



Strathmore
UNIVERSITY

The Impact of Mobile Money on Bank Profitability in Kenya

Yegon Dominic Kiprono
115168

**Submitted in partial fulfillment of the requirements for the Degree of
Financial Economics at Strathmore University**

**Strathmore Institute of Mathematical Sciences
Strathmore University
Nairobi, Kenya**

February 2025

This Research Project is available for Library use on the understanding that it is copyright material and that no quotation from the Research Project may be published without proper acknowledgement.

DECLARATION

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

© No part of this Research Project may be reproduced without the permission of the author and Strathmore University

Yegon Dominic Kiprono..... [Name of Candidate]

[Signature]

3rd February 2025.....[Date]

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

Dr. Caroline Kariuki..... [Name of Supervisor]

 [Signature]

3rd February 2025..... [Date]

Strathmore Institute of Mathematical Sciences

Strathmore University

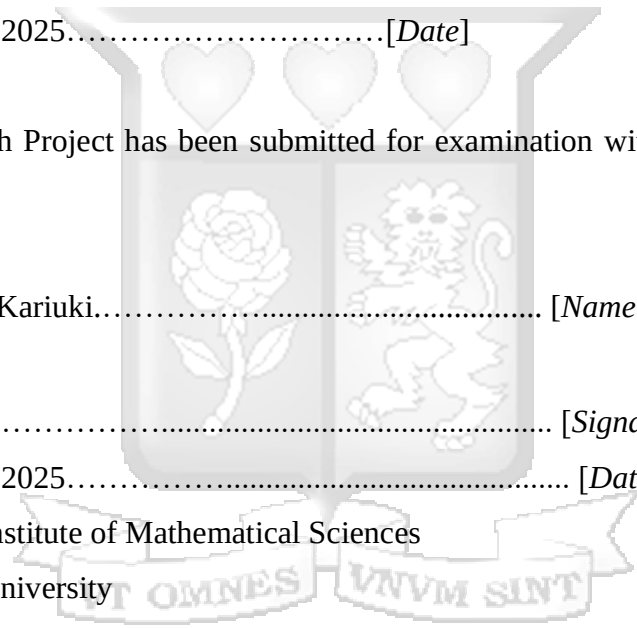


Table of Contents

CHAPTER 1: INTRODUCTION	1
1.1 Background of the Study.....	1
1.1.1 Mobile Money	1
1.1.2 Bank Profitability	2
1.2 Problem Statement	2
1.3 Research Objectives	3
1.4 Research Questions	4
1.5 Scope of the Study	4
1.6 Significance of the Study	4
CHAPTER 2: LITERATURE REVIEW	6
2.1 Introduction	6
2.2 Theoretical Framework	7
2.2.1 Disruptive Innovation Theory.....	7
2.2.2 Diffusion of Innovations Theory.....	8
2.2.3 Financial Intermediation Theory.....	9
2.3 Empirical Review.....	10
2.4 Relationship Between Literature Review and Research Objectives	11
2.5 Research Gap	12
2.6 Conceptual Framework	12
CHAPTER 3: METHODOLOGY	14
3.1. Introduction.....	14
3.2 Research Design.....	14
3.3 Population and Sampling	15
3.4 Data Collection	15
3.5 Data Analysis	17
3.5.1 Econometric Model.....	18
3.5.2 Summary Statistics.....	18
3.5.3 Unit Root Tests	19
3.5.4 Selection of the Appropriate Panel Data Model	19
3.5.5 Diagnostic Tests	21
CHAPTER 4: RESULTS AND ANALYSIS.....	22
4.1 Introduction	22

4.2. Pre-Estimation Tests	22
4.2.1 Descriptive Statistics	22
4.2.2 Stationarity Tests.....	23
4.3 Model Selection	25
4.4 Regression Results	26
4.4.1 Model Summary	27
4.5 Interpretation of Results	28
4.5.1 Mobile Money	28
4.5.2 Bank Size (Net Assets)	28
4.5.3 Interaction Term (Mobile Money*Bank Size)	29
4.5.4 Capital Adequacy Ratio	30
4.5.5 GDP Growth	30
4.5.6 CBK Rate	31
4.6 Multicollinearity.....	32
4.7 Heteroskedasticity	33
4.8 Summary	33
CHAPTER 5: DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS.....	34
5.1 Introduction	34
5.2 Discussions.....	35
5.3. Conclusions	37
5.4 Recommendations	38
5.5 Limitations of the Study	39
5.6 Areas for further research.....	40
References	41

LIST OF TABLES

Table 3.4: Data Collection.....	17
Table 4.2.1: Descriptive Statistics.....	22
Table 4.2.2: Stationarity Tests.....	23
Table 4.3: Model Selection.....	23
Table 4.4 Regression Results.....	26



LIST OF FIGURES

Figure 2.6: Conceptual Framework	13
--	----



LIST OF ACRONYMS

CAR: Capital Adequacy Ratio

CBK: Central Bank of Kenya

DFID: Department for International Development

GDP: Gross Domestic Product

IMF: International Monetary Fund

OLS: Ordinary Least Squares



Abstract

This study examines the impact of mobile money on the profitability of commercial banks in Kenya, focusing on how bank size influences this relationship. Using panel data from selected commercial banks and key macroeconomic indicators like GDP growth, the Central Bank Rate (CBK rate), and the capital adequacy ratio, the analysis was conducted through a pooled ordinary least squares (OLS) regression model. The results show that mobile money has a positive but statistically insignificant effect on bank profitability. This suggests that while mobile money contributes to financial transactions and customer reach, its direct impact on bank profits is limited. Bank size also shows a positive but insignificant effect, indicating that being a larger bank does not necessarily lead to higher profits in this context. Interestingly, the interaction term between mobile money and bank size is found to have a negative but insignificant relationship, suggesting that the benefits of mobile money may reduce as banks become larger, possibly due to increased operational complexities. However, the capital adequacy ratio had a significant negative effect on profitability, highlighting how holding more capital for regulatory purposes can limit income-generating activities. On the other hand, GDP growth and the CBK rate had insignificant effects on profitability. Based on these findings, the study recommends that banks strengthen partnerships with mobile money providers, manage capital more efficiently, and develop strategies to cushion against macroeconomic changes. The study adds to the understanding of how mobile money affects commercial banking profitability, providing insights for banks, regulators, and future researchers.

CHAPTER 1: INTRODUCTION

1.1 Background of the Study

1.1.1 Mobile Money

Mobile money refers to financial services accessed via mobile phones, allowing users to perform transactions such as sending money, paying for goods and services, and managing savings without a commercial bank account (World Bank, 2023). This service is particularly valuable in areas with limited banking infrastructure. In Kenya, mobile money has seen significant growth, driven by platforms such as M-Pesa, Airtel Money, and T-Kash. M-Pesa, launched by Safaricom in March 2007, represents a major innovation in financial services and holds 99% of mobile money transaction value (KNBS, 2022). Initially intended to facilitate microfinance loan repayments, it quickly evolved into a comprehensive mobile financial service due to the collaboration between Safaricom, Vodafone, and the UK's Department for International Development (DFID), which funded the pilot phase. The name "M-Pesa" combines "mobile" with "pesa," the Swahili term for money, reflecting its purpose as a mobile based financial service (Safaricom, 2007).

Safaricom, a leading telecommunications company in Kenya, was founded in 1997 as a subsidiary of the Kenya Posts and Telecommunications Corporation. It has since grown into one of Africa's largest and most successful mobile network operators. The company's extensive network coverage and innovative services, including M-Pesa, have significantly shaped Kenya's financial landscape. M-Pesa's launch marked a transformative shift, attracting over one million users in its first year. The service expanded beyond basic transactions to include savings, loans, and insurance, thus promoting broader financial inclusion. By 2010, M-Pesa had become a global leader in mobile money, and today, it boasts over 30 million users in Kenya alone (KNBS 2010), handling billions of shillings in transactions daily. Its success has spurred similar initiatives across Africa and beyond. Mobile money differs from mobile banking in that it involves simpler financial services accessible via mobile phones, often without requiring a bank account (World Bank, 2023). Mobile banking, by contrast, extends commercial banking services through mobile apps or websites and requires an existing bank account (International Monetary Fund, 2023). Current trends

indicate that mobile money continues to thrive in Kenya, with major players like M-Pesa, Airtel Money, and T-Kash competing in a dynamic market. Mobile money transactions have grown from 16 billion shillings in 2007 to 7.9 trillion shillings in 2022 (CBK, 2022). This growth highlights a significant shift towards mobile financial services, impacting commercial banking practices.

1.1.2 Bank Profitability

The banking sector in Kenya is a critical component of the country's financial system, consisting of 39 commercial banks as of 2023, with 11 of these listed on the Nairobi Stock Exchange. The profitability of these banks has varied over the years due to changing economic conditions and regulatory impacts. Some banks have achieved stable profitability, while others have faced challenges amid increasing competition and market disruptions. The Kenyan banking sector's profitability has grown its gross profits from 35.1 billion shillings in 2007 (CBK, 2007) to 170.7 billion in 2022 (CBK, 2022) representing a growth of 385% over the 15-year period. However, the emergence of mobile money has significantly influenced commercial banks' profitability. Platforms like M-Pesa have introduced new competition, leading to reduced potential transaction volumes and fee income for banks. As a result, banks are compelled to innovate and adapt to the growing popularity of mobile money, which offers a more accessible and convenient alternative to conventional banking. Analyzing how mobile money affects bank profitability and understanding the strategies banks employ in response to these changes are crucial for navigating the evolving financial landscape. This study seeks to explore these dynamics and understand how the rise of mobile money, particularly M-Pesa, has affected the profitability of banks in Kenya, with a special focus on the role of bank size in this relationship.

