FINANCIAL INCLUSION AND STABILITY OF COMMERCIAL BANKS IN KENYA

BY

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JULY, 2018
DECLARATION

This thesis is my original work and has not been presented for a degree in any other University or for any other award. No part of this thesis should be reproduced without authority of the author or/and Kenyatta University.

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DEDICATION

This thesis is dedicated to my parents the late Peter Musau Mwangangi and Domitila Syonzavi Musau for ensuring that I went to school; my siblings, especially my sisters Josephine Mwikali, Berita Mutinda and my brother David Mbithi who have always encouraged me. Finally, I dedicate this thesis to my husband Rogers Waswa, Daughter Rhoda Nafuna and son Emmanuel Waswa for their support and encouragement even when the going seemed tough.
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TABLE OF CONTENTS

Declaration ........................................................................................................................................... ii
Dedication............................................................................................................................................ iii
Acknowledgement ............................................................................................................................ iv
Table of Contents .............................................................................................................................. v
List of Tables ....................................................................................................................................... ix
List of Figures ..................................................................................................................................... xi
Operational Definition of Terms ......................................................................................................... xii
Abbreviations and Acronyms ............................................................................................................. xvi
Abstract ............................................................................................................................................... xviii

CHAPTER ONE: INTRODUCTION ................................................................................................. 1

1.1 Background of the Study .............................................................................................................. 1
   1.1.1 Stability of Commercial Banks .......................................................................................... 2
   1.1.2 Financial Inclusion ............................................................................................................ 6
   1.1.3 Operating Environment ...................................................................................................... 10
   1.1.4 Bank Competitiveness ........................................................................................................ 13
   1.1.5 Commercial Banks in Kenya ............................................................................................ 16

1.2 Statement of the Problem ............................................................................................................ 19

1.3 Objectives of the study ............................................................................................................... 20
   1.3.1 General Objective ........................................................................................................... 21
   1.3.2 Specific Objectives ............................................................................................................ 21

1.4 Research Hypotheses .................................................................................................................. 21

1.5 Significance of the study ............................................................................................................. 22

1.6 Scope of the Study ...................................................................................................................... 24
1.7 Limitations of the study ........................................................................................................ 25
1.8 Organization of the study .................................................................................................... 25

CHAPTER TWO: LITERATURE REVIEW ............................................................................. 26

2.1 Introduction ...................................................................................................................... 26
2.2 Theoretical Literature ..................................................................................................... 26
  2.2.1 Financial Intermediation Theory .................................................................................. 27
  2.2.2 Financial Growth Theory ............................................................................................ 29
  2.2.3 Asymmetric Information Theory ................................................................................ 31
  2.2.4 Competitive – Stability Theories .............................................................................. 32
2.3 Empirical Review .......................................................................................................... 35
  2.3.1 Bank Availability and Stability of Commercial Banks .............................................. 36
  2.3.2 Bank Accessibility and Stability of Commercial Banks .......................................... 39
  2.3.3 Bank Usage and Stability of Commercial Banks ..................................................... 42
  2.3.4 Financial Inclusion, Operating Environment and Bank Stability ......................... 44
  2.3.5 Financial Inclusion, Bank Competitiveness and Bank Stability ......................... 46
2.4 Summary of Literature and Research Gaps ..................................................................... 48
2.5 Conceptual Framework .................................................................................................. 51

CHAPTER THREE: RESEARCH METHODOLOGY ................................................. 56

3.1 Introduction ...................................................................................................................... 56
3.2 Research Philosophy ...................................................................................................... 56
  3.2.1 Research Design ........................................................................................................ 57
3.3 Empirical Model ............................................................................................................. 59
  3.3.1 Testing of Moderating Effect of Operating Environment ........................................ 61
  3.3.2 Testing of Mediating Effect of Bank Competitiveness ........................................... 64
3.4 Target Population ........................................................................................................66
3.5 Data Collection Instruments .......................................................................................67
  3.5.1 Validity of the Instruments ..................................................................................69
  3.5.2 Data Collection Procedure ...............................................................................70
3.6 Data Analysis Method ...............................................................................................70
  3.7.1 Diagnostic Test ...................................................................................................71
3.8 Ethical Consideration ...............................................................................................77

CHAPTER FOUR: RESEARCH FINDINGS AND DISCUSSION .................. 78
4.1 Introduction ..............................................................................................................78
4.2 Descriptive Statistical Analysis ................................................................................78
  4.2.1 Trend in Bank Stability ....................................................................................78
  4.2.3 Trend in the GDP and Inflation ........................................................................84
  4.2.4 Trend in Bank Competitiveness ........................................................................86
4.3 Inferential Statistics ..................................................................................................88
  4.3.1 Diagnostic Test ................................................................................................88
  4.3.2 Hypotheses Testing .........................................................................................98

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND
RECOMMENDATIONS ......................................................................................... 147
5.1 Introduction .............................................................................................................147
5.2 Summary ...............................................................................................................147
5.3 Conclusions ...........................................................................................................150
5.4 Contribution to Knowledge ....................................................................................152
5.5 Recommendations ................................................................................................154
5.6 Suggestions for Further Research .........................................................................157
REFERENCES .................................................................................................................. 158

APPENDICES .................................................................................................................. 175

Appendix I: Commercial Banks ..................................................................................... 175

Appendix II: Stability Data Review Form ....................................................................... 176

Appendix III: Financial Inclusion Data Review Form ..................................................... 177

Appendix IV: Index of Financial Inclusion (IFI) ............................................................. 178
LIST OF TABLES

Table 1.1: Commercial Banks Classification...........................................17
Table 2.1: Summary of Theories.................................................................34
Table 2.2: Summary of Literature and Research Gaps.................................49
Table 3.1: Moderation Decision Making Criteria........................................63
Table 3.2: Mediation Decision Making Criteria...........................................66
Table 3.3: Distribution of the Target Population.......................................67
Table 3.4: Operationalization and Measurement of Variables......................68
Table 4.1: Correlation Results on Financial Inclusion and Stability.............90
Table 4.2: Results of Heteroskedasticity Test...........................................92
Table 4.3: Results of Multicollinearity Test...............................................93
Table 4.4: Results of Serial Correlation Test.............................................94
Table 4.5: Results of Stationarity Test.......................................................95
Table 4.6: Hausman Test for Credit Risk..................................................96
Table 4.7: Hausman Test for Liquidity Risk..............................................97
Table 4.8: Hausman Test for Insolvency Risk..........................................98
Table 4.9: Effect of Financial Inclusion on Credit Risk...............................99
Table 4.10: Effect of Financial Inclusion On Liquidity Risk.......................104
Table 4.11: Effect of Financial Inclusion on Insolvency Risk.......................109
Table 4.12: Effect of Financial Inclusion on Stability................................114
Table 4.13: Inflation and GDP as Explanatory Variables on Credit Risk........116
Table 4.14: Inflation and GDP as moderator Variables on Credit Risk...........118
Table 4.15: Summary of Moderating Effect of Inflation and GDP (Credit Risk).121
Table 4.16: Inflation and GDP as Explanatory Variables on Liquidity Risk.....122
Table 4.17: Inflation and GDP as moderator Variables on Liquidity Risk........124
Table 4.18: Summary of Moderating Effect of Inflation and GDP (Liquidity)....127
Table 4.19: Inflation an GDP as Explanatory Variables on Insolvency Risk.......129
Table 4.20: Inflation and GDP as moderator Variables on Insolvency Risk.......131
Table 4.21: Summary of Moderating Effect of Inflation and GDP (Insolvency)...134
Table 4.22: Effect of Financial Inclusion on Competitiveness.......................137
Table 4.23: Effect of Competitiveness on Stability........................................138
Table 4.24: Effect of Competitiveness and Financial Inclusion on Stability.......140
Table 4.25: Summary of Mediating Effect of Bank Competitiveness.............143
Table 4.26: Summary of Hypotheses Testing.................................................145
LIST OF FIGURES

Figure 2.1: Conceptual Framework ................................................................. 52
Figure 3.1: Mediation Analysis Model ............................................................. 64
Figure 4.1: Trend in Bank Stability ................................................................. 79
Figure 4.2: Trend in Financial Inclusion ......................................................... 82
Figure 4.3: Trend in Inflation and Real GDP .................................................. 85
Figure 4.4: Trend in Bank Competitiveness .................................................... 86
Figure 4.5: Histogram of Normality Test ......................................................... 89
OPERATIONAL DEFINITION OF TERMS

Agency banking: This is the provision of financial services to customers by a third party (agent) on behalf of a licensed deposit taking financial institution and/or mobile money operator (principal).

Automated Teller machines: This is an electronic banking outlet, which allows customers to complete basic transactions without the aid of a branch representative or teller that is, to withdraw or deposit cash and receive a report of the account's balance.

Bank Accessibility: Process of broadening the use of financial services. Its represented by the total number of bank accounts.

Bank Availability: Outreach dimension of financial inclusion in terms of geographical and demographic variables. It includes the number of branch networks, ATMs and agents.

Bank Competitiveness: Measure of the market share of each bank as indicated by Herfindahl-Hirschman Index (HHI)

Bank Stability: Distance of an individual bank from insolvency and failure. It’s proxied by the probability of insolvency risk, credit risk and liquidity risk levels.
Bank Usage: Measures how clients use financial services as indicated by volume of deposits and credits to Gross Domestic Product.

Capitalization Risk: This is proxied by equity to assets ratio divided by the standard deviation of returns. It measures the number of times returns would have to drop before all the equity is over.

Commercial Banks: Financial institutions charged with the responsibility of deposit taking and giving loans. They act as financial intermediaries between borrowers and savers.

Credit Risk: The uncertainty surrounding a debtor’s repayment of a loan or credit. It’s proxied by the ratio of gross non-performing loans to total loans.

Financial inclusion: Process of promoting affordable, timely and adequate access to a range of regulated financial products services and broadening their use by all segments of society.

Financial intermediation: Process by which banks act as agents that bridge the gap that exists between savers and borrowers.

Financially excluded: The people from the mainstream populace who cannot access financial products.
Insolvency risk: Number of standard deviations by which a bank's return on assets has to fall for the bank's capital to be completely depleted.

Internet banking: This refers to an electronic payment system that enables customers of a bank or other financial institution to conduct a range of financial transactions through the financial institution's website.

Liquidity Risk: Possibility of loss when the bank does not have enough cash to pay off debts or satisfy the customer’s demands of withdrawing deposits and getting loans. This is the proportion of total liquid assets to total deposits in commercial banks.

Macroeconomic Variables: Indicators of economic performance of a country. This study included GDP and inflation rate in Kenya, since they influence the level of financial inclusion.

Market Share: Measure of competitiveness in the banking industry proxied by Herfindahl-Hirschman Index (HHI).

Mobile banking: This is service provided by a bank or other financial institution that allows its customers to conduct a range of financial transactions remotely.
using a mobile device such as a mobile phone or tablet, and using software, usually called an app, provided by the financial institution for the purpose.

