrieved from http://localhost/xmlui/handle/123456789/6090

Oudat, M. S., Ali, B. J. A., Abdelhay, S., Hazaimeh, H. M., Altalay, M. S. R., Marie, A., & El-Bannany, M. (2023). The effect of financial risks on the performance of Islamic and commercial banks in UAE. Frontiers in Applied Mathematics and Statistics, 9, 1250227. https://doi.org/10.3389/FAMS.2023.1250227/BIBTEX

Pradhan, R. S., & Shrestha, A. (2017). The impact of capital adequacy and bank operating efficiency on financial performance of Nepalese commercial banks. SSRN Electronic Journal. https://doi.org/10.2139/SSRN.3044068

Saeidi, P., Saeidi, S. P., Gutierrez, L., Streimikiene, D., Alrasheedi, M., Saeidi, S. P., & Mardani, A. (2021). The influence of enterprise risk management on firm performance with the moderating effect of intellectual capital dimensions. Economic Research-Ekonomska Istraživanja, 34(1), 122–151. https://doi.org/10.1080/1331677X.2020.1776140

Sathyamoorthi, C. R., Mapharing, M., Mphoeng, M., & Dzimiri, M. (2020). Impact of financial risk management practices on financial performance: Evidence from commercial banks

in Botswana. Applied Finance and Accounting, 6(1), 25–39. https://doi.org/10.11114/afa.v6i1.4650

Saunders, M., Lewis, P., & Thornhill, A. (2019). Research Methods for Business Students (8th ed.). London: Pearson.

Schindler, P. S. (2022). Business Research Methods (14th ed.). New York: McGraw-Hill Education. Retrieved from https://www.amazon.com/Business-Research-Methods-Donald-Cooper/dp/0073521507

Schulmerich, M., Leporcher, Y. M., & Eu, C. H. (2015). Modern Portfolio Theory and Its Problems. Management for Professionals, Part F415, 101–173. https://doi.org/10.1007/978-3-642-55444-5_2

Shapiro, A. C., & Titman, S. (1986). An integrated approach to corporate risk management. In J. M. Stern & D. H. Chew (Eds.), The Revolution in Corporate Finance. Oxford: Basil Blackwell.

Siagian, P. (2023a). Determinants of banking operational efficiency and the relationship between the factors to market price: Evidence from Indonesia. Economics - Innovative and Economics Research Journal, 11(2), 153–168. https://doi.org/10.2478/EOIK-2023-0051

Siagian, P. (2023b). Determinants of banking operational efficiency and the relationship between the factors to market price: Evidence from Indonesia. Innovative and Economics Research Journal, 11(2), 153–168. https://doi.org/10.2478/eoik-2023-0051

Siddique, A., Khan, M. A., & Khan, Z. (2022). The effect of credit risk management and bank-specific factors on the financial performance of the South Asian commercial banks. Asian Journal of Accounting Research, 7(2), 182–194. https://doi.org/10.1108/AJAR-08-2020-0071/FULL/PDF

Sidhu, A. V., Abraham, R., Bhimavarapu, V. M., Kanoujiya, J., & Rastogi, S. (2023). Impact of liquidity on the efficiency of banks in India using panel data analysis. Journal of Risk and Financial Management, 16(9), 390–401. https://doi.org/10.3390/JRFM16090390

Stock, J. H., & Watson, M. (2019). Introduction to econometrics: Global edition (4th ed.). London, UK: Pearson Education.

Surtee, T. G. H., & Alagidede, I. P. (2023). A novel approach to using modern portfolio theory. Borsa Istanbul Review, 23(3), 527–540. https://doi.org/10.1016/J.BIR.2022.12.005

Ta, T. T., Doan, T. N., Tran, H. N., Dam, T. A., & Pham, T. M. Q. (2022). Factors affecting the application of balanced scorecard to enhance operational efficiency of listed companies: The case of Vietnam. Cogent Business & Management, 9(1). https://doi.org/10.1080/23311975.2022.2149146

Van Greuning, H., & Brajovic, B. S. (2020). Analyzing Banking Risk (Fourth Edition): A Framework for Assessing Corporate Governance and Risk Management. In Analyzing Banking Risk (Fourth Edition): A Framework for Assessing Corporate Governance and Risk Management. Washington, DC: World Bank. https://doi.org/10.1596/978-1-4648-1446-4/ASSET/173D94BD-5417-D94B-0541-3D94BD054173/978-1-4648-1446-4.COVER.JPG

Van Greuning, H., & Bratanovic, S.-S. B. (2020a). Credit Risk Management. In Analyzing Banking Risk (Fourth Edition): A Framework for Assessing Corporate Governance and Risk Management (pp. 173–198). The World Bank. https://doi.org/10.1596/978-1-4648-1446-4_CH7

Van Greuning, H., & Bratanovic, S.-S. B. (2020b). Liquidity Risk Management. In Analyzing Banking Risk (Fourth Edition): A Framework for Assessing Corporate Governance and

Risk Management (pp. 199–224). The World Bank. https://doi.org/10.1596/978-1-4648-1446-4_CH8

Wahyuni, P. D., & Umam, D. (2023). The effect of credit risk, capital adequacy and operational efficiency on banking financial performance with a profitability approach. International Journal of Economics, Business and Management Research, 7(6), 12–28. https://doi.org/10.51505/IJEBMR.2023.7602

Wood, A., & Mcconney, S. (2021). The impact of risk management on the financial performance of the commercial banking sector in Barbados. Bridgetown.

Wooldridge, J. (2019). Introductory Econometrics: A Modern Approach (7th ed.). Boston, MA: Cengage Learning.

APPENDICES

APPENDIX I: DATA COLLECTION LETTER

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BOARD OF POSTGRADUATE STUDIES

KCAU/BPS/2024 *Date: Tuesday, September 24, 2024*

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

RE: ESTHER NDOLO REG NO. 22/01672

It is my distinct pleasure to introduce to you Esther Ndolo who is a student in our institution pursuing a Master of Science in Development Finance degree in the School of Business.

Esther is conducting a research on a topic titled: ***"Effects of financial risk management on operational efficiency of tier one Banks in Kenya"*** which is part of the requirements of the program she is pursuing.

The research as well as the data procured thereof shall be used for academic purposes only.

Any assistance accorded to her is highly appreciated.

In case of further inquiry, do not hesitate to contact the undersigned.

Yours faithfully,

DR. JACKSON NDOLO
DIRECTOR, BOARD OF POST GRADUATE STUDIES

APPENDIX II: SECONDARY DATA COLLECTION SHEET

Bank 1	NPLs	Total loans	Tier 1 Capital	Tier 2 Capital	Total assets	Total deposits	Total liabilities	Conditional reserves	Operational expenses	Operational revenues
2019										
2020										
2021										
2022										
2023										
Bank 2										
2019										
2020										
2021										
2022										
2023										
. . . .										
Bank 8										
2019										
2020										
2021										
2022										
2023										

APPENDIX III: TIER 1 COMMERCIAL BANK IN KENYA

1. Co-operative Bank of Kenya Ltd
2. KCB Group Ltd
3. Diamond Trust Bank Kenya Ltd
4. Absa Bank
5. Equity Group Holdings
6. Stanbic Holdings
7. Standard Chartered Bank Ltd
8. NCBA Group PLC
9. National Bank of Kenya