1.2 Problem Statement

Many studies have highlighted the impact of mobile money on bank profitability. For instance, Weil and Mbiti (2021) found that the widespread use of M-Pesa reduces the reliance on commercial banking services, affecting the revenue streams of banks, particularly transaction fees and interest on deposits. Their research provided early evidence of how mobile money can disrupt conventional banking models by offering more accessible financial services. Jack and Suri (2016) further demonstrated that M-Pesa influences savings behavior, consumption, and remittances among users, thereby

impacting the profitability of commercial banks by shifting customer behavior away from bank services. More recently, Kwami (2023) analyzed the effects of Tigo Cash on banks in Ghana and found that mobile money like Tigo Cash negatively impacted commercial banks by reducing transaction volumes and shifting customer engagement away from commercial banking. This study provides a relevant perspective on how mobile money can challenge commercial banks' profitability, not just in Kenya, but in other regions as well. While these studies provide essential insights into the relationship between mobile money and bank profitability, they primarily focus on the general effects without examining specific factors such as the size of banking institutions.

A significant gap in the current literature is the lack of focus on how bank size affects the relationship between mobile money and the profitability of listed commercial banks. This study aims to fill this gap by using multiple regression analysis, with bank profitability as a dependent variable and mobile money, measured using the total value of mobile money transactions, as a key independent variable. Control variables that may affect bank profitability, with bank size being the focus, and others such as the CBK interest rate, GDP growth, and inflation, will be used in the analysis. Carrying out this research is important because it will provide a deeper understanding of how mobile money, which has become an integral part of Kenya's financial system, impact different banks in varied ways depending on their size. Given the rapid expansion of mobile money, understanding these dynamics is crucial for banks looking to remain competitive, for policymakers aiming to craft effective financial regulations, and for investors making strategic decisions in the banking sector. By shedding light on these issues, the study will contribute to the development of strategies that can help ensure the continued health and stability of Kenya's commercial banking system in the face of technological change.

1.3 Research Objectives

The main objective of this study is to investigate the impact of mobile money transactions on the profitability of listed commercial banks in Kenya, with a particular focus on how bank size influences this relationship. The specific objectives are:

- i) To determine the effect of mobile money transactions on the profitability of commercial banks in Kenya.
- ii) To examine how the size of a bank moderates the relationship between mobile money transactions and bank profitability.

1.4 Research Questions

The study seeks to answer the following research questions:

- i) What is the impact of mobile money transactions on the profitability of commercial banks in Kenya?
- ii) How does the size of a bank moderate the relationship between mobile money transactions and bank profitability?

1.5 Scope of the Study

As of 2023, there are 39 commercial banks in Kenya, out of which 11 are listed on the Nairobi Stock Exchange. The study focuses on all the commercial banks over the 2007 to 2022 period based on their size, measured by their total net assets. They will be categorized into the CBK's three tier list: Tier I for large banks, Tier II for medium sized banks and Tier III for small sized banks. The study examines the impact of mobile money transactions on their profitability and will specifically analyze how the size of these banks moderates this relationship. Additionally, the study will consider other factors, such as CBK interest rates, GDP growth and liquidity ratio, which may influence bank profitability in the context of mobile money adoption.

1.6 Significance of the Study

The significance of this study lies in its potential to provide valuable insights for various stakeholders within the financial sector. For banks, the findings of this research will be instrumental in strategic planning. As mobile money continues to grow and potentially encroach on commercial banking operations, understanding how these services affect bank profitability is crucial. This study will offer detailed insights into how banks of different sizes can effectively respond to the challenges and opportunities presented by mobile money. By exploring how bank size influences the relationship between mobile money transactions and profitability, banks will be better equipped to develop strategies that are tailored to their specific circumstances. For policymakers, the study's findings will be essential in guiding the development of

regulations that promote financial innovation while ensuring the stability of the banking sector. As mobile money continues to reshape the financial landscape, it is important for policymakers to understand the implications for commercial banks. This study will provide evidence-based insights that can help strike a balance between encouraging technological advancements and maintaining a healthy, competitive banking sector. Investors in the banking industry will also benefit from this research. With mobile money becoming an increasingly important factor in the financial ecosystem, investors need to be aware of how these services are impacting the profitability of banks. This study will provide valuable information that can inform investment decisions, helping investors to identify which banks are best positioned to thrive in an environment where mobile money plays a significant role.

Finally, this study will contribute to the academic field by filling a gap in existing literature. While previous research has explored the general effects of mobile money on bank profitability, there is a lack of focus on how bank size moderates this relationship. By addressing this gap, the study will provide new insights that can inform future research in the areas of financial technology, banking, and economic development. Researchers can build on these findings to further explore the complex dynamics between mobile money and commercial banking, potentially uncovering new trends and implications for the financial sector.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter reviews the existing research and theories that are important for understanding how mobile money transactions affect the profitability of commercial banks in Kenya. It is divided into several sections, each focusing on different aspects of the topic. The first section, theoretical framework, introduces three key theories that help explain the changes brought about by mobile money in the banking sector. These theories are Disruptive Innovation Theory, Diffusion of Innovations Theory, and Financial Intermediation Theory. Each theory offers a different perspective on how mobile money has challenged commercial banking, influenced how quickly people adopt new financial technologies, and altered the role of banks as intermediaries between savers and borrowers. Next, the empirical review looks at studies that have explored the impact of mobile money on commercial banking. This section reviews research conducted in Kenya and other regions, highlighting how mobile money has changed the financial landscape. The review also identifies areas where existing studies have fallen short, particularly in understanding how the size of a bank might change the way mobile money affects its profitability.

The chapter then discusses the relationship between literature review and research objectives, showing how the studies reviewed tie into the specific goals of this research. This section emphasizes the importance of examining how bank size might moderate, or influence, the impact of mobile money on profitability. In the research gap section, the focus shifts to what is missing in the current body of research. While many studies have looked at the general effects of mobile money on banks, few have considered how the size of a bank might play a role. This gap highlights the need for the current study, which aims to provide new insights into this area. Finally, the conceptual framework outlines how the study will investigate the relationship between mobile money transactions and bank profitability, with special attention to the role of bank size. This section introduces the key variables like mobile money transactions and bank size and explains how they will be analyzed. The framework also includes control variables, such as interest rates and GDP growth, to provide a more complete picture of the factors influencing bank profitability.

2.2 Theoretical Framework

The introduction of mobile money has dramatically reshaped Kenya's financial sector. Several theories can help us understand this change:

2.2.1 Disruptive Innovation Theory.

This theory, introduced by Clayton Christensen, offers a powerful lens through which to understand the transformation brought about by mobile money like M-Pesa in Kenya. Christensen's theory explains how certain innovations start by targeting a small, often overlooked segment of the market with a simpler, more affordable solution. As Christensen discussed in his article for *Harvard Business Review*, these innovations, while initially less appealing to mainstream customers, gradually improve and evolve, eventually challenging and potentially overtaking established industries (Christensen, 1997). In the financial sector, M-Pesa is a prime example of this kind of disruption. Before the advent of mobile money, commercial banks in Kenya primarily catered to middle- and upper-income customers, leaving a significant portion of the population without access to formal banking services. M-Pesa filled this gap by providing a straightforward, low-cost platform that allowed millions of Kenyans, particularly those in rural and underserved areas, to conduct basic financial transactions via their mobile phones.

Over time, M-Pesa expanded its offerings, moving beyond simple money transfers to include services like savings accounts, loans, and insurance products. As these services became more sophisticated, M-Pesa started to attract a broader customer base, including those who were previously loyal to commercial banks. This shift forced banks to rethink their strategies and adapt to a new competitive environment dominated by mobile money. The relevance of Disruptive Innovation Theory to this research lies in its ability to explain the competitive pressures that commercial banks have faced due to the rise of mobile money. This study will explore how mobile money, as a disruptive force, has impacted the profitability of banks in Kenya, and whether these banks have been able to successfully adapt to the challenges posed by this new technology. By applying this theory, the research aims to provide insights into the strategic responses of commercial banks to the growing influence of mobile money like M-Pesa. This theory explains how new technologies can challenge and sometimes replace established industries. Mobile money, like M-Pesa, has done this

by offering financial services that are more accessible and convenient than commercial banking, especially for people who were previously unbanked.

2.2.2 Diffusion of Innovations Theory

The theory, introduced by Everett Rogers, provides a framework for understanding how new ideas and technologies spread within a society. According to this theory, innovations are adopted in a social system over time through a process that involves different categories of adopters: innovators, early adopters, early majority, late majority, and laggards (Rogers, 1962). In their article on the *Free Press*, he explains that the rate and success of adoption depend on several factors, including the perceived advantage of the innovation, its compatibility with existing values and practices, its complexity, its trialability, and its observability. In the context of mobile money in Kenya, M-Pesa is an excellent example of how an innovation can spread rapidly and transform an entire industry. M-Pesa's adoption can be seen as a textbook case of the diffusion process. The service began with innovators and early adopters, those willing to experiment with a new way of handling financial transactions. As these early users demonstrated the benefits of mobile money, such as ease of use, accessibility, and security, M-Pesa quickly gained acceptance among the early adopters and late majority. Over time, even the most hesitant individuals were drawn in, either by necessity or by the growing social and economic pressure to participate in the mobile money ecosystem.

The success of M-Pesa can be attributed to several factors highlighted by the Diffusion of Innovations Theory. First, M-Pesa offered a clear relative advantage over commercial banking, particularly for those without access to formal financial services. It was highly compatible with the daily lives of Kenyans, many of whom relied on mobile phones as their primary communication tool. The service was also relatively simple, making it easy for users to understand and adopt. Furthermore, M-Pesa's trialability, where users could test the service with small amounts of money, helped lower the barrier to entry, and its visibility in society, through widespread marketing and the success stories of early adopters, helped to reinforce its benefits.