**Returns volatility:** Standard deviation of the return on assets ratio. It is a measure of banks insolvency.

**Stability Z-score:** It’s a measure of insolvency risk of a bank.
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>AFI</td>
<td>Alliance for financial Inclusion</td>
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<tr>
<td>ATM</td>
<td>Automated Teller Machine</td>
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<td>BAV</td>
<td>Bank Availability</td>
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<tr>
<td>BAC</td>
<td>Bank Accessibility</td>
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<tr>
<td>BUS</td>
<td>Bank Usage</td>
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<tr>
<td>CAMELS</td>
<td>Capital adequacy, Asset quality, Management capability, Earnings, Liquidity and Sensitivity to market risk</td>
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<tr>
<td>CBK</td>
<td>Central Bank of Kenya</td>
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<tr>
<td>CBs</td>
<td>Commercial Banks</td>
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<tr>
<td>CRB</td>
<td>Credit Reference Bureau</td>
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<tr>
<td>CGAP</td>
<td>Consultative Group to Assist the Poor</td>
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<tr>
<td>CLRM</td>
<td>Classical Linear Regression Model</td>
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<td>CMA</td>
<td>Capital Market Authority</td>
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<td>COOP</td>
<td>Cooperatives</td>
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<td>CR</td>
<td>Credit Risk</td>
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<tr>
<td>DIC</td>
<td>Deposit Insurance Co-Operation</td>
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<td>FBs</td>
<td>Forex Bureaus</td>
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<td>FSD</td>
<td>Financial Sector Deepening</td>
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<td>G-20</td>
<td>Great- 20 Countries</td>
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<td>GDP</td>
<td>Gross Domestic Product</td>
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<tr>
<td>GFC</td>
<td>Global Financial Crisis</td>
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<td>GFDD</td>
<td>Global Financial Development Database</td>
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<tr>
<td>GOK</td>
<td>Government of Kenya</td>
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<tr>
<td>Acronym</td>
<td>Definition</td>
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<td>GPF</td>
<td>Global Partnership of Financial Inclusion</td>
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<td>HHI</td>
<td>Herfindahl-Hirschman Index</td>
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<tr>
<td>ICT</td>
<td>Information Communication Technology</td>
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<tr>
<td>IFI</td>
<td>Index of Financial Inclusion</td>
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<td>IFRS</td>
<td>International Financial Reporting Standards</td>
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<tr>
<td>IMF</td>
<td>International Monetary Fund</td>
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<td>IS</td>
<td>Insolvency Risk</td>
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<tr>
<td>KNBS</td>
<td>Kenya National Bureau of Statistics</td>
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<tr>
<td>LR</td>
<td>Liquidity Risk</td>
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<td>MDGs</td>
<td>Millennium Development Goals</td>
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<tr>
<td>MFIs</td>
<td>Micro Finance Institutions</td>
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<tr>
<td>NBFs</td>
<td>Non-Bank Financial Institutions</td>
</tr>
<tr>
<td>NGOs</td>
<td>Non-Governmental Organizations</td>
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<tr>
<td>NPL</td>
<td>Non Performing Loans</td>
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<tr>
<td>NRF</td>
<td>National Research Fund</td>
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<tr>
<td>OLS</td>
<td>Ordinary Least Squares</td>
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<tr>
<td>ROA</td>
<td>Returns on Assets</td>
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<tr>
<td>ROE</td>
<td>Returns on Equity</td>
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<tr>
<td>ROI</td>
<td>Return on Investment</td>
</tr>
<tr>
<td>SMEs</td>
<td>Small and Medium Enterprises</td>
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<tr>
<td>SACCO</td>
<td>Savings and credit cooperative society</td>
</tr>
<tr>
<td>UK</td>
<td>United Kingdom</td>
</tr>
<tr>
<td>VIF</td>
<td>Vector Inflation Factor</td>
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Commercial banks remain the dominant channel of financial intermediation in emerging market economies such as Kenya. After the global financial crisis of 2007-2009, policy makers, regulators and financial institutions heavily invested in reforms aimed at improving financial stability. At the same time, there has been global commitment to promoting greater financial inclusion. Consequently, commercial banks have addressed financial inclusion by designing new services and products targeting unbankable customers. However, despite these initiatives, some commercial banks have incurred stability related challenges in Kenya and thus some were put under receivership and others closed. It is therefore, important for financial institutions to understand the interlinkages in advancing financial inclusion and financial stability. Therefore, this study set out to establish the effect of bank availability, bank accessibility and bank usage on stability of commercial banks in Kenya. The study further sought to determine the moderating effect of bank operating environment, and establish the mediating effect of bank competitiveness on the relationship between financial inclusion and financial stability of commercial banks in Kenya. The study was anchored on financial intermediation theory supported by finance growth theory, asymmetry information theory and competitive-stability theory. Positivism philosophy, longitudinal and explanatory non–experimental research designs were used. The target population was all the 43 commercial banks in Kenya. The study used secondary data collected from annual reports of the Central Bank of Kenya (CBK); commercial banks audited published financial statements and annual data from the Kenta National Bureau of Statistics (KNBS) for the period between 2007 and 2015. Data was analyzed using descriptive statistics and panel multiple regression analysis. The results indicated that bank availability had a statistically significant effect on bank stability. Bank accessibility also had a significant effect on bank stability. However, it was found to have insignificant effect on liquidity risk. In addition, bank usage was also found to have a significant effect on bank stability. On operating environment, inflation rate was found to moderate the relationship between financial inclusion and bank stability. The Gross Domestic Product growth rate moderated the relationship between financial inclusion and bank stability. Nevertheless, there was no moderation effect for insolvency risk which is a measure of stability. Bank competitiveness was found to partially mediate the relationship between financial inclusion and bank stability. However, there was no mediation for insolvency risk. The study thus concluded that financial inclusion influences stability. Further, increase in GDP growth rate encourages more financial inclusion. Moreover, banks that have developed competitive strategies are likely to be more stable. The study, therefore, recommends that managers of commercial banks should design strategies that enhance financial inclusion to many customers, develop strong and persuasive promotion of their products and provide financial literacy to the customers. This will enable the customers to appreciate and use the products and assist the banks to remain competitive in the market. The regulator should strengthen the legal and regulatory framework to ensure that banks remain stable while accommodating financial inclusion. Bank managers should lobby the CBK to maintain a favorable environment hence form an all-inclusive and stable financial sector over time.
CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

Bank stability has been a key international agenda by policy makers following the Global Financial Crisis (GFC) of 2007-2009 (Beck, 2009). The financial Stability Board and Basel Accords have been key in enhancing financial stability of commercial banks in Kenya. One of the mandates of the Central Bank of Kenya (CBK) is to foster financial stability through regulation. The CBK has ensured stability by adopting the Basel II Accord and ensuring compliance by the financial institutions regulations (CBK, 2015).

Globally, governments, central banks and other policy makers have increasingly taken on mandate of ensuring financial stability of both financial institutions, financial sector and by extension the economic stability of countries (Ciha’ki, Mare & Malecky, 2016). Consequently, countries and governments have increasingly prepared as well as implemented financial inclusion initiatives (World Bank, 2014). In addition, commercial banks have taken actions to address financial inclusion by designing new services and products targeting groups previously referred to as unbankable (Allen, Carlett, Qian, Senbet & Valenzuela, 2013).

Commercial banks are important financial intermediaries in the economy which perform the basic functions of accepting deposits, lending money and offering transfer services. They represent a critical role in the implementation of governments’ economic policies, particularly monetary policy, linking them to the
rest of the economy (Ongore & Kusa, 2013). In emerging market economies such as Kenya, commercial banks remain the dominant channel of financial intermediation. Bank deposits represent the most significant component of money supply used by the public, changes in money growth are highly correlated with changes in prices of goods and services in the economy (Chibba, 2009).

Access to bank credit and other bank services is absolutely essential for any country and this justifies the need to make banking services accessible, available and attractive to all without any form of discrimination (Sarma & Pias, 2011). What it means is that if financial services are available and easily accessible to all, then banks can attract more savings and in turn improve their profitability. This is possible through financial inclusion which ensures more people are included in the formal financial system (Allen et al., 2013). However, for commercial banks to efficiently perform their intermediation role of providing liquidity, they must be stable.

1.1.1 Stability of Commercial Banks

According to Mostak and Sushanta (2015), when a bank has financial stability, it performs its financial intermediation process smoothly, thereby building confidence among users. Khan (2011) also observed that a financial system is said to be stable if it performs its financial intermediation process among the users smoothly, through a range of financial institutions supported by a myriad of financial infrastructure. Fluctuations in the global financial system are a constant concern. Due to this many countries prioritize financial stability over financial growth. This is because growth
may be unsustainable over long periods if there is instability. To achieve financial stability, many countries strengthen financial regulation. Sparatt and Stephen, (2013) observed that a financial system can become unstable, triggering crisis that devastate the real economy. A case in point is the global financial crisis of 2007-2009. If sound, appropriate and effective regulation is not provided, such crisis is inevitable.

After the GFC of 2007-2009, policy makers across the world including both advanced and developing countries have prioritized bank stability agenda (Beck, 2009). However, while policy makers are concerned more about the systematic banking crisis, individual bank fragility can also be worrying since several systematic banking crises initially start as crisis in individual banks. The debate on factors that affect bank stability continues but very little is known on how financial inclusion affects bank stability (Kalunda, 2015).

Amatus and Alireza (2015) established that, in Africa, the financial sectors are less developed compared to other developing regions of the rest of the world. Banking systems account for the preponderance of financial sector assets and activities. For a country where the financial sector is dominated by commercial banks, any failure in the sector adversely affects its economic growth.

In Kenya, the banking sector has been facing stability challenges from time to time (CBK, 2015). In 1978, a number of financial institutions were closed after encountering liquidity troubles. At that time, the CBK lacked adequate capacity to
regulate the highly politicized financial sector. Twelve banks collapsed between 1984 and 1989, occasioning the government to pass the Banking Act 1989. The act tightened the requirements for the licensing of new financial institutions.

The minimum capital requirement was increased and deposit insurance was made compulsory. More banks went under between 1993 and 1995 despite the stringent regulation. In 1998 Bullion Banks, Fortune Finance, Trust Banks, City Banks, Reliance Bank and Prudential Banks collapsed (Matete, 2014). In 2015, CBK put all banks operating in Kenya under tight scrutiny as it moved to restore and sustain market confidence in the sector, following the collapse of Charter House Bank in 2012, Imperial Bank and Dubai Bank in 2015 and Chase Bank all facing stability challenges (CBK, 2016).

According to the Basels II Accord, the core indicators relating to bank financial stability include capital adequacy, asset quality, management soundness, earnings and profitability, liquidity and sensitivity to market risk CAMELS (Beck, 2009). Measuring of individual bank stability has been based on accounting data using Z-score and Non-Performing Loan (NPL) ratio (Ghosh, 2008; Beck, 2009; Mostak & Sushanta, 2015).

The Z-score is termed to be a more comprehensive measure of bank stability compared to liquidity ratio and NPL ratio. This is because it combines information on leverage (equity to assets) with performance (return on assets) and risk (standard deviation of return on assets) to more fully approximate the likelihood of insolvency.
in the commercial banks (Ciha’ki et al., 2016). The Z-score increases with higher profitability and capitalization levels; it decreases with unstable earnings reflected by higher standard deviation of return on assets. An increasing value of Z-score indicates a small risk profile for a bank and higher bank stability (Kalunda, 2015).

Bank stability was conceptualized based on the study of Beck, (2009) that used Z-score to measure insolvency risk and NPL, to measure credit risk to determine the stability of German banks with different ownership structures. The study used Z-score as a measure of bank stability where it indicated the distance from insolvency by combining accounting measures of profitability, leverage and volatility.

Specifically, Z-score indicates the number of standard deviation that a bank’s ROA has to drop below its expected value before equity is depleted and the bank is insolvent. Z-score was computed annually for each of the forty one commercial banks. It is worth noting that Z-score increases with higher profitability and capitalization levels, decreasing with unstable earnings reflected by a higher standard deviation of ROA (Mostak & Sushanta, 2015).

Loans are the major assets of commercial banks and their most important single and largest source of earnings. The profitability of commercial banks has been found to rely heavily on the quality of the loan portfolio (Ongore & Kusa, 2013). Losses derived from delinquent loans have the capacity of increasing bank financial risks. Delis et al. (2014) observed that NPL ratio is the best to measure credit risk exposure.
Maintaining the amount of NPLs very low has been a major priority by all banks given that low values of NPLs are indicators of good health of the bank portfolio. On the other hand, high level of NPLs affects profitability negatively. This study adopted the definition of Beck (2009), of NPL ratio as the ratio of classified loans to total loans, excluding interbank loans. NPL is computed as the ratio of the volume of NPL to total loans of a bank. A default occurs when the bank considers that a borrower is unlikely to repay his credit obligations in full, without recourse to collateral (Morgan & Pontines, 2014).

Liquidity risk is used to measure the risk which results from a mismatch of assets and liabilities. This study adopted the loan-to-deposits ratio as the indicator for liquidity risk. It is argued that the liquidity of a bank is usually evaluated by using a host of tools and techniques. However, the traditional loan-to-deposits ratio is a measure that often receives the most attention by analysts and regulators.

Loan to deposits ratio captures the bank’s ability to repay depositors and other creditors without incurring excessive costs, as it continues simultaneously to fund its expansion (Mostak & Sushanta, 2015). This study adopted the three measures, namely, credit risk, liquidity risk and insolvency risk as recommended by Beck, (2009); Mostak and Sushanta, (2015) and Ciha’ki et al. (2016).

1.1.2 Financial Inclusion

According to the Global Partnership of Financial Inclusion (GPFI) and G-20, financial inclusion has become an important component of financial development in
the world. Increasing access of financial services to many citizens has been a priority to policy makers. The last decade has witnessed many initiatives by both emerging and developing economies in pushing the financial inclusion agenda. (Demirguc-Kunt & Huizinga, 2010). Multilateral agencies including the International Monetary Fund (IMF), G-20, the Alliance for Financial Inclusion (AFI), and the Consultative Group to Assist the Poor (CGAP) have also been active in enhancing the inclusive banking agenda.

According to CGAP, for a country to achieve an inclusive financial sector, every member of the economy should be able to utilize the financial services provided, with ease in accessibility, availability, affordability and usage. Bartha et al. (2008) established that the initiatives taken had a great impact by increasing the population of people included financially and consequently improving the stability of commercial banks. In emerging market economies like Kenya, commercial banks remain the dominant channel of financial intermediation leading to financial inclusion (Ongoro & Kusa, 2013).

The GFC), of 2007-2009 tested the rationale of financial inclusion when bank failures were associated with financial inclusion (Carneiro, 2011; Ghosh, 2008). Financial inclusion has also been linked to improved financial performance (Allen et al., 2013). Despite all the importance and renewed attention on financial inclusion and the claim that the GFC was accelerated by financial inclusion, there is still lack of empirical evidence to conclude this. Besides, not much is known on the effect of
financial inclusion at the micro- level or bank level as most studies are carried out at the sector level, with few studies dealing with individual banks (Allen et al., 2013).

In the last two decades, studies done in sub-Saharan Africa have shown increased bank activities caused by entrance of new customers through financial inclusion. In addition, the commercial banks in the region have been reporting better profits compared to other parts of the world (Flamini et al., 2009; Ongore & Kusa, 2013). This has been attributed to huge investments in risky ventures a mismatch between demand and supply of bank services as well as concentration in government ownership in the industry.

Kerata (2007) and Allen et al. (2013) posit that these ventures through financial inclusion have the potential of influencing positively the stability of banks. However, Kipesha and Zhang (2013) warn that long- term effect can be negative, if the financial inclusion programs are poorly implemented.

Currently, commercial banks are actively targeting groups previously targeted by MFIs and previously referred to as unbankable (Allen et al., 2013) under a phenomenon known as downscaling (Delfiner & Peron, 2007). Chibba (2009) observed that commercial banks have taken action to address financial inclusion by designing new services and products targeting the low-wage earners and the poor throughout the world.

According to the Finance Sector Deepening Report (FSD) of 2013 t, Kenya has witnessed increased financial inclusion and access to financial services in the last
decade. In Kenya’s Vision 2030, the country planned to increase financial access to 80% of the population. Financial inclusion is a key component in enhancing access. Financial inclusion in Kenya has been monitored through financial access survey conducted by FSD in 2006, 2009, 2013 and 2016.

Since 2007, Kenya has significantly succeeded in expanding financial inclusion within the country. There are several factors that have contributed to this greater level of inclusion. First, is expanding the reach of the major types of financial providers, commercial banks, savings and credit co-operatives (SACCOs) and MFIs (CBK, 2012). Secondly, is identification of financial inclusion as a national priority in Vision 2030. Finally is the increase in accessibility brought about by financial innovations.

Financial inclusion in Kenya has been characterized by rapid technological change in the finance sector that has led to the development of financial innovations, new products and new forms of payment. According to the CBK (2012) the banking sector has undergone substantive transformation particularly from the year 2007. The invention of the mobile phone payment platform *M-pesa* dramatically changed the financial landscape by offering a simple efficient and cost-effective method to transfer money and make payments.

Through agency banking, bank clients have been enabled access to basic financial services by allowing small businesses to operate as satellite branches (Musau, 2013). In 2012, Safaricom ltd in conjunction with Commercial Bank of Africa (CBA), one
of the Kenya’s registered commercial bank, launched a service dubbed *M-shwari* that automatically opens a bank account for *M-pesa* registered customer and operates fully like a bank account. This has ensured that more people are able to access financial services.

According to Allen *et al.* (2013), there are three basic measures of financial inclusion; bank availability, bank accessibility and bank usage. Bank availability dimension accounts for the level of penetration and presence of a bank physical outlet. The physical distance between bank points of touch and the customers is an important impediment to financial inclusion.

This study used penetration of bank branches, ATMs and agents to represent bank availability dimension (Mostak & Sushanta, 2015). For the bank accessibility, the number of bank deposits, loan and mobile accounts per 1000 adult population was used to account for the financial inclusion deepen within the country. The bank usage dimension is measured using a combination of the total volume of credits and the total volume of deposits in comparison to the level of GDP (Sarma & Pias, 2011; Beck *et al.*, 2013).

1.1.3 Operating Environment

Stability of commercial banks and financial inclusion have been found to be affected by internal and external operating environmental factors (Githinji, 2016). Internal factors are classified as bank specific, that is, individual characteristics and influence bank stability. These factors are basically controlled by decisions, policies and
objectives made internally by the management. They include bank size, market share, and capital adequacy, operating efficiency, income diversification and ownership, among others.

On the other hand, external factors are classified as macroeconomic variables. They can affect the entire financial sector and their management is outside the prerogative of bank specific decisions and policies. Bank stability has been influenced by the operating environmental variables which include GDP, inflation rate, interest rate, exchange rate and the general macroeconomic policy. To control for bank operating environments, GDP and Inflation are the relevant macroeconomic variables for the financial sector (Demirguc-Kunt & Huizinga, 2010; Uzeru, 2012; Were & Wambua, 2014; Maina, 2015). These variables were also adopted by this study.

The influence of inflation and GDP on the performance of banks is substantial; any fluctuations can adversely affect commercial banks returns, hence affecting their profitability (Mostak & Sushanta, 2015). They influence how the citizens utilize the financial sector. More favourable macroeconomic conditions are expected to increase the financial inclusion of a population. Higher incomes allow for higher levels of savings which in turn are likely to be held in financial accounts (Adusei & Elliott, 2015)

This study used two external environment variables; GDP and inflation, to represent trends in the macroeconomic stability in Kenya, while examining the implication of financial inclusion on bank stability. Honohan (2008) observed that financial
inclusion follows similar trends to economic development. Therefore, this study investigated the changes in bank stability caused by financial inclusion while controlling for operating environment variables of GDP and inflation. Inflation rate was used to measure macroeconomic stability in Kenya. GDP growth rate was used to measure the overall health of Kenya’s economy.

Bank stability is affected by inflation, depending on whether the inflation was anticipated or unexpected. When it is anticipated, positively affects stability because interest rates are adjusted accordingly to match the inflation rate. In addition, inflation influences stability negatively, if it was unexpected. Unexpected inflation causes interruptions in the cash flow translating into loan losses for the borrowers (Hoggarth et al., 1998). These variations in inflation create difficulties in loan planning and negotiation strategies for both the bank and the borrower.

Kosmidou (2008) found out that GDP growth enhances profitability which in turn enhances stability. This is due to the fact that increase in GDP is associated with a general improvement in income within an economy. Accordingly, increase in financial inclusion. However, Tan and Floros (2012) observed that growth in GDP may lead to a reduction in profitability which by extension affects stability negatively. They established that an improved economic growth ushers in a conducive environment and lowers bank entry barrier and hence increased competition. The increased competition in the banking sector reduces bank profitability which also implies reduction in stability. From the foregoing study, it is
clear that the effect of GDP on the financial inclusion and bank stability is inconclusive.

1.1.4 Bank Competitiveness

According to Porter (2008), every industry is formed by an underlying structure together with a fundamental economy and technical characteristics which contribute to its competitive force. Bank competitiveness therefore, refers to how banks manage the totality of their competencies to achieve profitability and stability, within the available structures, policies and regulatory framework. A bank must, therefore, seek to position itself to operate best within the industry operating environment or in contrary; it should seek to influence that environment in its favour.

In Kenya, the commercial banks industry is characterized by intense competition, serious poaching and luring of talented personnel from one bank to the other. This situation has been compounded by the introduction of innovative technology-driven products which are more customer-friendly. Various products have been designed to suit different categories of customers. Banks indulge in the use of strong and persuasive marketing communication efforts to promote their products, although bank products offered by competitors seem alike. New products and services are easily replicated by rivals. The only difference is the quality of the services and the charges levied by various banks (Cytonn, 2016).
Starting from 2006, Kenyan banks have increased in numbers and grown in terms of branch network, services provided, such as loans, credit facilities, accounts opening, having automatic teller machines (ATMs) in strategic places, mobile banking, internet banking and other services (Lyaga, 2006). These commercial banks are in competition for loans and deposits. Competition is likely to deepen in this industry due to stringent economic times, regulations by the government, innovations and disclosure requirements.

Yildirim and Philippatos (2007) stated that competition in the banking industry could result in better quality and pricing of the banking products. It would also result in promotion of financial innovation, leading to better skills, techniques and technology. The Kenyan banking industry has metamorphosed through several phases; starting with deregulation in early 1990s to the present day, liberalized and competitive industry. These changes have led to increased and unpredicted levels of competition, never witnessed previously.