The Diffusion of Innovations Theory is particularly relevant to this research as it provides a theoretical basis for understanding the rapid adoption and widespread use

of M-Pesa in Kenya. The theory helps explain why M-Pesa was able to achieve such a dominant market position and how it has influenced the financial behaviors of a large portion of the population. In this study, the theory will be used to explore how M-Pesa's diffusion has affected the profitability of commercial banks, which have had to adapt to the new realities of a market where mobile money plays a significant role. By focusing on M-Pesa's diffusion, this research will offer insights into the challenges and opportunities that commercial banks face in a rapidly evolving financial landscape.

2.2.3 Financial Intermediation Theory.

The theory, developed by Douglas Diamond and Philip Dybvig, provides insight into the crucial role financial intermediaries such as banks play in the economy. According to this theory, financial intermediaries exist primarily to bridge the gap between savers and borrowers (Diamond and Dybvig, 1983). In their article on *The Journal of Political Economy*, they explain that financial intermediaries do this by pooling deposits from numerous small savers and then lending out those funds to individuals or businesses that need capital. This process of financial intermediation not only facilitates investment and consumption but also enhances the efficiency of the financial system by reducing transaction costs, providing liquidity, and managing risks. In the context of Kenya's financial landscape, mobile money, particularly M-Pesa, has introduced a new dimension to financial intermediation. Commercially, banks have been the primary intermediaries in the financial system. However, the advent of mobile money has created alternative channels for financial intermediation, especially for populations that were previously underserved by commercial banks. M-Pesa allows users to save, transfer, and access funds without the need for a commercial bank account, thereby shifting some of the financial intermediation functions away from banks and into the mobile money system.

M-Pesa's success in Kenya can be analyzed through the lens of Financial Intermediation Theory by considering how it has transformed the commercial roles of banks. For instance, M-Pesa provides liquidity to users in a way that is similar to how banks allow depositors to withdraw funds on demand. Additionally, by facilitating loans through partnerships with financial institutions, M-Pesa has also taken on a role commercially held by banks, albeit on a more accessible and user-friendly platform. This shift poses significant challenges and opportunities for commercial banks. On the

one hand, the growth of mobile money has forced banks to innovate and develop new products that can compete with or complement these services. On the other hand, banks may face a reduction in their commercial customer base and deposit levels as more people turn to mobile money for their financial needs. In this research, Financial Intermediation Theory will be used to explore the implications of mobile money on the profitability of commercial banks in Kenya. Specifically, the study will examine whether banks have been able to adapt to the changing financial landscape by leveraging their commercial strengths in financial intermediation, or whether the rise of mobile money has eroded their competitive edge. Understanding this dynamic is crucial for analyzing how the financial intermediation role of banks is evolving in the face of disruptive technologies like M-Pesa. These theories provide a foundation for understanding how mobile money, particularly M-pesa, is changing the commercial banking system, affecting both customer behavior and bank profitability.

2.3 Empirical Review

Numerous empirical studies have examined the impact of mobile money on various aspects of the financial sector, particularly on commercial banking. Kulu (2024) analyzed the effect of mobile money transactions on the Ghanaian commercial banks' credit to deposit ratio. The study used Granger causality, impulse response functions and Autoregressive Distributive Lag estimation technique to carry out the research. He found that the rate at which Ghanaian commercial banks can make loans from their deposits reduces as more mobile money transactions are made, thus the banks' profitability reduced as their services became substitutes to mobile money. Kulu and Opoku (2022) using data from 2015-2020 sought to investigate the effect of mobile money transactions on banking sector performance. The study utilized autoregressive Distributed Lag bounds test and impulse response analysis to carry out the research. They found that the performance of the Ghanaian banking system, thus its profitability, reduces as mobile money value increases.

Kwami (2023) analyzed the effects of Tigo Cash on banks in Ghana using qualitative data from 2022. The study used purposeful sampling from knowledgeable experts to explore how Tigo Cash influenced bank profits. The findings revealed that Tigo Cash had a negative effect on commercial banks, mainly because it reduced transaction volumes and shifted customer engagement away from commercial banking. This

research provides a useful perspective on how mobile money can challenge commercial banks in other regions. Kamukama and Tumwine (2012) investigated if mobile money was a liquidity threat to Uganda's commercial banks. They used cross-sectional study design and linear regression tests to carry out the research on 2011 data on mobile money and commercial banks in Uganda. The findings were that mobile money had caused a liquidity crisis to the commercial banks by being substitute to the banks, which has affected their lending capacity and thus their profitability.

In Kenya, the work by Isaac and Weil (2021) and Suri and Jack (2016) offers valuable insights. Isaac and Weil's (2021) study, covering data from 2007 to 2019, used a regression analysis approach and found that M-Pesa had a significant negative impact on the profits of commercial banks. This was largely due to M-Pesa decreasing transaction volumes and taking away market share from commercial banks. Their study highlights how M-Pesa has changed the financial sector in Kenya by altering consumer behavior and bank performance. Suri and Jack (2016) used a combination of econometric analysis and field experiments to study the impact of M-Pesa on various economic outcomes, including its effects on bank profitability. Their methodology involved analyzing survey data in the period 2007 to 2014 from households and businesses in Kenya, as well as using data from financial institutions. They provided further evidence that mobile money has altered savings habits, particularly among lower-income individuals. As people increasingly use mobile money to save, banks are seeing a decrease in deposits, directly affecting their profitability. These studies provide a strong basis for understanding how mobile money affects commercial banks. However, they generally do not focus on how the size of a bank might change this relationship, which is an important aspect to consider.

2.4 Relationship Between Literature Review and Research Objectives

The literature reviewed provides a comprehensive understanding of how mobile money impacts commercial banking, yet it lacks focus on the moderating effect of bank size. This research aims to bridge this gap by investigating how bank size influences the impact of M-Pesa on bank profitability. By examining this relationship, the study will contribute to a deeper understanding of how banks of different sizes respond to the rise of mobile money.

2.5 Research Gap

Despite the extensive research on mobile money's impact on commercial banking, most studies such as those done by Suri and Jack (2016), Isaac and Weil (2021) and Kwami (2023), mostly look at the general effects of mobile money without considering how the size of a bank might influence this relationship. This gap is directly related to the research objective, which is to understand how bank size affects the impact of mobile money on bank profitability in Kenya. By focusing on this aspect, the study aims to provide insights that could help banks develop more effective strategies and inform policymakers about how different types of banks are impacted by mobile money.

2.6 Conceptual Framework

The conceptual framework of this study is based on the interaction between mobile money and commercial banking profitability, with a particular emphasis on the role of bank size. The research will use multiple regression analysis to explore the relationship between bank profitability and mobile money transactions, with a particular focus on how bank size influences this relationship. By including control variables like interest rates, GDP growth and inflation, the study will provide a more detailed understanding of how mobile money impacts banks of different sizes.

Bank profitability is the dependent variable, measured by net profit of the banks and mobile money as the independent variable, measured by the total value of mobile money transactions. The moderating Variable is bank size, which can be determined by total assets of the different banks. Control variables to be used include CBK interest rates, which impact profitability by influencing net interest margins; GDP growth, which generally boosts bank performance through increased lending and improved credit quality; and the capital adequacy ratio, which measures a bank's ability to meet short-term obligations and affects stability and profitability. A higher CAR indicates better capacity to handle financial needs, enhancing stability and profitability. However, excessive liquidity might lead to lower returns if funds are not effectively used.

The relationship between these variables is based on the theoretical and empirical insights discussed earlier. The study hypothesizes that while mobile money adoption negatively impacts bank profitability, the extent of this impact is moderated by the size

of the bank. Larger banks may have more resources to innovate and compete with mobile money, potentially mitigating the adverse effects on profitability. In contrast, smaller banks may be more vulnerable to these disruptions. This framework provides the basis for a deeper understanding of how mobile money affects banks of different sizes and thus gives valuable insights for both financial institutions and policymakers.

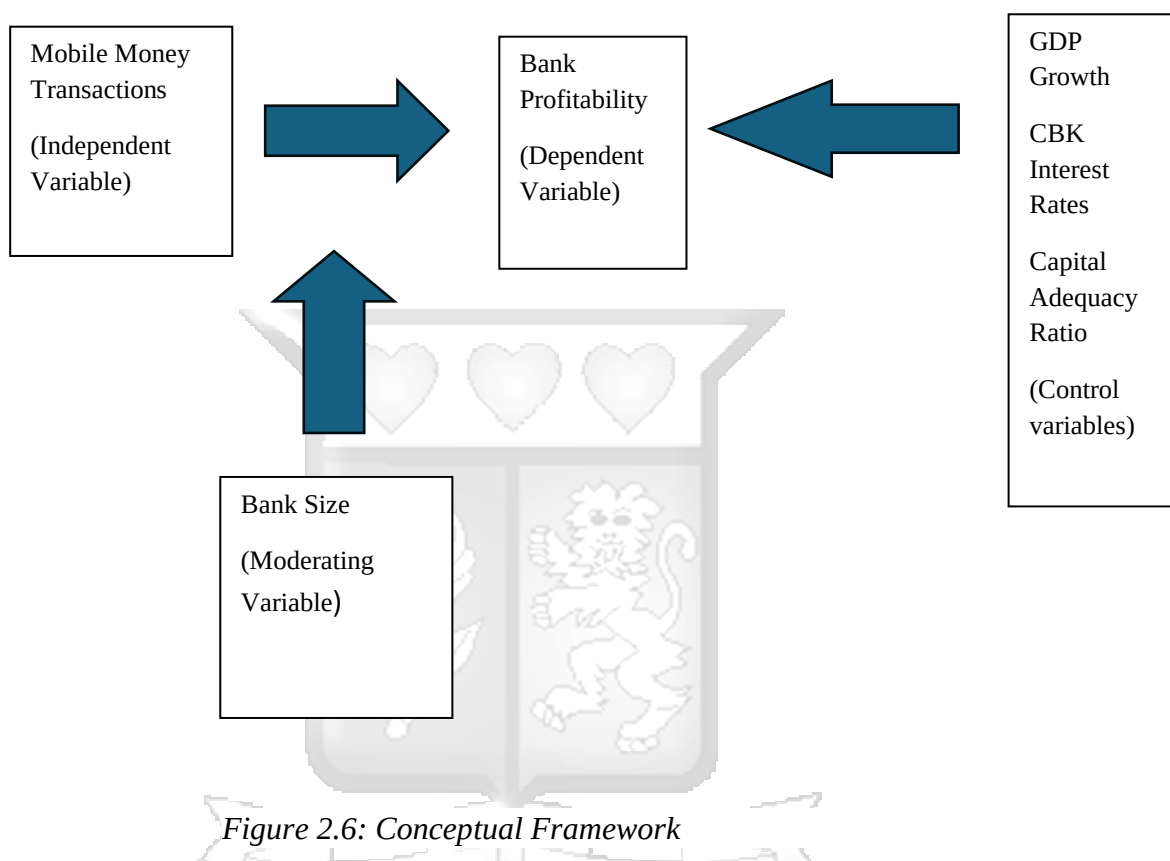


Figure 2.6: Conceptual Framework

CHAPTER 3: METHODOLOGY

3.1. Introduction

This chapter outlines the research methodology employed to examine the impact of mobile money on the profitability of listed commercial banks in Kenya, with a particular focus on the moderating effect of bank size. The methodology is designed to rigorously analyze the relationships between mobile money transactions and bank profitability, considering various economic factors and control variables. This chapter is structured to provide a comprehensive overview of the research design, population and sampling techniques, data collection methods, and the analytical procedures utilized to address the study's objectives. The research adopts a causal research design to establish and explore cause-and-effect relationships between the key variables of interest. By focusing on the impact of mobile money transactions on bank profitability and how this relationship is influenced by bank size, the study aims to provide valuable insights into the dynamics of the banking sector in Kenya. The chapter begins with a discussion of the research design, outlining the rationale for choosing a causal approach and its appropriateness for the study's objectives. It then details the population and sampling techniques, including the criteria for selecting the sample banks and the rationale for these choices. This section ensures that the study's findings are representative and generalizable. Data collection methods are described, focusing on secondary data from financial reports and relevant publications. The chapter specifies the variables of interest, their definitions, and sources, ensuring clarity in the data collection process. In the data analysis section, the chapter explains the use of multiple regression analysis to assess the relationships between mobile money transactions, bank size, and profitability. The econometric model is detailed, followed by the procedures for generating summary statistics, conducting unit root tests, and selecting the appropriate panel data model. Diagnostic tests are also outlined to ensure the robustness and reliability of the findings.

3.2 Research Design

This study adopts a causal research design to explore the impact of mobile money on the profitability of listed commercial banks in Kenya, with a particular emphasis on the moderating effect of bank size. A causal design is one used to identify and establish cause-and-effect relationships between variables, allowing researchers to determine whether one variable directly influences another. Causal research is appropriate as it

allows for the examination of cause-and-effect relationships between variables, which aligns with the study's objective of understanding how mobile money transactions influences bank profitability and how this relationship is moderated by bank size. By employing this design, the study aims to establish a clear link between mobile money transactions and bank profitability while accounting for the influence of other factors such as interest rates, GDP growth, and liquidity ratio.

3.3 Population and Sampling

The population for this study comprises all the commercial banks in Kenya. Their number over the 2007 to 2022 period varied from 39 to 43. The CBK's annual sustainability reports detail all their total net assets as well as profitability. The CBK categorizes them into three groups: Tier I banks, which are the large banks, with each bank having at least a 5% market share. Tier II banks are the medium-sized banks with each bank having between 1% and 5% market share. and Tier III banks which are the small banks with each bank having a lower than 1% market share. The sustainability reports also detail each year's mobile money transactions value, which will be used in the regression analysis. Using all the commercial banks' profitability and categorized net assets data, and regressing against mobile money is adequate in showing the heterogeneity of the banking sector and how mobile money has impacted their profitability based on their size.

3.4 Data Collection

The study will rely on secondary data for analysis. The data will be collected from the CBK's 2007 to 2022 annual sustainability reports, that gives details of each year's mobile money transaction value, all the commercial bank's profitability and categorized net assets.

Variable	Definition	Source
Bank Profitability	This represents the profitability of a bank in each time period, measured by net profit. Net profit is calculated as the bank's total revenues minus its total expenses, taxes, and	Central Bank of Kenya annual sustainability reports

		costs. It indicates how well a bank is performing financially.	
Mobile Money Transactions		This denotes the volume of transactions conducted through mobile money at a time. It includes the total value of transactions processed through services like M-Pesa, Airtel Money, and T-Kash.	Central Bank of Kenya annual sustainability reports
Bank Size		This captures the size of the bank, often measured by total assets. Total assets reflect the value of everything owned by the bank and provide an indication of the bank's scale of operations and market presence.	Central Bank of Kenya annual sustainability reports
Interest Rates		This variable represents the average interest rates set by the Central Bank of Kenya, which influence borrowing and lending rates within the banking sector. Changes in interest rates can impact bank profitability.	Central Bank of Kenya annual reports
GDP Growth		This measures the annual percentage increase in the Gross Domestic Product (GDP) of Kenya. GDP	Central Bank of Kenya annual reports

	growth indicates the overall economic performance and can influence bank profitability through economic conditions.	
Capital Adequacy Ratio	This reflects the proportion of a bank's liquid assets to its total liabilities. A higher liquidity ratio indicates a bank's ability to meet its short-term obligations and manage its liquidity effectively.	Annual financial reports of all the commercial banks
Interaction term	This term represents the interaction between mobile money transactions and bank size. It is used to test how the impact of mobile money transactions on bank profitability varies with different bank sizes.	Derived from data on mobile money transactions and bank size

Table 3.4: Data Collection Methods

The data collection methods will include extracting key financial metrics such as net profit, total assets, and mobile money transaction volumes from Central Bank of Kenya annual financial stability reports. The control variables: CBK interest rates, GDP growth and liquidity ratio will be sourced from the same CBK reports.

3.5 Data Analysis

The study will employ multiple regression analysis as the primary analytical technique to assess the relationship between mobile money transactions and bank profitability, with bank size as a moderating variable. Multiple regression is suitable for this study because it allows for the simultaneous examination of the effects of several

independent variables: mobile money transactions, bank size, interest rates, GDP growth, and liquidity ratio on the dependent variable: bank profitability.

3.5.1 Econometric Model

The econometric model will be specified as follows:

$$\begin{aligned}
 \text{Bank Profitability}_{(it)} &= \alpha + \beta_1(\text{Mobile Money Transactions})_{it} + \beta_2(\text{Bank Size})_{it} \\
 &+ \beta_3(\text{Interest Rates})_t + \beta_4(\text{GDP Growth})_t \\
 &+ \beta_5(\text{Capital Adequacy Ratio})_{it} \\
 &+ \gamma(\text{Mobile Money Transactions})_{it} \times (\text{Bank Size})_{it} + \lambda_i + \delta_t \\
 &+ \varepsilon_{it}
 \end{aligned}$$

The interaction term between mobile money transactions and bank size (Mobile Money Transactions) $\times$ (Bank Size) will be included to test the moderating effect of bank size on the relationship between mobile money and profitability. In the regression model, the gamma (γ) represents the coefficient of the interaction term between Mobile Money Transactions_{it} and Bank Size_i. This interaction term captures how the effect of mobile money transactions on bank profitability varies depending on the size of the bank. Essentially, γ quantifies whether the impact of mobile money transactions on profitability is stronger or weaker for larger banks compared to smaller banks. The rationale for using multiple regression analysis lies in its ability to control for confounding factors, thereby providing a more accurate estimate of the impact of mobile money on bank profitability. The model accounts for bank-specific fixed effects (λ_i) and time-specific fixed effects (δ_t) to control unobserved characteristics of banks and time-related variations that could influence profitability. The error term (ε_{it}) captures any unexplained variation in bank profitability. The analysis will help achieve the study objectives by identifying the magnitude and direction of the relationships, testing the study's hypotheses, and offering insights into how different bank sizes respond to mobile money adoption in the Kenyan context.

3.5.2 Summary Statistics

Summary statistics will be generated to provide an overview of the data, offering insights into its distribution and central tendencies. This includes calculating the mean, which represents the average value of each variable; the standard deviation, a measure

of the dispersion of values around the mean; the minimum, the smallest value observed for each variable; the maximum, the largest value observed for each variable; and the median, the middle value in the sorted data. These statistics will help in understanding the general characteristics and variability within the dataset.

3.5.3 Unit Root Tests

To ensure the reliability of the panel data series used in this study, unit root tests are important for verifying the stationarity of the data. Stationarity means that the statistical properties of a time series, such as its mean and variance, remain constant over time. Non-stationary data can exhibit trends or patterns that may lead to spurious and misleading regression results. Therefore, conducting unit root tests is essential to confirm that the data does not display such trends, which is important for accurate and reliable regression analysis. In this study, the Levin-Lin-Chu (LLC) test will be employed. The LLC test assesses whether the panel data is stationary across all cross-sectional units, assuming a common unit root process. It evaluates if the data series is homogeneous and follows a similar unit root process throughout the panel. Conducting this unit root test is important for several reasons. First, it helps avoid erroneous conclusions by ensuring that the data is stationary before regression analysis, thereby preventing misleading conclusions about the relationships between variables. Second, confirming stationarity ensures that the assumptions underlying econometric models are met, which enhances the accuracy and validity of the regression estimates. Lastly, stationary data enables more consistent and accurate inferences about the relationships between mobile money transactions, bank profitability, and the moderating effect of bank size. This approach ensures that the conclusions drawn from the regression analysis are both valid and reliable.

3.5.4 Selection of the Appropriate Panel Data Model

Selecting the appropriate panel data model is crucial for accurately analyzing the impact of mobile money transactions on bank profitability and understanding how bank size moderates this relationship. In this study, three panel data models will be considered: Fixed Effects Model, Random Effects Model, and Pooled OLS Model.