According to Mostak (2015), bank competitiveness is heavily influenced by the level of financial inclusion in the financial sector. Besides, bank competitiveness was viewed to be a key factor in determining bank stability. A study by Ryan, O’Toole and McCann (2014) established that bank competition is a key element in broadening financial access. The study further noted that a highly competitive financial market may persuade banks to seek relationship marketing and lending strategies, leading to more financial services availability.
According to the (GFD) Report (2013), most of the empirical studies on financial inclusion and competition have obtained mixed results. A study by Claessens and Laeven (2005) posits that financial inclusion is easier in more competitive banking sectors. In their study, they established that competition in the banking market reduces the cost of finance and increases the availability of credit. Carbo, Rodriguez and Udell (2009) also found evidence that competition promotes financial inclusion in their study that involved analyzing small and medium enterprises (SMEs) in Spain.

Boyd and Nicolo (2005) observed that reducing loan rates as a result of bank competition assisted borrowers to repay loans, contributing to lower default risk. In contrast, if banks joined new financial market environments in order to provide financial services in a highly competitive environment. In such an environment, banks tended to acquire less information rents in a bid to win borrowers. This often would lead to moral hazards and adverse selection hence resulting to banking instability (Allen & Gale, 2004).

Keeley (1990) observed that excessive competition emerging from financial inclusion could encourage banks to pursue riskier policies in taking more credit risk in their loan portfolio so as to maintain their former profit level. This study therefore sought to establish the effect of financial inclusion on bank stability when mediated by bank competitiveness.
Moyo et al. (2014) posit that there are three widely used measures of competition; the number of firms, the concentration ratio and the Herfindal-Hirschman Index (HHI). The number of firms is the simplest index as it only gives the number of firms. However, this index does not take into account the distribution of the firms. The concentration ratio requires more information than the number of firms; extends to include the market share of the top firms in the industry.

However, by focusing only on the market share of the top firms, the concentration ratio does not account of the size distribution of the remaining firms. According to Hirschman (1964), HHI is more information intensive than the number of firms and concentration ratio. It utilizes more information on the entire firm size distribution (market share of each firm). As such it is the most frequently used measure of bank competition by many researchers and was also adopted in study.

1.1.5 Commercial Banks in Kenya

In the East Africa region, Kenya’s financial system is the most developed and stable (Beck, 2009). Commercial banks dominate the financial system; by the end of 2015, the banking industry comprised forty-three commercial banks with two banks namely Imperial bank and Dubai bank being under statutory management in 2015 and Chase bank in 2016 (CBK, 2015).

Commercial banks in Kenya are grouped into three categories by means of weighted composite index that encompasses net assets, deposits, capital and reserves, aggregate deposit accounts and aggregate credit accounts (CBK, 2015). The CBK
report further indicates that a bank with a weighted composite index of 5 per cent or more is categorized as a large bank. A medium bank has a weighted composite index of between 1 per cent and 5 per cent while a small bank has a weighted composite index under 1 per cent.

Table 1.1: Commercial Banks’ Classification (ksh. Millions)

<table>
<thead>
<tr>
<th>Peer Group</th>
<th>No. of institutions</th>
<th>Total assets</th>
<th>Market share</th>
<th>Customer deposits</th>
<th>Capital reserves</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>8</td>
<td>2,404,194</td>
<td>65.32%</td>
<td>1,739,278</td>
<td>373,516</td>
</tr>
<tr>
<td>Medium</td>
<td>12</td>
<td>981,099</td>
<td>25.90%</td>
<td>654,602</td>
<td>159,814</td>
</tr>
<tr>
<td>Small</td>
<td>23</td>
<td>310,651</td>
<td>8.77%</td>
<td>211,273</td>
<td>59,094</td>
</tr>
<tr>
<td>Total</td>
<td>43</td>
<td>3,695,944</td>
<td>100%</td>
<td>2,485,919</td>
<td>540,579</td>
</tr>
</tbody>
</table>

Source: CBK (2015)

The above table shows the distribution of commercial banks in Kenya. As at 31st December 2015, there were 8 large commercial banks with a combined market share of 58.21 per cent, 12 medium banks with a market share of 32.42 per cent and 23 small banks with a market share of 9.24 per cent as demonstrated in Table 1.1 above.

Kenya’s banking sector is regulated by the CBK Act, Banking Act, Companies Act and other prudential guidelines issued by CBK. The CBK is responsible for overall regulation and supervision of banks. There have been numerous revisions and reforms to the Banking Act, CBK Act and prudential guidelines over the past decade aimed at strengthening CBK’s supervisory role (Beck et al., 2013). In 1995, the banking industry was liberalized and other exchange controls lifted which lead to
strengthened supervision, self-regulation and increased competition among the banks. The Kenya Bankers Association serves as a lobby for the local banks and also a forum to addressing the welfare of the members.

In Kenya, the vision 2030, the country’s economic blueprint spells out financial inclusion as one of the pillars to be used in poverty eradication and also as a channel to assist in improving economic growth and development (GoK, 2007). This has seen the banking system undergo numerous important reforms and structural changes. Key among those changes include increased bank and branch network, shift from brick and mortal outlets branchless banking, agency banking which was commissioned in 2010, innovations in product development, use of information communication and technology (ICT) and emergence of non-bank financial institutions.

According to CBK (2013), the country’s banking sector has undergone substantial transformations. Between 2006 and 2013 the number of deposit accounts increased from 2 million to 18 million while loan accounts increased from 1 million to 3 million. In addition, the population of adult population totally excluded from financial services declined from 39.3% in 2006 to 25.4% in 2013 and 75% in 2016 (FSD, 2016). It is, therefore, important to analyze the influence these changes have had on the stability of the commercial banks in Kenya.
1.2 Statement of the Problem

Kenya’s Vision 2030’s economic blueprint aims to transform Kenya into a middle-income country, providing high quality of life to its citizens by improving access and deepening of financial services and products (Ongore & Kusa, 2013; CBK, 2015). To achieve this, the GoK and commercial banks have initiated and implemented several reforms. These include the Banking Amendment Act (2012), Credit Reference Bureau (CRB) Regulations in (2009), Interest Rate Cap (2015) and the introduction of International Financial Reporting Standards (IFRS) 9 in 2018.

Despite these initiatives by the government, some commercial banks have faced stability related challenges in the recent past. This led to the collapse of Charter House Bank (2005), Imperial Bank and Dubai Bank were put under receivership in 2015. Chase Bank was also put under receivership in 2016 (CBK, 2016). Poorly implemented financial inclusion policies can impair stability, and also, there may be important synergies brought by broad access and utilization of financial products which assist banks to diversify risk hence improving stability.

Earlier, studies have established a synergy relationship between financial inclusion and financial stability (Adasme et al., 2008; Hannig & Jonsen, 2010; Han & Maleck, 2013; Morgan & Pontines, 2014; Amatus & Alireza, 2015; Kalunda, 2015; Mostak & Sushanta, 2015). Most of these studies have concentrated on cross-country and sector level. None of them focused on the banking sector hence, creating a contextual gap.
Moreover, other studies by Gokhale (2009), Khan (2011) and Allen et al., (2013) revealed potential threats caused by financial inclusion. Lending to those previously excluded from the formal banking sector in India revealed that new customers were not credit worthy and were a threat to banks. This creates two divergent schools of thought. One claiming the financial inclusion-stability and the other claiming financial inclusion-instability outcome, hence creating a knowledge gap dilemma in terms of knowledge advancement.

The foregoing studies mainly considered the effect of financial inclusion on the financial stability of countries as opposed to the banking sector. Furthermore, the few locally available studies have focused on branch networks and ignored the other channels of availability for example ATMs, agents and mobile banking; these have had an impact in financial inclusion, thus raising an issue of empirical gap.

Given the importance of financial inclusion and the intermediation role played by commercial banks and the existing empirical gaps, this study aimed at enriching the existing related literature by studying the effect of financial inclusion on the stability of commercial banks in Kenya. In addition, it also incorporated the mediating effect of bank competitiveness and moderating effect of operating environment on the relationship between financial inclusion and stability of commercial banks in Kenya which earlier studies appeared to have ignored.

1.3 Objectives of the study

The study was guided by the following objectives
1.3.1 General Objective

The general objective of the study was to investigate the effect of financial inclusion on the stability of commercial banks in Kenya.

1.3.2 Specific Objectives

The study was guided by the following specific objectives:

i. To establish the effect of bank availability on stability of commercial banks in Kenya.

ii. To analyze the effect of bank accessibility on stability of commercial banks in Kenya.

iii. To determine the effect of bank usage on stability of commercial banks in Kenya.

iv. To establish the moderation effect of operating environment on the relationship between financial inclusion and stability of commercial banks in Kenya.

v. To establish the mediation effect of bank competitiveness on the relationship between financial inclusion and stability of commercial banks in Kenya.

1.4 Research Hypotheses

The study was guided by the following null hypotheses:

H$_{01}$: Bank availability has no significant effect on stability of commercial banks in Kenya.

H$_{02}$: Bank accessibility has no significant effect on stability of commercial banks in Kenya.
H₀₃: Bank usage has no significant effect on stability of commercial banks in Kenya

H₀₄: Bank operating environment has no significant moderating effect on the relationship between financial inclusion and stability of commercial banks in Kenya.

H₀₅: Bank competitiveness has no significant mediating effect on the relationship between financial inclusion and stability of commercial banks in Kenya.

1.5 Significance of the study

This study is insightful as it informs and contributes to practice, theory and policy in several ways. Through the findings of this study, commercial banks in Kenya may understand and design suitable financial services and products for financial inclusion clientele. The findings further informs commercial banks on how to utilize the prevailing competition in the process of bringing new financially included clients, leading to loan portfolio diversification and enhancing stability. The interaction of financial inclusion, operating environment and stability indicators is very insightful in pricing financial inclusion products. This ensures expected inflation is taken care of while taking advantage of economic growth as indicated by GDP to broaden financial inclusion.

Understanding the interlinkages between financial inclusion, bank competitiveness, and external operating environment (GDP and Inflation) and bank stability is important to policy makers. The study is helpful to the Central Bank of Kenya (CBK), Treasury and other regulatory institutions like Capital Markets Authority (CMA). It becomes a point of reference when formulating relevant policies, rules
and prudential guidelines that would guide the commercial banks in implementing bank availability, accessibility and usage strategies as well as maintaining sound financial stability in the banking industry.

The general public may gain more understanding about the changes brought about by increasing financial inclusion, operating environment as well as bank competitiveness on stability. The acquired knowledge from this study may help in choosing financial inclusion products and services. It may also assist the public in adopting right decisions on where to bank basing on the financial stability of the bank. Competition helps clients to choose suitable products from a range of varieties from different suppliers. GDP and Inflation will help the general public to choose well priced products as well as understanding the best time to be included according to economic and business growth cycles.

The researcher builds on already established body of knowledge on investigating how finance growth theory, financial intermediation, asymmetric information theory and competitive-stability theories are applied in the process of financial inclusion and stability of commercial banks. The study points out areas of further research on other aspects of financial inclusion, competition, GDP, Inflation and stability of commercial banks in Kenya. It recommends that future researchers can use the findings of this study to justify the relationship between those variable.
1.6 Scope of the Study

According to the CBK (2015), there were 43 commercial banks in Kenya in 2015. However, only forty one (41) commercial banks were studied due to the fact that the two (2) banks were under statutory management (Imperial Bank and Dubai Bank) in the year 2015 and there was restriction on the availability of data. Data was available for the remaining banks which resulted to 95 percent response rate and was adequate for the study.