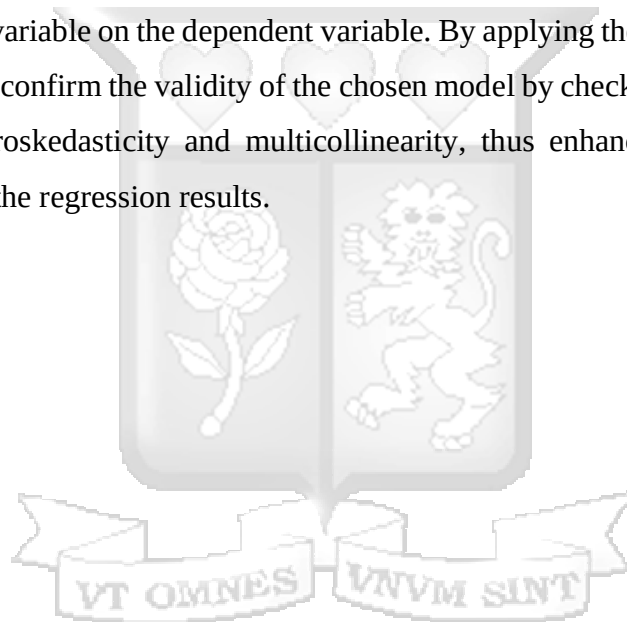
The Fixed Effects Model is used when the variation across entities (in this case, bank tiers) is unique and constant over time. This model controls individual heterogeneity by allowing each bank tier to have its own intercept, which accounts for unobserved variables that vary between bank tiers but are constant over time. The Fixed Effects

Model is particularly useful when analyzing data where the differences between entities are significant and should be accounted for. The Random Effects Model, on the other hand, assumes that the individual-specific effects are random and uncorrelated with the explanatory variables. This model is appropriate when the variation across entities is assumed to be random and not correlated with the independent variables in the model. It is used when there is an interest in generalizing the results beyond the sample and when the assumption of no correlation between the individual effects and the regressors holds. The Pooled OLS Model treats all observations as if they come from a single pooled sample without accounting for the panel structure. It assumes that the data from different entities are homogenous and does not account for individual-specific effects. While this model is simpler, it may lead to biased results if the data exhibits significant individual variability.

To determine the most suitable model, two to three tests will be conducted on an elimination basis depending on the significance of the results. The Hausman Test will be used to choose between the Fixed Effects and Random Effects models. This test evaluates whether there are systematic differences between the estimators of the two models, with a significant result indicating a preference for the Fixed Effects model. The Breusch-Pagan LM Test will be performed to decide between the Random Effects Model and Pooled OLS Model. A significant result suggests that the Random Effects Model is more appropriate. Finally, the F-Test will be conducted to select between the Fixed Effects Model and Pooled OLS Model, with a significant result indicating that the Fixed Effects Model is preferable. By carefully selecting the appropriate panel data model, the study ensures that the analysis accurately captures the relationships between mobile money transactions, bank profitability, and the moderating effect of bank size, leading to more reliable and insightful results.

3.5.5 Diagnostic Tests

To ensure the robustness and validity of the model chosen, the Breusch-Pagan Test will be conducted to test for heteroskedasticity, which occurs when the variance of the residuals is not constant across observations. Heteroskedasticity can lead to inefficient estimates and affect the reliability of the statistical inference. The Breusch-Pagan Test specifically evaluates whether the variance of the errors is dependent on the independent variables, which can indicate the presence of heteroskedasticity. A multicollinearity test will be conducted using the variance inflation factor, with a significant figure of VIF above 10 indicating there is presence of multicollinearity. This would mean two or more independent variables are highly correlated which would lead to misleading and biased results, as determine the individual effect of each independent variable on the dependent variable. By applying these diagnostic tests, the study aims to confirm the validity of the chosen model by checking for potential issues such as heteroskedasticity and multicollinearity, thus enhancing the accuracy and reliability of the regression results.



CHAPTER 4: RESULTS AND ANALYSIS

4.1 Introduction

This chapter presents the findings from the panel data analysis of the impact of mobile money on the profitability of commercial banks in Kenya. The results are aligned with the study's objectives, hypotheses and existing literature to ensure a comprehensive understanding of the relationships between the variables. The chapter covers pre-estimation tests, regression results, interpretations, and linkages to previous research, demonstrating how the findings contribute to the broader discourse on mobile money and banking profitability.

4.2. Pre-Estimation Tests

4.2.1 Descriptive Statistics

Table 4.2.1 Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Bank Profitability (Millions)	48	24.50	14.00	1.00	48
Mobile Money Transactions (Billions)	48	8.50	4.66	1.00	16
Net Assets (Millions)	48	24.50	14.00	1.00	48
Interaction Term (mobile money*bank size)	48	722.32	1340.20	0.00	7462.05
GDP Growth (%)	48	7.00	3.54	1.00	13
CBK Rate (%)	48	8.50	4.66	1.00	16
Capital Adequacy Ratio (%)	48	23.72	7.52	15.89	60.30

Before conducting the regression analysis, descriptive statistics were generated to provide an overview of the key variables in the study. As shown in table 4.2.1 above, bank profitability has a mean value of Ksh. 24.5 million, with a standard deviation of Ksh. 14 million, indicating moderate variation in profitability across the sampled banks. Mobile money exhibits a mean value of Ksh. 8.5 billion, with a minimum of Ksh. 1 billion and a maximum of Ksh. 16 billion suggesting that it varies significantly over the study period. Net assets, which reflect the size of the banks, have a mean of

Ksh. 24.5 million and a standard deviation of Ksh. 14 million, showing notable differences in the financial strength of the sampled banks. The interaction term between mobile money and bank size has a high standard deviation of 1340.20, indicating significant variation in how mobile money interacts with bank size in influencing profitability. Macroeconomic factors such as GDP growth and the CBK rate also display variability. GDP has a mean of 7.00% and a standard deviation of 3.54, while the CBK rate has a mean of 8.50% with a standard deviation of 4.66, reflecting fluctuations in Kenya's economic conditions over the study period. The capital adequacy ratio, which measures a bank's financial stability, has a mean of 23.72%, with values ranging from 15.89% to 60.30%, suggesting differences in how well banks are capitalized. Overall, the descriptive statistics provide key insights into the distribution and variability of the study variables before proceeding with regression analysis.

4.2.2 Stationarity Tests

Table 4.2.2 Stationarity Tests

Variable	Level Form p-value	Differenced Form p-value	Stationary status
Bank Profitability	0.3014	0.0400	Stationary at first difference
Mobile Money	0.3138	0.0115	Stationary at first difference
Bank Size	0.1725	0.0024	Stationary at first difference
Interaction term (Mobile Money*Bank Size)	0.9287	0.0000	Stationary after log transformation
CBK Rate	0.0000	N/A	Stationary at level form
GDP	0.0000	N/A	Stationary at level form
Capital Adequacy Ratio	0.2647	0.0000	Stationary at first difference

To ensure the reliability of the regression analysis, stationarity tests were conducted using the Levin-Lin-Chu (LLC) unit root test. This test examines whether a variable contains a unit root (indicating non-stationarity) or is stationary over time. The test follows the hypotheses: the null hypothesis states that the variable has a unit root (non-stationary), while the alternative hypothesis states that the variable does not have a unit root (stationary). A variable is considered stationary if the p-value is less than 0.05, indicating rejection of the null hypothesis in favour of the alternate hypothesis. The results indicate that bank profitability had a p-value of 0.3014 at level form, suggesting it was non-stationary. However, after first differencing, the p-value dropped to 0.0400, confirming stationarity. Similarly, mobile money transactions had a p-value of 0.3138 at level form, but after first differencing, the p-value declined to 0.0115, making it stationary. Bank size exhibited a similar pattern, with a level form p-value of 0.1725, which dropped to 0.0024 after first differencing, confirming its stationarity. The capital adequacy ratio also followed this trend, with a level form p-value of 0.2647, which became 0.0000 after first differencing.

For the interaction term (mobile money * bank size), the results initially showed a highly non-stationary p-value of 0.9287 in its level form. Since first differencing did not sufficiently improve stationarity, a log transformation was applied. After transformation, the p-value dropped to 0.0000, indicating that the transformed variable had achieved stationarity. Unlike the previously mentioned variables, CBK rate and GDP were already stationary in their level form, with p-values of 0.0000, confirming that these variables did not require differencing or transformation. By ensuring all variables were stationary before proceeding with regression analysis, this study ensured the avoidance of misleading regression results, thereby improving the reliability of the findings. The application of first differencing and log transformation where necessary ensured that all predictor variables were appropriate for further statistical analysis.

4.3 Model Selection

Table 4.3. Model selection

Test	Null Hypothesis (Ho) p-value >0.05	Alternate Hypothesis (Ha) p-value <0.05	Statistic	p-value	Decision
Hausman Test	Random Effects model is preferred over Fixed Effects model.	Fixed effects model is preferred over the Random Effects model.	Chi-squared = 0.1900	0.9073	Since the p-value (0.9073) is greater than 0.05, we fail to reject the null hypothesis. This means the Random Effects model is preferred over Fixed Effects.
Breusch Pagan LM Test	Pooled OLS model is preferred over Random Effects model.	Random Effects model is preferred over Pooled OLS model	Chibar ² = 0.0000	1.0000	Since the p-value (1.0000) is greater than 0.05, we fail to reject the null hypothesis. This means Pooled OLS is preferred over Random Effects.
Time Effects Test (F-Test)	No time fixed effects are needed.	Time-fixed effects are needed	F(11, 27) = 0.8400	0.6035	Since the p-value (0.6035) is greater than 0.05, we fail to reject the null hypothesis and conclude that Time Fixed effects are not needed.