This study focused on commercial banks in Kenya for the period between the years 2007 and 2015. The period 2007-2015 is important because it coincides with the Kenya’s vision 2030 blue print whose financial inclusion is one of the pillars. It is also during this period that Kenya experienced rapid technological change in the finance sector. This has led to the development of financial innovations, new products and new forms of payment which changed the financial inclusion landscape.

Banks responded to the needs of the Kenyan market for convenience and efficiency. This has been achieved through alternative banking channels and delivery models including mobile, internet and bank agents as well as increased branch networks. The period also brought about several prudential guidelines amendments by the CBK, as it moved to save the public confidence on the banking industry. This was necessitated by the collapse of several commercial banks.
1.7 Limitations of the study

This study faced several limitations that needed to be reported. It employed secondary data which sometimes can have possible errors and biases. However the secondary data used was obtained from authenticated sources including KNBS, CBK, Commercial banks Audited financial statements and published annual financial reports. The KNBS and CBK were likely to be reluctant in giving the information for fear of the information to being used against their policies. However the researcher explained the purpose of the study and the confidentiality measures undertaken in order to safeguard their concerns.

1.8 Organization of the study

The thesis is organized into five chapters. Chapter One covers the background, statement of the problem, the objectives of the study, research hypotheses, significance of the study, scope of the study, limitations of the study and organization of the study. Chapter Two deals with theoretical and empirical literature review on the research topic summarized the literature and research gaps and the conceptual framework.

The third chapter covers the research philosophy, research design, empirical model, target population, data collection and analysis, diagnostic tests and ethical consideration. Chapter Four provided the research findings and discussions. Finally, the fifth chapter presents the summary of findings, conclusions, contributions of the study and recommendations for policy implications.
CHAPTER TWO  
LITERATURE REVIEW

2.1 Introduction

This chapter provides an overview of the relevant theories supporting this study. It presents a critical review of empirical literature on the study variables including financial inclusion, stability of commercial banks, bank operating environment and bank competitiveness and summary of the research gap. The conceptual framework is presented in a diagram showing the relationship between financial inclusion and stability of commercial banks as variables.

2.2 Theoretical Literature

This section presents the underlying theoretical foundations which form the basis for the rest of the thesis. This study was anchored on finance growth theory, financial intermediation theory and asymmetric information theory. The finance growth was used to determine the effect of financial inclusion in building an all-inclusive financial sector as a social and profitable venture.

Financial intermediation theory was used to investigate the role of banks in intermediating funds through inclusion of the population which were considered ‘unbankable’. The asymmetry theory sought to establish how bank involvement in financial inclusion changes its competitiveness and its effectiveness to reduce information opaqueness associated with the financial inclusion targeted customers.
2.2.1 Financial Intermediation Theory

This theory was proposed by Diamond (1984). It explains how banks act as intermediaries between borrowers and savers. As financial intermediaries, banks provide access, financial diversification and financial utilization. The extent of inclusion influences the level of stability as confirmed by literature. According to Ndebbio (2004), financial intermediation theory explains the role of commercial banks in bridging the gap between deficit spending customers and surplus spending customers in the market.

Diamond (1984) points out that commercial banks play the role of delegated monitoring by putting effective measures necessary to monitor borrowers’ behavior. By reducing monitoring costs, banks are able to attain competitive edge in the market. Diamond and Dybvig (1983) analyzed the position of banks in transforming illiquid assets into liquid liabilities. Accordingly, similar investors and depositors are characterized by being risk averse; this brings uncertainty in timing future opportunities. Through intermediation, banks assist investors to avoid being locked into long-term illiquid investments yielding high pay-offs to future consumers.

According to Demirgüç-Kunt, Beck and Honohan (2008), financial market friction has been found to be a critical mechanism. It may lead to persistent income inequality or poverty gaps if corrective measures are not put in place. Honohan (2008) also observed that accumulated capital coupled with imperfect financial markets are key determinants of the level to which poor clients can access funds to make investments in consumption and physical capital.
Thus, the evolution of financial development, innovations, growth and integrated income models are closely related in assisting financial inclusion. Finance influences not only the efficiency of resource allocation throughout the economy, but also the comparative economic opportunities of individuals from relatively rich or poor households.

Through intermediation, banks are able to create and supply specialized financial products to meet the needs of all types of customers. This happens whenever banks establish that they can supply the financial products for higher returns which cover all costs. In addition, banks as financial intermediaries find the reason for existence from market imperfections. Therefore given a perfect market position, where transaction and information costs are missing, banks would not exist.

Demirgüç-Kunt and Klapper (2012), in their argument on financial intermediation, observed that reducing financial market imperfection results in expanded individual opportunities hence, creating a positive incentive effect. Commercial banks as financial intermediaries play a key role in ensuring good corporate governance, less risk contracts and ease of transaction for players in an economy. By increasing the level of financial inclusion, banks attempt to reduce these market frictions. In turn, this reduces information asymmetry hence reducing market imperfections among the users (Hannig & Jansen, 2010).
2.2.2 Financial -Growth Theory

This theory was proposed by Bagehot (1973). The theory upholds that the presence of financial development creates a conducive and productive economic growth environment. The theory also explains that inability to easily access affordable financial products by a majority of the population leads to persistent income inequality and imbalances. This slows down the pace of economic growth and development.

Demirgüç-Kunt and Levine (2008) posit that financial accessibility is important for economic growth and development of any nation. As such, they suggested that countries should motivate policy makers to prioritize financial sector policies. They should devote attention to factors that influence financial development as a mechanism for promoting an all inclusive growth. This can be achieved through financial inclusion.

According to Bagehot (1973) this theory explains that a well – functioning financial institution can promote overall economic efficiency, create and expand liquidity, mobilize savings, enhance capital accumulation, transfer resources from tradition (non-growth) sectors to the more modern growth inducing sectors. Sparatt and Stephen (2013) argue that the success of economic growth depends on the level of financial inclusion, the composition and stability of the financial institutions. This also promotes a competent entrepreneur response hence promoting economic growth and development.
This theory underpins the study variables that comprise dependent variable commercial bank stability; it is a condition where the financial institutions are able to perform their intermediation process functions smoothly. It also explains how the independent variable financial inclusion, assists a country in forming an inclusive economy. This is because a country cannot be build by just a fraction of its citizens built by all.

For Serrao et al. (2012), the finance growth theory advocates that access to financial services leads to a good environment for economic growth brought about by supply push leading to demand pull effect. The theory further perceives lack of affordable financial products to all as a critical determinant responsible for increased income inequality and imbalance resulting to slow economic growth.

Consequently, access to safe, easily available and affordable finance has been identified as a pre-condition for accelerating income and economic growth and hence reducing the disparity in income and poverty. Such a situation will further create equal opportunities and economically encourage the people who were socially excluded. It will also integrate them better into participating in economic development actively hence preventing themselves from economic shocks (Aduda & Kalunda, 2012).

Bagehot (1973) argues that a vibrant and strong financial sector enhances economic growth. Schumpeter (1911) posited that by being able to provide efficient and effective financial markets for funds, banks assist in growing the economy.
Goldsmith (1969), Mckinnon (1973), Levin and Zervos (1996) also observed that financial systems have a positive and important role to play in the economy (Ndebbio, 2004). Financial markets evolve in response to increased demand for financial services from an already budding economy. Therefore, the development of financial markets reflects growth in other sectors of the economy.

2.2.3 Asymmetric Information Theory

Information asymmetry arises where one person in a financial debt contract seems to be more knowledgeable or better informed about the subject matter than the other person. The theory was proposed by Akerlof in 1970 and observes that in marketing of financial services, it may be a challenge to differentiate between good and bad borrowers.

Richard (2011) observed that asymmetric information may result into adverse selection and moral hazard problem. The theory further states that in making a financial contract, the person who possesses more information on a specific item to be transacted is better placed to negotiate optimal terms for the transaction than the counterpart. The person who knows less about the same specific item to be transacted is therefore disadvantaged in making right or wrong decisions concerning the contract.

According to Bofondi and Gobbi, 2003, moral hazard and adverse selection results from information asymmetry between borrowers and lenders can contribute to contractions in credit hence affecting performance and stability. Moral hazard is the
risk which a party to a transaction provides misleading information about its assets, liabilities or credit capacity. This is noted to be contributing to NPLs.

Adverse selection assumes that lenders cannot distinguish between borrowers of different degrees of risk and that loan contracts are limited. This leads to borrowers repaying loans when they have the means to do so, and hence significant accumulation of NPLs. This theory is considered relevant in this study as it holds that borrowers and lenders tend to conceal crucial information pertaining to the lending and borrowing agreement. Financial institutions depend on accurate information about borrowers and projects the funds are targeted for (Bloem & Gorte, 2001).

Financial inclusion is characterized by entry of new, inexperienced and numerous customers into the formal financial sector including commercial banks (Hansen & Jansen, 2010). This creates a challenge in the debt market because lenders have difficulties in determining whether the customer is a good risk; this threatens financial performance and in turn stability. Therefore it becomes difficult for banks to establish whether financial inclusion is a low risk good investment or otherwise.

2.2.4 Competitive – Stability Theories

In the banking literature, it is considered that markets which have more competitive banking systems exhibit more stability as opposed to those which have less competitive banking systems. Several authors have proposed different approaches to explain this relationship. Keenly (1990) proposed the charter value hypothesis which
refers to a bank’s net income current value on new businesses assuming that its office, employees and customers do not change. The charter value is determined by a financial institution’s authorized power, market structures in the area and the expertise of its employees.

According to the charter value hypothesis, banks with increased market power limit their levels of risk. In this way, they are able to sustain their quasi monopoly. When competition increases, it causes a decrease in market power. This reduces the value of the charter, motivating the banks to pursue more risky projects and customers (financial inclusion) which increases NPLs and risk level ultimately impairing stability.

The charter value hypothesis also argues that small banks in more competitive environments are more likely to take excessive risks; they have a high risk of failure. In modeling the charter value, Keeley (1990) suggested that banks whose charter values are high arising from high market power are able to deter excessive-risk taking behavior by their management.

Contrary to the charter value hypothesis, (Boyd & De-Nicole, 2005) observe competition can be a risk shifting paradigm. The theor propounds that when the market power of banks increases, they end up charging high rates to borrowers who then have trouble in repaying. The entrepreneurs facing high interest rates end up increasing the risk of their investment projects, a practice that leads to problematic loans.
Martinez-Miera and Repullo (2008) proposed a model to reconcile the two conflicting paradigms of charter value and risk shifting. Their model suggests that the increase in risk because of lower market power due to increased interest rate balances against the higher margins from customers who are able to repay even after increase in the interest rates. As such, there is a possibility of an initial decline in risk with increased competition and an eventual increase in risk level as competition intensifies.

Mostak and Sushanta (2015) established that the level of financial inclusion heavily relies on the level of bank competitiveness in the market. Bank competition was also found to be a key determinant of bank stability. Therefore, this study investigated how the effect of financial inclusion on bank stability changes due to competitiveness in the market. The charter value and risk shifting theories therefore underpin the mediator variable competition in this study. These theories are summarised in Table 2.1.