The Hausman test was conducted to determine whether the Fixed Effects or Random Effects model should be used. The test yielded a p-value of 0.9073, which is greater than 0.05. Since the p-value is above the threshold, we fail to reject the null hypothesis, indicating that the Random Effects model is preferred over the Fixed Effects model. The Breusch-Pagan LM test was then used to compare the Random Effects model and the Pooled OLS model. The test produced a p-value of 1.0000, which is greater than 0.05, meaning we fail to reject the null hypothesis. This result indicates that the Pooled OLS model is more suitable than the Random Effects model. Finally, the F-test for time-fixed effects was performed to determine whether time effects should be included in the model. The p-value of 0.6035 was greater than 0.05, meaning we fail to reject the null hypothesis. This suggests that time-fixed effects are not necessary. Based on these model selection tests; Pooled OLS was chosen as the most appropriate model for this study.

4.4 Regression Results

The regression analysis was conducted using the Pooled OLS model, as determined by the model selection tests. This analysis examines the impact of mobile money, bank size, the interaction between mobile money and bank size, GDP, capital adequacy ratio, and CBK rate on bank profitability. The coefficient of the variables determined whether they had a positive or negative impact. The significance of each variable was assessed based on its p-value, with a threshold of 0.05. If the p-value is less than 0.05, the variable is considered statistically significant, meaning it has a meaningful impact on bank profitability. If the p-value is greater than 0.05, the variable is considered insignificant, indicating that its effect is not strong enough. The regression results using the Pooled OLS model are presented in the table below:

Table 4.4. Pooled OLS model results

Variable	Coefficient	Standard Error	t-statistic	p-Value	Interpretation
Mobile Money	0.3565	0.4560	0.7500	0.4560	Positive but statistically insignificant.
Bank Size(Net Assets)	0.0091	0.1121	0.4900	0.9350	Positive but statistically insignificant.
Interaction term (Mobile Money*Bank Size)	-0.0013	0.0026	-0.4900	0.6250	Negative but statistically insignificant
Capital Adequacy Ratio	-1.4493	0.3595	-4.0900	0.0000**	Significant negative effect
GDP Growth	-0.6904	0.6632	-1.0400	0.3040	Insignificant negative effect
CBK Rate	0.4926	0.5122	0.9600	0.3420	Positive but statistically insignificant.

*** Statistical significance at 1% level ** Statistical significance at 5% level; * Statistical significance at 10% level.

4.4.1 Model Summary

The model has an R-squared value of 36.28%, which indicates that the model explains 36.28% of the variability in bank profitability. The model's overall significance ($p = 0.0027$) confirms its reliability for analysing the relationship between mobile money and bank profitability.

4.5 Interpretation of Results

In the regression analysis, the null hypothesis dictates that there is no significant relationship between the variable and bank profitability, while the alternate relationship dictates that there is a significant relationship between the variable and bank profitability. The coefficients of the variables determine if the impact is positive or negative.

4.5.1 Mobile Money

The results show that mobile money has a positive 0.3565 impact on bank profitability. Its p-value of 0.4560 is greater than the 0.05 significance level, thus we fail to reject the null hypothesis and conclude that it is statistically insignificant in its impact on bank profitability. The statistically insignificant effect of mobile money on bank profitability reflects a balance between competition and collaboration. Mobile money platforms like M-Pesa and Airtel Money compete with banks by capturing a share of transaction revenues and deposits. For example, M-Pesa allows users to save, transfer, and make payments without requiring a bank account. These services reduce the revenue banks might otherwise earn from similar activities. However, mobile money has also created opportunities for banks to innovate and expand their customer base. Collaborations between banks and mobile money providers have been particularly important. Initiatives like M-Shwari (a partnership between Safaricom and NCBA) and KCB-M-Pesa enable banks to offer savings and loans through mobile money platforms. These partnerships help banks reach previously unbanked populations, contributing to profitability in ways that offset some of the competitive pressures.

4.5.2 Bank Size (Net Assets)

The results show that bank size has a positive 0.0091 impact on bank profitability. Its p-value of 0.9350 is greater than the 0.05 significance level, thus we fail to reject the null hypothesis and conclude that it is statistically insignificant in its impact on bank profitability. The positive but statistically insignificant effect of bank size on bank profitability suggests that larger banks in Kenya may enjoy some benefits from their scale, but these are not substantial enough to make a measurable impact. Larger banks often have more resources, broader customer bases, and better access to capital, which could explain the positive coefficient. For example, large banks are more likely to invest in advanced technology, form strategic partnerships with mobile money providers, and diversify their income streams, all of which can contribute positively to

profitability. However, the insignificant result indicates that these advantages are not as impactful as might be expected. One reason could be that larger banks face higher operational costs and bureaucratic inefficiencies, which offset their potential gains. Additionally, competition from mobile money platforms like M-Pesa and Airtel Money may have levelled the playing field, limiting the ability of large banks to capitalize fully on their size. Overall, the positive impact of bank size suggests that larger banks are still somewhat resilient to competition and may benefit from their broader reach and resources. However, the lack of statistical significance indicates that other factors, such as market dynamics and operational efficiencies, play a significant role in moderating this relationship.

4.5.3 Interaction Term (Mobile Money*Bank Size)

The results show that the interaction term of mobile money and bank size has a negative 0.0013 impact on bank profitability. Its p-value of 0.6250 is greater than the 0.05 significance level, thus we fail to reject the null hypothesis and conclude that it is statistically insignificant in its impact on bank profitability. This implies that as bank size increases, the positive effect of mobile money on profitability weakens slightly, though not in a statistically meaningful way. The negative interaction suggests that larger banks may experience a diminishing impact from mobile money, possibly due to their higher operational costs. However, the lack of statistical significance indicates that this moderating effect is weak, and other factors may play a more prominent role in shaping the relationship between mobile money and bank profitability.

4.5.4 Capital Adequacy Ratio

The results show that capital adequacy ratio has a negative 1.4493 impact on bank profitability. Its p-value of 0.0000 is less than the 0.05 significance level, thus we reject the null hypothesis and conclude that it is statistically significant in its impact on bank profitability. The capital adequacy ratio measures the proportion of a bank's capital to its risk-weighted assets, serving as a safeguard against financial crises. While a higher ratio ensures that banks can absorb losses and meet regulatory requirements, it also ties up funds that could otherwise be used for income-generating activities, such as lending or investing. In Kenya, this trade-off is particularly evident as banks strive to comply with the Central Bank of Kenya's stringent regulatory framework, which prioritizes financial stability. By holding a larger share of their resources in reserve, banks may reduce their ability to extend credit, which is a primary source of interest

income. The negative relationship also reflects the opportunity cost of holding excess capital. Funds allocated to meet capital adequacy requirements cannot be deployed in high-yield investments or other profit-making ventures. Additionally, the pressure to maintain high ratios may force banks to operate more conservatively, potentially limiting their growth opportunities. This finding shows the delicate balance between regulatory compliance and profitability. While high capital adequacy ratios enhance a bank's resilience to financial shocks, they may simultaneously hinder its ability to maximize returns, particularly in Kenya's competitive financial ecosystem.

4.5.5 GDP Growth

The results show that GDP has a negative 0.6904 impact on bank profitability. Its p-value of 0.3040 is greater than the 0.05 significance level, thus we fail to reject the null hypothesis and conclude that it is statistically insignificant in its impact on bank profitability. A possible explanation is that during periods of rapid GDP growth, banks may face increased competition from non-bank financial institutions or alternative financial technologies, which can dilute the profitability gains typically associated with economic expansion. Additionally, economic growth might lead to higher inflation or increased operating costs for banks, further limiting their profitability. The insignificant relationship may reflect the broader structural challenges in Kenya's banking sector. For example, high levels of non-performing loans (NPLs) or increased regulatory costs could offset the positive effects of GDP growth on bank profitability. This finding suggests that while economic growth is important, it may not be sufficient to boost profitability without addressing the underlying challenges faced by banks in the competitive and evolving financial ecosystem.

4.5.6 CBK Rate

The results show that CBK Rate has a positive 0.4926 impact on bank profitability. Its p-value of 0.3420 is greater than the 0.05 significance level, thus we fail to reject the null hypothesis and conclude that it is statistically insignificant in its impact on bank profitability. The CBK rate serves as a benchmark for lending rates in the economy, directly affecting the cost of borrowing and the returns on loans extended by banks. A higher CBK rate typically allows banks to increase their lending rates, which could enhance their interest income. However, this study's findings indicate that this relationship is not statistically significant. One possible reason for the insignificant effect is banks' ability to manage interest rate changes through pricing strategies.

Banks may adjust their loan and deposit rates gradually, mitigating the direct impact of fluctuations in the CBK rate on their net interest margins. For instance, fees and commissions from partnerships with mobile money providers like M-Pesa and Airtel Money may reduce their reliance on interest-based income, weakening the link between CBK rate changes and overall profitability.

Additionally, changes in the CBK rate may have limited transmission effects in a financial system increasingly influenced by mobile money. Mobile money platforms provide alternative financial services, including savings, transfers, and credit, which operate largely outside traditional banking structures. This could dampen the responsiveness of banks' profitability to monetary policy adjustments, as observed in this study. Another factor could be the nature of loan demand during periods of interest rate changes. While higher CBK rates may increase banks' returns on loans, they can simultaneously suppress loan demand due to higher borrowing costs, particularly for smaller businesses and individuals. This dual effect may neutralize the overall impact on profitability, resulting in an insignificant relationship.

4.6 Multicollinearity

Table 4.6 Multicollinearity

Variable	VIF	1/VIF
Mobile Money	1.5400	0.6494
Bank Size	1.1300	0.8836
Interaction term (Mobile Money*Bank Size)	1.0500	0.9515
CBK Rate	1.3300	0.7530
GDP	1.3500	0.7403
Capital Adequacy Ratio	1.1100	0.9002
Mean VIF	1.2800	N/A

The Variance Inflation Factor (VIF) was used to check for multicollinearity among the independent variables. With all variables showing VIF values below 10, with a mean

VIF of 1.2800, it was concluded that multicollinearity was not a concern, thus ensuring that the coefficients were reliable.