**Table 2.1: Summary of the Theories that Underpinned the Study**

<table>
<thead>
<tr>
<th>Financial intermediation theory (Diamond, 1984)</th>
<th>Argument of the theory</th>
<th>Contribution to the current study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial market imperfections determine the level and extent of intermediation by banks. Financial inclusion reduces the market imperfection in order to bring on board many persons who were initially excluded from accessing financial services.</td>
<td>Explains the role of commercial banks in intermediating funds through financial inclusion as a social and profitable venture and hence stability.</td>
<td></td>
</tr>
<tr>
<td>Finance – Growth Theory (Bagehot, 1973)</td>
<td>A stable financial institution performs its role of providing financial services efficiently. It’s also in a position to enable many citizens to access financial services, hence promoting an overall economic growth.</td>
<td>Used to determine the effect of financial inclusion in building an all-inclusive financial sector as a social and profitable venture. Growth in banks is a reflection of growth in the economy.</td>
</tr>
<tr>
<td>----------------------------------------</td>
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</tr>
<tr>
<td>Asymmetric Information Theory (Akerlof, 1970)</td>
<td>Moral hazard and adverse selection results from information asymmetry between borrowers and lenders. This contributes to contradiction in credit hence affecting performance and stability.</td>
<td>Explains the effect of financial inclusion policies on the effectiveness of banks to reduce information opaqueness. This in turn triggers bank competition which influences bank stability.</td>
</tr>
<tr>
<td>Competitive-stability Hypothesis (Keenly, 1990, Boyd &amp; De-Nicole, 2005)</td>
<td>Keenly (1990) posits that banks with increased market power limit their level of risk rendering them unable to sustain their quasi monopoly in the charter value hypothesis. Boyd (2005) observed that when the market power of banks increases, they end up charging high rates.</td>
<td>The impact of lack of financial inclusion may rely on the competitiveness in the markets. Also bank competitiveness is one of the important determinants of bank stability.</td>
</tr>
</tbody>
</table>

Source: Researcher (2016)

2.3 Empirical Review

Financial inclusion is a strategy whose aim is drawing the people initially termed as unbankable to accessing and using formal financial services which are available and affordable to them. However, these new clients are inexperienced and some, illiterate; they suffer from information asymmetry in terms of the knowledge they possess on bank products, services and other terms and thus become vulnerable. In general, there is a consensus from the regulators, including IMF, CGAP and GPFI
and the literature that there are three ways through which financial inclusion can be measured. These three are discussed in details below.

2.3.1 Bank Availability and Stability of Commercial Banks

The physical geographical distance between a banks’ physical point of touch and the clients has been found to be an important determinant of the extent of financial inclusion. The availability dimension accounts for the pervasiveness of a bank’s presence and outreach (Allen et al., 2013).

To measure this dimension, penetration of bank branches networks, bank ATMs and bank agents have been widely used as supply channels of availing banking facilities and services to the customers. Under an inclusive financial system, banking services should be easily available to its users. Availability of a bank services was computed by using the number of bank branches owned by a bank per 100,000 adult populations, the number of ATM per 100,000 and agents per 100,000 Sarma & Pias (2011).

Mostak and Sushanta (2015) using a cross country data sought to establish how the increased financial inclusion interventions by global institutions and policy makers had impacted on bank stability across countries. Banks financial stability was the dependent variable, operationalized in three measures; insolvency risk, return volatility and capitalization risk. Z- Score was used to measure and indicate insolvency risk as well as financial stability. The standard deviation of ROA and
Equity to Assets (E/A) ratio divided by the standard deviation of ROA were used to measure return volatility and capitalization risk.

The study employed a panel multiple regression to establish the effect of the independent variable financial inclusion on bank stability across 87 countries. From the findings, the study concluded that higher degree of financial inclusion strengthens banking stability. The study focused on the financial sector level across countries and ignored the micro level effect of individual banks. The instability of a single bank can lead to systemic effect due to bank interconnectivity. The current study sought to investigate the effect of financial inclusion on stability of commercial banks in Kenya. Liquidity risk was also added as a measure of stability which was not factored in the above study.

Kalunda (2015) sought to establish the joint effect on performance of commercial banks in Kenya brought about by financial inclusion and stability. Financial inclusion was found to influence the performance of commercial banks. However, the study established that bank stability had no significant mediation effect on the relationship between financial inclusion and financial performance of commercial banks in Kenya.

The current study used bank stability as the dependent variable; it included liquidity risk in the measure which was not used by Kalunda. Bank operating environment represented by GDP and inflation were used as moderators while bank
competitiveness was used as a mediator. Literature has found these variables to be key determinants of broadening financial inclusion and stability.

In addition, the emerging channels of bank availability including ATMs and bank agents and mobile banking were overlooked by Kalunda but have been included in the current study. The years 2014 and 2015 were not included; they are key since this is the period within which three aforementioned commercial banks were put under receivership, causing a systematic panic within the banking sector in Kenya.

Ghosh (2008) in India investigated the interaction between financial inclusion and financial fragility of state owned banks between 1997 and 2007. He concluded that an increased availability of banking services is associated with increased fragility due to banks compromising on their credit evaluation procedures and qualifications. Financial inclusion strategies were found to be influenced by the structure of the economy.

It was noted that an agricultural economy was not very supportive to financial inclusion strategies. Increased geographical penetration had less influence on fragility while bank size increased stability. The study recommended a differentiated approach to implementing financial inclusion strategies to suit the requirements of different economies. The current study sought to establish the effect of financial inclusion on bank stability in Kenya. The study included three dimensions of
financial inclusion namely availability, accessibility and usage. Operating environment, GDP growth rate and inflation rate were also included to represent the economic structure in Kenya, testing their moderation effect on the study variables.

2.3.2 Bank Accessibility and Stability of Commercial Banks

Access of banking services such as deposit, credit and mobile accounts are used to account for demand side parameter of access. Access to insurance, savings and credit by households represents the supply side of access dimension. To measure this dimension, bank deposits, loans and mobile accounts per 1000 adult people within the population was used to analyze the extent of penetration in terms of financial access (Beck et al., 2013).

According to Sarma and Pias (2011) and Beck et al.( 2011) having a bank account is one of the basic indicators of financial inclusion and a key basic measure of bank accessibility. If every adult person in an economy has a bank account, then the value of this measure would be equal to 1. In the absence of the data on banked population, the number of bank deposit accounts, loan accounts and mobile accounts as a proportion 1,000 adult population can be used to compute this dimension (Sarma & Pias, 2011).

This study therefore, used the number of bank deposit, loan and mobile accounts held by individual banks as a proportion of 1,000 adult populations to compute the dimension. The authors argue that the number of deposit bank accounts per adult can be expected to be positively correlated; that justifies using the number of deposit
accounts per 1000 adults as a proxy for the number of banked adults (Musau, Muathe & Mwangi, 2018).

Morgan and Pontines (2014) sought to establish the cause and effect relationship between bank stability and financial inclusion using empirical evidence from Asian Development Bank Institute. They employed the use of a dynamic panel equation where financial stability was the independent variable. Per capital GDP was used as the control variable. Bank stability was proxied using Z-score to measure insolvency risk and NPLs as a proportion of gross loans by banks.

The study results implied that increasing the amount of loaning to small and medium businesses reduces NPLs and the exposure to default risk hence improving stability. However, the study involved only one bank in Asia hence creating a contextual gap. The current study included all the commercial banks in Kenya. In addition, Liquidity risk was included in the measurement of stability which was missing in the above reviewed study.

Han and Malecky (2013) analyzed the effect of financial inclusion on bank stability across countries, using World Bank data. The study findings indicated that increasing the number of customers with deposits has a positive implication on the stability and tends to reduce returns volatility, especially during financial crises.

The maximum drop in bank deposits growth was used as the dependent variable between 2006 and 2010. Income per capita, inflation and population were used as
economic growth control variable during the period under study. The findings of the study implied that averagely, increased bank deposits and use of other bank services by the people leads to better stability and resilience in periods of economic and financial downturns. The study involved a cross country analysis and focused only on access dimension of financial inclusion. The current study involved commercial banks in Kenya and included the availability and usage dimensions of financial inclusion which were not included by Han and Malecky (2013).

A study on effect of improving access in Kenya at district level by Allen et al. (2013). Bank presence was found to increase access to credit. The study also established that branch networks increased in Kenya between 2006 and 2009. However, the study used Equity Bank only as a case study, making it a weak research design. The current study addressed that gap by employing a panel multiple regression analysis, involving the entire banking sector in Kenya. The study used only bank accounts which is the demand side of financial inclusion and ignored the supply side which were included in the current study through the availability dimension of financial inclusion.

Hannig and Jansen (2010) did cross country analysis focusing on MFI's and studied the effect of financial inclusion on bank stability. They noted that greater financial inclusion presents opportunities to change the composition of the financial sector. These changes range from types of transaction undertaken, client type and new institutions formed in the newly created markets. These new clients and changes are associated with increased bank risks and threaten stability of the institution.
However, that risk is perceived to be negligible and can be easily contained through strong regulatory framework and intense customer protection initiatives. This is due to the fact that the financial inclusion target group is characterized by large numbers with limited balances and small transaction volume. The current study focused on commercial banks in Kenya in order to fill the contextual gap left by other researchers.

Adasme et al. (2006) established that NPLs of small businesses possess less systemic risks than large, infrequent and less predictable large loans. The study involved Chilean commercial banks. They noted that loaning to SMEs reduces the exposure to systemic risk as opposed to lending to large firms. Small loans were found to have capacity in reducing the overall riskiness of banking lending portfolio which implies an improvement in stability. The above study included a sample from SMEs and employed a descriptive research design which is a weak approach. To enrich the design, this study utilized both longitudinal and explanatory non experimental designs involving the banking sector in Kenya.

2.3.3 Bank Usage and Stability of Commercial Banks

According to Beck et al. (2006), a mere ownership to a bank account does not mean that one is actively using the financial service. This causes the need to measure the extent of usage. The measures of usage include demographic loan penetration, loan-income ratio, demographic deposit penetration, deposit-income ratio, deposit-GDP ratio and cash deposit ratio (Beck et al., 2013).
Sarma and Pias (2011) stressed that merely having a bank account does not ensure that the bank holders are using the banks’ services and that the bank is inclusive. This necessitates the formulation of a measure of the use of bank services. The study used two basic services of the banks: outstanding credit and deposit. The volume of outstanding deposit and credit as a proportion of the GDP expressed as a percentage was used to measure this dimension for each bank under study.

Amatus and Alireza (2015) empirically analyzed the effect of financial inclusion on bank stability in sub-Saharan Africa. The study hypothesized bank Z-score as a measure of stability. Financial inclusion was measured by the usage dimension of total outstanding deposits and loans, while GDP per capita and inflation were control variables.

From the results, bank usage had a negative effect on stability of banks. Greater GDP per capita was found to improve stability while inflation, had an adverse effect on bank stability. The study employed only one measure of stability, namely insolvency risk. The current study included credit risk and liquidity risk to enhance the tests of stability.

Ghassan and Fachin (2014) carried out an analysis on financial stability of Islamic banks in Saudi Arabia by utilizing a time series model. It involved six banks which were listed on the Saudi stock market for the period between 2008 and 2013. Stability was measured using Z-score to represent insolvency risk. Z-score was
found to be stationary around some long run dashed level determined by total assets, credit assets ratio, competitiveness and share of Islamic banks in the banking sector. The current study included credit risk and liquidity risk to enrich the multidimensional measure of stability.

2.3.4 Financial Inclusion, Operating Environment and Bank Stability

Honohan (2008) observed that operating environment variables namely inflation and GDP are important determinants of financial inclusion and bank stability. He posited that as economic development increases, so does financial inclusion increases in equal measures. Honohan’s study inflation rate was used to measure the changes in macroeconomic stability in Kenya; GDP represented the overall economic performance in Kenyan during the study period. Earlier, a number of studies sought to establish the effect of macroeconomic factors on bank stability. These studies revealed mixed effects with some proposing a negative effect and others a positive effect.

Kosmidou (2008) established GDP growth as profit enhancing which in turn enhancing bank stability. This is due to the fact that increase in GDP growth rate is associated with better economic performance in a country. On the contrary, Tan and Floros (2012) suggest that growth in GDP leads to a reduction in profitability and by extension, a reduction in bank stability. They argue that an improvement in economic growth results in an improvement in the business environment, lowering entry barrier. This promotes competition which reduces bank profitability, implying
a reduction in stability. From the foregoing studies, the effect of GDP on bank stability is inconclusive.

Hoggarth, Milne and Wood (1998) observed that, high and variable inflation may pose challenges in loan planning. This leads to difficulties in lending contract negotiations. On the other hand, inflation has been established to influence bank performance depending on whether or not the inflation was anticipated or unexpected. Under normal situations, when inflation is anticipated, banks adjust interest rates accordingly. This yields positive results since increase in profitability leads to increase in stability.

However, unexpected increase in inflation causes cash-flow problems for borrowers. In return, this leads to disruptions of loan contract and existing arrangements translating into abrupt loan losses and by extension, instability negatively. From the above results, it is obvious that the discussion on the effect of inflation on bank stability is inconclusive.

Sufian and Habibullar (2010) observed that favorable operating environmental conditions influence the utilization of bank services by customers. Supply and demand for loans and deposits follow the changes in operating environmental factors. GDP and inflation are the most commonly used macroeconomic indicators to measure total economic activity within an economy. GDP growth rate and annual inflation rate were used to test how the influence of financial inclusion on stability behaved when moderated by bank operating environment.
This study used the index of financial inclusion (IFI) (Appendix IV) developed by Sarma and Pias (2011) to test for moderation effect of bank operating environment. The IFI is a measure of inclusiveness of the financial sector of a country. The variables used in financial inclusion can be used at the micro level to depict the efforts of individual banks in financial inclusion. The index captures information on the three financial inclusion dimensions in a single number lying between 0 and 1, where 0 denotes complete financial exclusion and 1 indicates complete financial inclusion.

This study used the index to capture information on the three dimensions of financial inclusion namely bank availability of bank services, accessibility of bank services and usage of the bank services as developed by Sarma (2008) as cited by Sarma & Pias 2010 & 2011; Mostak & Sushanta, 2015) and adopted to bank specific level.

2.3.5 Financial Inclusion, Bank Competitiveness and Bank Stability

The literature on financial inclusion, competition and stability is largely inconclusive (Leon, 2015). Financial inclusion aims at drawing the ‘’unbanked’’ population into the formal financial system so that they have the opportunity to access financial services (Hannig & Jansen, 2010).

The financial inclusion changes the composition of the financial system with regard to the transactions undertaken, client type and the composition and structure of the
financial institutions that operate in the newly created and expanded markets. These new changes can be linked to increased bank competition, bank stability/instability and bank risk (Mostak & Sushanta, 2015). This study interrogated and examined how the relationships in the study variables change due to bank competitiveness.

Bank competitiveness has been established to be crucial and fundamental factor in the banking industry especially at this point of increased financial inclusion agenda by policy makers (Kaskende et al., 2009). The level of competitiveness has been found instrumental in broadening financial inclusion (Beck et al., 2006; Ryan et al., 2014). Greater market competition persuades banks to establish relationship lending leading to increased credit availability (Ariss, 2014). Boyd and Conolo (2005) established that due to competition, banks are forced to reduce loan rates assisting borrowers to repay loans hence contributing to lower default risk; banks are less likely to suffer from NPL.

Moyo et al. (2014) sought to determine how bank competitiveness influences bank stability in African countries. They established that in a more competitive market, banks tend to be more stable compared to less competitive markets. The study used HHI statistic to measure competitiveness. However, their study focused on cross country level and not at the bank level. For banks to benefit from competition, it is important to understand how competition affects bank stability.
Broadly, critics of financial inclusion that leads to intense competition in the banking sector assert that banks’ aggressiveness undermine stability largely due to increased risk-taking behavior associated with heightened competitive behavior among banks (Ariss, 2010). Fiercer competition has been found to persuade banks in venturing more into including high risky and opaque clients. Such competition also induces banks to acquire less information on borrowers, from the newly created markets by financial inclusion (Hauswald & Marquez, 2006). Therefore, stiff interbank competition in a new unbanked area leads banks into building a portfolio of high risky clients, in turn undermining their stability.

This study used the IFI (Appendix IV) developed by Sarma and Pias (2011) to test how the effect of financial inclusion on stability changes when mediated by bank competitiveness. Bank competition was measured using Herfindahl Hirschman Index (HHI). Van et al. (2013) defined as the sum of squares of bank sizes measured as market shares and computed as:

$$HHI = \sum_{i=1}^{n} S^2$$

where $S=$ total assets of bank $i$ and $n$ is the number of banks

2.4 Summary of Literature and Research Gaps

A summary of the empirical literature and research gaps are summarized in Table 2.2 below
<table>
<thead>
<tr>
<th>Author</th>
<th>Study</th>
<th>Findings</th>
<th>Research gaps</th>
<th>Addressing the gap</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>-Low income clients have small volume transactions hence less risky.</td>
<td>-Focused only on MFI's.</td>
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<tr>
<td>Adasme et al.(2006)</td>
<td>Effect of financial inclusion in Chile.</td>
<td>-Lending to small scale clients poses less systematic risk than large ones.</td>
<td>-Focused on one activity only that is NPLs as a measure of stability.</td>
<td>-Included liquidity risk and insolvency risk as measures of stability</td>
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<tr>
<td></td>
<td></td>
<td>-Increased access to credit coincides with greater stability</td>
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<tr>
<td>Kalunda (2015)</td>
<td>Analysed the effect of financial inclusion, bank stability, bank ownership and financial performance of commercial banks in Kenya.</td>
<td>-There was no mediation effect of bank stability and also no moderation effect of ownership structure. -Financial inclusion was found to affect bank performance</td>
<td>-It focused only on bank branches and left other methods of bank availability like ATMs and agents. -Bank operating environment and competitiveness were not included; and literature find them influencing financial inclusion and financial stability of commercial banks</td>
<td>-Included bank operating environment variables as a moderator and competitiveness as a mediator, -Emerging channels of bank availability of ATMs, mobile banking and Agents will be included.</td>
</tr>
<tr>
<td>Han and Malecky</td>
<td>Financial inclusion for international banks</td>
<td>-The study established that cross section</td>
<td>-The study used cross section</td>
<td>-Focused on commercial</td>
</tr>
<tr>
<td>(2013)</td>
<td>financial stability, a cross country analysis.</td>
<td>greater access to bank deposits enhances resilience during financial stress by banks.</td>
<td>data for many countries.</td>
<td>banks in Kenya.</td>
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<td>Morgan and Pontines (2014)</td>
<td>The cause and relationship between financial inclusion and bank stability in Asia.</td>
<td>-The study established that by enlarging the loans to SMEs, stability is strengthened.</td>
<td>-Used a sample drawn from SMEs.</td>
<td>-Focused on commercial banks in Kenya</td>
</tr>
<tr>
<td>Ghassan and Fachin (2014)</td>
<td>Analysis of financial stability of Islamic banks in Saudi Arabia.</td>
<td>-The study established that the banks managed to keep their Z-score stationary</td>
<td>-The study involved only Islamic banks.</td>
<td>-Involved all the commercial banks in Kenya.</td>
</tr>
<tr>
<td>Amatus and Alireza (2015)</td>
<td>Effect Financial inclusion on stability in Sub-Saharan Africa.</td>
<td>-It indicated that outstanding deposits negatively affect financial stability. -Greater GDP per capita helps financial inclusion. -Inflation had adverse effect to stability.</td>
<td>-The study focused on cross country approach in sub-Saharan Africa. -Outstanding deposits and loans were used to measure inclusion.</td>
<td>-Included other dimensions of financial inclusion like ATMs and agents and competitiveness as a mediator.</td>
</tr>
<tr>
<td>Ghosh (2008)</td>
<td>Financial inclusion and financial fragility in India.</td>
<td>-Financial inclusion and fragility complement each other. -Geographical penetration has less influence on fragility.</td>
<td>-Used state banks only -Used credit extension services only and ignored other aspects of financial inclusion.</td>
<td>-Focused on Commercial Banks in Kenya. -Include access and availability dimensions.</td>
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</table>

**Source:** Researcher (2016)

### 2.5 Conceptual Framework

A conceptual framework is a research tool that helps in the creation of awareness and understanding of the research scenario under study. The conceptual framework diagram assists the researcher in deriving insightful meaning from subsequent study findings. The conceptual framework in Figure 2.1 below shows the relationship between financial inclusion, bank operating environment, bank competitiveness and financial stability of commercial banks in Kenya.
Figure 2.1 presents the conceptual relationship between the independent variables, moderating variable, mediating variable and the dependent variable. Financial inclusion dimensions are the independent variable; they were represented by three variable; bank availability, bank accessibility and bank usage. Stability is represented by three measures namely credit risk, liquidity risk and insolvency risk.

Source: Researcher (2016)
Figure 2.1: Conceptual Framework
bank operating environment is represented by inflation rate and GDP growth rate, whereas bank competitiveness is represented by market share of each bank. According to literature, financial inclusion has been established to influence stability of commercial banks.

From the conceptual framework and literature reviewed, bank stability (dependent variable) is measured using three different indicators: credit risk, liquidity risk and insolvency risk. Financial inclusion (independent variable) has three dimensions: bank availability, bank accessibility and bank usage. Hence the study derived the following null hypotheses based on the three dimensions of financial inclusion and three indicators of stability.

a) **Financial inclusion and credit risk of commercial banks in Kenya.**

\( H_{0a}: \) Bank availability has no significant effect on credit risk of commercial banks in Kenya.

\( H_{0b}: \) Bank accessibility has no significant effect on credit risk of commercial banks in Kenya.

\( H_{0c}: \) Bank usage has no significant effect on credit risk of commercial banks in Kenya.

b) **Financial inclusion and liquidity risk of commercial banks in Kenya.**

\( H_{02a}: \) Bank availability has no significant effect on liquidity risk of commercial banks in Kenya.
$H_{02b}$: Bank accessibility has no significant effect on liquidity risk of commercial banks in Kenya.