4.7 Heteroskedasticity

Table 4.7 Heteroskedasticity

Test	Chi-square Statistic	p- value	Decision
Breush-Pagan/Cook Weisberg test	0.3600	0.5505	Fail to reject Ho (No heteroskedasticity)

The Breusch-Pagan/Cook-Weisberg test was conducted to assess whether heteroskedasticity was present in the regression model. This test evaluates whether the variance of the error terms remains constant across observations. The null hypothesis (H_0) states that the model exhibits homoskedasticity, meaning the variance of the errors is constant, while the alternative hypothesis (H_A) suggests the presence of heteroskedasticity, meaning the variance of the errors is not constant. The results of the test produced a Chi-square statistic of 0.36 and a p-value of 0.5505. Since the p-value is greater than 0.05, we fail to reject the null hypothesis (H_0). This indicates that there is no significant evidence of heteroskedasticity in the model, meaning that the error terms have constant variance. Failing to reject the null hypothesis confirms that the model satisfies the assumption of homoskedasticity, ensuring that standard errors and test statistics remain reliable.

4.8 Summary

This chapter provided a comprehensive analysis of the regression results. The variables of mobile money, bank size and their interaction's limited direct impact, the insignificant influence of GDP, CBK Rate and the significant influence of the capital adequacy ratio offer valuable insights into the evolving dynamics of Kenya's financial sector. These findings address the research objectives and contribute to the broader understanding of mobile money's role in shaping bank profitability in Kenya.

CHAPTER 5: DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the concluding sections of the study, summarizing the key findings, insights, and contributions derived from the research on the impact of mobile money on the profitability of commercial banks in Kenya. The chapter is structured to provide a comprehensive understanding of the study's outcomes and their implications for the banking sector. In the discussion section, the interpretation of the regression results is explored, linking them to existing theories and previous studies. It examines the influence of mobile money, bank size, the interaction between these variables, and macroeconomic factors such as GDP growth, the Central Bank Rate (CBK rate), and the capital adequacy ratio on bank profitability. The findings are analyzed in the context of theoretical frameworks like the Disruptive Innovation Theory, Financial Intermediation Theory, and Diffusion of Innovations Theory. The conclusion section provides a summary of the core insights and highlights the contributions of the research. It reflects on the relationships between mobile money, bank characteristics, and macroeconomic variables, offering a clear synthesis of the study's outcomes and drawing meaningful conclusions from the data analysis.

The recommendations section outlines practical strategies based on the study's findings. These recommendations are tailored to policymakers, banking institutions, and stakeholders in the financial sector, providing actionable guidance to enhance bank profitability while navigating the evolving landscape of mobile money and macroeconomic fluctuations. In the limitations of the study section, the constraints encountered during the research process are discussed, acknowledging how these limitations may have influenced the results. This section provides transparency and sets the context for interpreting the findings, helping future researchers understand the boundaries within which the study was conducted. The areas for further research section identifies gaps that future studies could explore to build on the current research. It offers directions for more comprehensive investigations into the dynamics of mobile money, banking operations, and profitability, suggesting topics such as the long-term effects of mobile money, the role of emerging financial technologies, and cross-country comparative analyses.

5.2 Discussions

The study aimed to examine the impact of mobile money on the profitability of commercial banks in Kenya, with bank size serving as a moderating variable. The analysis also considered macroeconomic factors such as GDP growth, the Central Bank Rate (CBK rate), and the capital adequacy ratio. The regression results indicated that mobile money has a positive but statistically insignificant impact on bank profitability. This finding contradicts with the Disruptive Innovation Theory, which suggests that innovations like mobile money disrupt traditional financial systems. While mobile money platforms such as M-Pesa and Airtel Money have introduced competitive pressures for banks, their insignificant impact on profitability could imply that banks have adapted effectively, mitigating the disruptive effects predicted by the theory.

Suri (2016) highlighted how mobile money fosters economic activity and financial inclusion, which can increase demand for bank products like loans and investment accounts. Weil (2021) showed that mobile money reduces transaction volumes and deposit levels for banks. These losses may counteract gains from bank partnerships with mobile money providers and increased financial inclusion, resulting in an overall insignificant effect on profitability. This mixed outcome supports the dual nature of disruptive innovations, both as a challenge and an opportunity for commercial banks. Bank size also showed a positive but statistically insignificant effect on profitability, implying that economies of scale do not substantially influence profitability within the context of this study. This finding aligns with the Financial Intermediation Theory, which posits that banks play a critical role in bridging the gap between savers and borrowers. Larger banks, expected to benefit from economies of scale, may face diminishing returns due to increased operational costs and inefficiencies, offsetting their potential advantages. While Opoku (2022) observed that bank size had a more pronounced positive effect in Ghana due to better resource utilization, the Kenyan context might differ due to other factors such as market dynamics and operational efficiencies.

A key contribution of this study was the inclusion of the interaction term between mobile money and bank size, which formed the basis of the identified research gap. Since no prior research had explored this specific interaction, this study provides new insights into how mobile money and bank size jointly influence bank profitability. The results revealed that the interaction term has a negative but statistically insignificant

impact on bank profitability. This suggests that as bank size increases, the positive effect of mobile money on profitability slightly diminishes. Although this relationship was not statistically significant, the negative coefficient highlights a potential trend where larger banks might experience diminishing benefits from mobile money adoption, possibly due to operational complexities or increased competition as highlighted earlier. This finding challenges traditional assumptions within the Diffusion of Innovations Theory, which suggests that larger institutions are better positioned to adopt and benefit from innovations.

In contrast, the capital adequacy ratio demonstrated a significant negative impact on bank profitability. This finding suggests that higher capital reserves, while essential for regulatory compliance and financial stability, may limit a bank's capacity to engage in income-generating activities, thereby reducing profitability. This aligns with Kamukama (2012), who observed a similar trend in Uganda, where higher reserves constrained banks' ability to lend, leading to lower profitability. While high capital adequacy ratios enhance a bank's resilience to financial shocks, they may simultaneously hinder its ability to maximize returns, particularly in Kenya's competitive financial ecosystem.

GDP growth and the CBK rate both had insignificant impacts on bank profitability, indicating that macroeconomic conditions, as measured by these variables, do not have a direct, strong influence on bank profitability within the study period. GDP's negative though insignificant impact could be explained by the notion that during periods of rapid GDP growth, banks may face increased competition from non-bank financial institutions or alternative financial technologies, which can dilute the profitability gains typically associated with economic expansion. This aligns with Suri (2016), who noted that macroeconomic growth can amplify the competitive pressures between banks and other financial providers such as SACCOs, fintechs, and microfinance institutions. The CBK rate had a positive impact, which could be explained by the fact that a higher CBK rate typically allows banks to increase their lending rates, enhancing their interest income. However, its insignificance may be due to banks' adaptive strategies. Banks may adjust their loan and deposit rates gradually, mitigating the direct impact of fluctuations in the CBK rate on their net interest margins. This aligns with Kulu (2024), who observed that in markets dominated by mobile money, banks diversify their revenue streams beyond interest income to remain competitive.

Overall, the study concludes that while mobile money and other macroeconomic factors are important components of Kenya's financial ecosystem, their direct effects on bank profitability are limited. The significant negative impact of the capital adequacy ratio highlights the delicate balance between maintaining financial stability and achieving profitability.

5.3. Conclusions

This study set out to investigate the impact of mobile money on the profitability of commercial banks in Kenya, with a focus on the moderating role of bank size and the influence of macroeconomic variables such as GDP growth, the Central Bank Rate (CBK rate), and the capital adequacy ratio. The findings revealed that mobile money has a positive but statistically insignificant effect on bank profitability, suggesting that while mobile money services provide opportunities for revenue generation and financial inclusion, they do not have a strong direct influence on profitability within the Kenyan banking sector.

The interaction between mobile money and bank size, which formed the basis of the research gap, exhibited a negative but statistically insignificant effect on bank profitability. This implies that as bank size increases, the benefits derived from mobile money adoption slightly diminish, possibly due to operational complexities and strategic misalignments. Bank size alone also showed a positive but insignificant impact, indicating that economies of scale may not play a significant role in enhancing profitability without efficient resource utilization.

A key finding of the study was the significant negative impact of the capital adequacy ratio on bank profitability. This highlights the trade-off between maintaining regulatory capital requirements for financial stability and pursuing profit-maximizing activities. On the other hand, GDP growth and the CBK rate showed insignificant effects on profitability, suggesting that macroeconomic conditions, while important, may not directly influence bank performance in a substantial way.

In conclusion, the study underscores the complex dynamics between mobile money, bank characteristics, and macroeconomic factors in shaping the profitability of commercial banks in Kenya. It provides new insights into the role of mobile money in the banking sector, the moderating effect of bank size, and the broader economic factors influencing financial performance. These findings contribute to the existing

body of knowledge and offer valuable guidance for policymakers, banking institutions, and researchers interested in the evolving financial landscape in Kenya.

5.4 Recommendations

Based on the study's findings, several recommendations are proposed. First, based on this study's findings on the positive impact of mobile money on bank profitability, the banks should continue to form strategic partnerships with mobile money providers to maximize the potential benefits of mobile money. These collaborations can help diversify income streams and improve customer outreach. These findings would align with Paul (2024) who suggested that banks rather than just competing, should partner with mobile money providers so as to provide more reliable and accessible means to transact, leading to higher financial performance and thus profitability for both.

Second, the analysis showed that bank size has a positive but statistically insignificant effect on profitability, implying that economies of scale do not substantially influence profitability within the context of this study. Therefore, banks should prioritize operational efficiency and cost management over mere expansion. Streamlining processes, leveraging technology, and focusing on core competencies can enhance profitability regardless of size. This strategy aligns again with Paul (2024) whose study on the impact of mobile money services on the profitability of commercial banks in Zambia, suggested that banks should focus on improving operational efficiencies to enhance profitability.

Third, based on the significant negative effect of capital adequacy ratio, regulatory bodies, such as the Central Bank of Kenya, should consider policies that strike a balance between financial stability and profitability of the banking sector. This aligns with Hussam (2020) who cautions against raising capital adequacy ratios as it would lead to larger immobilization of capital and thus lower profitability for banks. Banks on their part should also explore innovative financial products that optimize the use of capital without compromising regulatory requirements.

The negative but insignificant impact of the interaction term suggests that as bank size increases, the benefits of mobile money may diminish. Petria (2015) findings indicated that banks may experience diseconomies of scale at a certain point. It is therefore recommended that banks should tailor their mobile money strategies to their specific size and operational capacities. Smaller banks might focus on niche markets, while

larger banks can leverage their extensive networks to integrate mobile money more effectively.

The study's findings also align with Mhiri(2013) and Yanikaya(2018) on that GDP growth has a negative impact on bank profitability, mainly due to the increased competition during periods of economic expansion. Furthermore, as they recommended, banks should develop strategies that are resilient to macroeconomic fluctuations. Diversifying financial products and expanding into untapped markets can help mitigate potential economic shocks.

The study observed that fluctuations in the CBK rate had an insignificant impact on bank profitability. This could be due to banks' adaptive interest rate policies that mitigate the direct effects of monetary policy changes. These findings align with Callan (2023) who had a similar discovery and recommended that banks should continue to monitor monetary policy developments closely and maintain flexible interest rate strategies that can be adjusted in response to policy shifts. Additionally, diversifying income sources beyond traditional interest-based revenue can help insulate banks from the effects of interest rate volatility.

5.5 Limitations of the Study

While the study provides valuable insights, it faced several limitations that should be acknowledged. First, although the best available data were utilized, the study focused on a limited set of variables, excluding other potential factors such as customer behaviour patterns and technological adoption, which may also influence bank profitability.

Secondly, the scope of the study did not account for external shocks, such as political instability, global economic crises, or pandemics, which can have significant impacts on the banking sector's performance. Lastly, while the methodology provided robust results, the inherent limitations of econometric models, such as the assumption of linear relationships and potential model misspecification due to factors such as omitted variables, may have had an effect on the findings.

Despite these limitations, the study contributes to the understanding of mobile money's impact on bank profitability in Kenya and provides a foundation for future research in this area.

5.6 Areas for further research

While this study has provided valuable insights into the impact of mobile money on the profitability of commercial banks in Kenya, several areas warrant further investigation. First, future studies could explore the long-term effects of mobile money adoption on bank profitability using long-term time-series data to capture dynamic changes and trends over extended periods. This would provide a more comprehensive understanding of how mobile money impacts profitability over different economic cycles. Second, additional research could focus on the role of technological innovations beyond mobile money, such as digital banking platforms, blockchain technology, and fintech solutions, in influencing bank profitability. Understanding the interplay between these technologies and traditional banking models could offer deeper insights into the evolving financial landscape.

Third, the interaction between mobile money and other moderating variables, such as regulatory frameworks, customer behavior, and financial literacy levels, remains underexplored. Investigating these factors could help clarify the mechanisms through which mobile money affects bank performance, particularly in diverse economic environments. Fourth, future research could examine the differential impact of mobile money on banks of varying sizes and ownership structures, including foreign owned versus locally owned banks, to determine if these characteristics influence the relationship between mobile money and profitability. Lastly, comparative studies across different countries or regions could provide valuable cross-contextual insights. Such studies would help identify whether the patterns observed in Kenya are consistent with those in other markets, thereby contributing to the generalizability of the findings. By addressing these areas, future research can build on the current study's findings and contribute to a more nuanced understanding of the complex relationship between mobile money, banking operations, and profitability in the financial sector.

References

Ameur, I. G. B., & Mhiri, S. M. (2013). Explanatory factors of bank performance in Tunisia: A panel model approach. *Global Journal of Management and Business Research*, 13(C5), 1–12.

Central Bank of Kenya. (2007). *Bank supervision annual report 2007*. Central Bank of Kenya.

<https://www.centralbank.go.ke/images/docs/Bank%20Supervision%20Reports/Annual%20Reports/bsd2007.pdf>

Central Bank of Kenya. (2008). *Bank supervision annual report 2008*. Central Bank of Kenya.

<https://www.centralbank.go.ke/images/docs/Bank%20Supervision%20Reports/Annual%20Reports/bsd2008.pdf>

Central Bank of Kenya. (2009). *Bank supervision annual report 2009*. Central Bank of Kenya.

<https://www.centralbank.go.ke/images/docs/Bank%20Supervision%20Reports/Annual%20Reports/bsd2009.pdf>

Central Bank of Kenya. (2010). *Bank supervision annual report 2010*. Central Bank of Kenya.

<https://www.centralbank.go.ke/images/docs/Bank%20Supervision%20Reports/Annual%20Reports/bsd2010.pdf>

Central Bank of Kenya. (2011). *Bank supervision annual report 2011*. Central Bank of Kenya.

<https://www.centralbank.go.ke/images/docs/Bank%20Supervision%20Reports/Annual%20Reports/bsd2011.pdf>

Central Bank of Kenya. (2012). *Bank supervision annual report 2012*. Central Bank of Kenya.

<https://www.centralbank.go.ke/images/docs/Bank%20Supervision%20Reports/Annual%20Reports/bsd2012-r.pdf>

Central Bank of Kenya. (2013). *Bank supervision annual report 2013*. Central Bank of Kenya.

<https://www.centralbank.go.ke/images/docs/Bank%20Supervision%20Reports/Annual%20Reports/BSD2013AnnualReport.pdf>

Central Bank of Kenya. (2014). *Bank supervision annual report 2014*. Central Bank of Kenya.

<https://www.centralbank.go.ke/images/docs/Bank%20Supervision%20Reports/Annual%20Reports/2014BSAnnualReport.pdf>

Central Bank of Kenya. (2015). *Bank supervision annual report 2015*. Central Bank of Kenya.

https://www.centralbank.go.ke/uploads/399346751_2015%20Annual%20Report.pdf

Central Bank of Kenya. (2016). *Bank supervision annual report 2016*. Central Bank of Kenya.

https://www.centralbank.go.ke/uploads/banking_sector_annual_reports/831171133_2016%20Annual%20Report.pdf

Central Bank of Kenya. (2017). *Bank supervision annual report 2017*. Central Bank of Kenya.

https://www.centralbank.go.ke/uploads/banking_sector_annual_reports/849246690_2017%20Annual%20Report.pdf

Central Bank of Kenya. (2018). *Bank supervision annual report 2018*. Central Bank of Kenya.

https://www.centralbank.go.ke/uploads/banking_sector_annual_reports/1174296311_2018%20Annual%20Report.pdf

Central Bank of Kenya. (2019). *Bank supervision annual report 2019*. Central Bank of Kenya.

https://www.centralbank.go.ke/uploads/banking_sector_annual_reports/197965474_BSDANNUALREPORT2019%20.pdf

Central Bank of Kenya. (2020). *Bank supervision annual report 2020*. Central Bank of Kenya.

https://www.centralbank.go.ke/uploads/banking_sector_annual_reports/468154612_2020%20Annual%20Report.pdf

Central Bank of Kenya. (2021). *Bank supervision annual report 2021*. Central Bank of Kenya.

https://www.centralbank.go.ke/uploads/banking_sector_annual_reports/1033515790_2021%20Annual%20Report.pdf

Central Bank of Kenya. (2022). *Bank supervision annual report 2022*. Central Bank of Kenya.

https://www.centralbank.go.ke/uploads/banking_sector_annual_reports/1376276635_2022%20Annual%20Report.pdf

Christensen, C. M. (1997). *The innovator's dilemma: When new technologies cause great firms to fail*. Harvard Business Review Press.

Diamond, D. W., & Dybvig, P. H. (1983). Bank runs, deposit insurance, and liquidity. *Journal of Political Economy*, 91(3), 401–419.

International Monetary Fund. (2023). *What is the difference between mobile money and mobile banking?* IMF Data Help. <https://datahelp.imf.org>

Jack, W., & Suri, T. (2016). The long-run poverty and gender impacts of mobile money. *Science*, 354(6317), 1288–1292.

Kulu, E. (2024). Mobile money, credit to deposit ratio and monetary policy: Empirics from Ghana. *The NorthCap Research Journal*, 200060.

- Kwami, A. K. (2023). The impact of Tigo Cash on the profitability of banks in Ghana. *African Journal of Economic and Financial Studies*, 15(2), 234–248.
- Mbiti, I., & Weil, D. N. (2021). Mobile banking: The impact of M-Pesa in Kenya. *Journal of Development Economics*, 117, 2–16.
- Mbunji, P., & Kaira, B. (2024). An investigation of the impact of mobile money services on the profitability of commercial banks in Zambia. *International Journal of Research and Innovation in Social Science (IJRISS)*, 8(4), 2772–2788.
- Nixon, K. (2022). Exploring the impact of mobile money services on rural economies. *Heliyon*, 8(2), e10761.
- Opoku, M., & Ackah, M. (2022). Assessing mobile money adoption in Ghana: Challenges and prospects. *Heliyon*, 8(2), e10761.
- Petria, N., Capraru, B., & Ihnatov, I. (2015). Determinants of banks' profitability: Evidence from EU 27 banking systems. *Procedia Economics and Finance*, 20, 518–524.
- Rogers, E. M. (1962). *Diffusion of innovations* (1st ed.). Free Press.
- World Bank. (2023, September 5). *E-Money – Mobile money – Mobile banking – What's the difference?*
World Bank Blogs. <https://blogs.worldbank.org/psd/e-money-mobile-money-mobile-banking-what-s-the-difference>