$H_{02c}$: Bank usage has no significant effect on liquidity risk of commercial banks in Kenya.

c) Financial inclusion and insolvency risk of commercial banks in Kenya.

$H_{03a}$: Bank availability has no significant effect on insolvency risk of commercial banks in Kenya.

$H_{03b}$: Bank accessibility has no significant effect on insolvency risk of commercial banks in Kenya.

$H_{03c}$: Bank usage has no significant effect on insolvency risk of commercial banks in Kenya.

d) Moderating effect of bank operating environment

$H_{04a}$: Inflation rate has no significant moderating effect on the relationship between financial inclusion and credit risk of commercial banks in Kenya.

$H_{04b}$: Inflation rate has no significant moderating effect on the relationship between financial inclusion and liquidity risk of commercial banks in Kenya.

$H_{04c}$: Inflation rate has no significant moderating effect on the relationship between financial inclusion and insolvency risk of commercial banks in Kenya.

$H_{04d}$: GDP growth rate has no significant moderating effect on the relationship between financial inclusion and credit risk of commercial banks in Kenya.
$H_{04e}$: GDP growth rate has no significant moderating effect on the relationship between financial inclusion and liquidity risk of commercial banks in Kenya.

$H_{04f}$: GDP growth rate has no significant moderating effect on the relationship between financial inclusion and insolvency risk of commercial banks in Kenya.

e) **Mediation effect of bank competitiveness**

$H_{05a}$: Bank competitiveness has no significant mediating effect on the relationship between financial inclusion and credit risk of commercial banks in Kenya.

$H_{05b}$: Bank competitiveness has no significant mediating effect of bank competitiveness on the relationship between financial inclusion and liquidity risk of commercial banks in Kenya.

$H_{05c}$: Bank competitiveness has no significant mediating effect on the relationship between financial inclusion and insolvency risk of commercial banks.
CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the methodology that was used to achieve the research objectives. The research philosophy, the research design, data sources, target population, empirical model, operationalization and measurement of variables, data collection instrument and the regression model formulated to achieve the research objectives.

3.2 Research Philosophy

According to Saunders et al. (2007), a research philosophy is a belief about the way in which data about a phenomenon should be gathered, analyzed and used. A research paradigm reflects the nature and approach taken when conducting research. Research paradigms can be identified by their research philosophy and research methods. Research philosophy relates to the development of knowledge and the nature of that knowledge. Research methods on the other hand are the techniques used to gather and analyze data in a study (Saunders, Lewis & Thorrihill, 2009, Mwangi, 2014).

According to Bryman and Bell (2003) and Murya (2010), most academic researches are underpinned by either positivism or social constructivism. Positivism assumes in its understanding of the world that the environment and the events of interest are objective, external and independent of the researcher. Social constructivism assumes
that the understanding of the environment and events in it are socially constructed and subjective from the researcher’s view.

This study therefore adopted positivism philosophy since events of interest are objective, external and independent of the researcher. According to Saunders et al. (2009), positivism philosophy is adopted when working with observable social reality and that the end product of the research can be generalized in the form of law. This study was also based on hypotheses that are derived from existing finance theory and later was tested to support or reject the hypotheses.

### 3.2.1 Research Design

Saunders (2007) explains that a research design as the overall plan that guides the researcher work. It directs the researcher on how to go about answering the research question(s). A proper research design contains objectives, sources where data is collected from, expected constraints and ethical issues to be observed. Hence it assists the researcher in making informed decisions concerning the research methodology appropriate for the study.

According to Saund (2007), research design can be classified as exploratory, descriptive and explanatory. An exploratory research attempts to establish if what is being observed can be explained by an existing theory and lays the groundwork that will lead to future studies. Once the groundwork has been established, the newly explored field requires more information through descriptive survey research design.
Descriptive survey research design affords the researcher an opportunity to capture a population's characteristic and test hypothesis (Mugenda & Mugenda, 2003; Cooper & Schindler 2008). Further, the researcher has no control of the variables in the sense of being able to manipulate them hence guarding against bias. There are two types of descriptive research designs which could be used in a research; longitudinal and cross sectional survey designs.

Longitudinal survey design involves repeated observations of same variables over long periods of time. Cross-sectional survey design involves data collected on the study population at a single point in time (Cooper & Schindler 2008). Longitudinal descriptive design was found suitable in this study; it allowed for time variation in collecting data for commercial banks for the period between 2007-2015.

Explanatory research design establishes causal and effect relationship between variables like it was in the current study. Saunders et al. (2009), Robson (2002) and Sekaran and Bougie (2011) stipulate that an explanatory research work is to obtain the cause and effects between study variables. A non-experimental research is systematic empirical inquiry in which the researcher does not have direct control of independent variables.

Kerlinger and Lee (2000) stipulate that an explanatory non-experimental research design can be applied in a situation where, a study attempts to understand how diverse phenomena behaves, by establishing the contributing variables that usher in the change in it without applying any further analysis on the variable.
Saunders et al. (2009) recognize that no single research design exists in isolation; an interpretation of diverse research designs to one study is good for delivering optimal results. Therefore, descriptive survey design specifically longitudinal and explanatory non-experimental designs were found more appropriate in interrogating the influence of financial inclusion on the stability of commercial banks in Kenya.

3.3 Empirical Model

Several models could be used to analyze quantitative data: logistic, probit, tobit, discriminant analysis and regression models. Logistic, probit and tobit apply when the dependent variable is dichotomous (Field, 2009 & Muathe, 2010). In this study, the dependent variable was continuous, so panel multiple regressions model was the most suitable. This was used to test the relationships between the various variables so as to understand the strength of each predictor variable.

Panel multiple regression analysis entails the evaluation of the effect of one or more independent variables and a dependent variable whose measures are continuous in nature (Brooks, 2008). The study’s financial inclusion variables were used to explain any variation in stability of commercial banks measured by credit risk, liquidity risk and insolvency risk, as such, panel multiple regression was used in this study as discussed by Wooldridge (2002).

Panel multiple regression includes bringing together many predictor variables into a single regression equation. Thus the effect of multiple predictor variables on the dependent measure was assessed as recommended by Jackson (2009). The goal of
analysis for using this model was to find the best fitting and most parsimonious reasonable model to describe the relationship between the dependent variable bank stability and a set of independent variables financial inclusion.

The general empirical model that was used in this study is adapted from Beck (2009) and Mostak and Sushanta (2015) as indicated below:

\[ Y_{it} = \alpha + \beta X_{it} + \epsilon_{it} \] ………………………………………………………………………..3.1

Where

\( Y_{it} \) was the dependent variable denoting stability of bank \( i \) at time \( t \) proxied by three variables: credit risk, liquidity risk and insolvency risk. \( i \) denotes the observation (Bank), \( i=1-----41 \) while \( t \) is the time period \( t=2007-------2015 \). \( X_{it} \) denotes a vector of independent variables (financial inclusion), \( \beta \) is coefficients to be estimated, \( \alpha \) a constant term, and \( \epsilon_{it} \) an error term.

Equation 3.1 was expanded to obtain equation 3.2, 3.3 and 3.4 which were used for estimation.

Credit Risk \( \text{Risk}_{it} = \alpha + \beta_1 BAV_{it} + \beta_2 BAC_{it} + \beta_3 BUS_{it} + \epsilon_{it} \) …………………………………………………………3.2

Liquidity Risk \( \text{Risk}_{it} = \alpha + \beta_1 BAV_{it} + \beta_2 BAC_{it} + \beta_3 BUS_{it} + \epsilon_{it} \) …………………………………………………………3.3

Insolvency Risk \( \text{Risk}_{it} = \alpha + \beta_1 BAV_{it} + \beta_2 BAC_{it} + \beta_3 BUS_{it} + \epsilon_{it} \) …………………………………………………………3.4

Where:

Insolvency Risk \( \text{Risk}_{it} = [\text{ROA}_{it} + \text{EQA}_{it}] / \delta(\text{ROA}) \), which measures risk of insolvency of bank \( i \) at time \( t \)

Credit Risk \( \text{Risk}_{it} = \) The level of exposure to credit risk for bank \( i \) at time \( t \). 

Liquidity Risk \( \text{Risk}_{it} = \) The level of exposure to liquidity risk for bank \( i \) at time \( t \).
BAV\text{it} = \text{A composite index of bank availability measures of bank } i \text{ at time } t.

BAC\text{it} = \text{A composite index of bank accessibility of bank } i \text{ at time } t.

BUS\text{it} = \text{A composite index of bank usage of bank } i \text{ at time } t.

\alpha = \text{Constant term.}

\beta = \text{Coefficients of the explanatory variables.}

\epsilon = \text{Error term.}

3.3.1 Testing of Moderating Effect of Operating Environment

To test for moderation, the researcher adopted a three step procedure as specified by Baron and Kenny (1986). This study used the IFI developed by Sarma and Pias (2011) to test for moderation effect of bank operating environment on the relationship between financial inclusion and stability of commercial banks in Kenya.

The moderation test involves determining whether the co-efficient of interaction term (IFI * Operating environment) was statistically different from zero. The co-efficient for interaction term strengthens and directs the moderator. To determine the moderation effect of operating environment on the relationship between the financial inclusion (IFI) and bank stability, the following model was carried out.

Given that bank stability was measured using three different variables: insolvency risk, credit risk and liquidity risk, the study derived six moderation effect equations to test whether bank operating environment specifically, inflation rate and GDP growth rate, moderated the relationship between financial inclusion and stability of commercial banks in Kenya. This is presented in the following equations.
Credit Risk

\[ \text{Credit Risk}_{it} = \alpha + \beta_1 \text{IFI}_{it} + \beta_2 \text{INF}_{it} + \beta_3 \text{GDP}_{it} + \epsilon_{it} \]  

3.5a

Credit Risk

\[ \text{Credit Risk}_{it} = \alpha + \beta_1 \text{IFI}_{it} + \beta_2 \text{INF}_{it} + \beta_3 \text{IFI} \times \text{INF}_{it} + \epsilon_{it} \]  

3.5b

Credit Risk

\[ \text{Credit Risk}_{it} = \alpha + \beta_1 \text{IFI}_{it} + \beta_2 \text{GDP}_{it} + \beta_3 \text{IFI} \times \text{GDP}_{it} + \epsilon_{it} \]  

3.5c

Liquidity Risk

\[ \text{Liquidity Risk}_{it} = \alpha + \beta_1 \text{IFI}_{it} + \beta_2 \text{INF}_{it} + \beta_3 \text{GDP}_{it} + \epsilon_{it} \]  

3.6a

Liquidity Risk

\[ \text{Liquidity Risk}_{it} = \alpha + \beta_1 \text{IFI}_{it} + \beta_2 \text{INF}_{it} + \beta_3 \text{IFI} \times \text{INF}_{it} + \epsilon_{it} \]  

3.6b

Liquidity Risk

\[ \text{Liquidity Risk}_{it} = \alpha + \beta_1 \text{IFI}_{it} + \beta_2 \text{GDP}_{it} + \beta_3 \text{IFI} \times \text{GDP}_{it} + \epsilon_{it} \]  

3.6c

Insolvency Risk

\[ \text{Insolvency Risk}_{it} = \alpha + \beta_1 \text{IFI}_{it} + \beta_2 \text{INF}_{it} + \beta_3 \text{GDP}_{it} + \epsilon_{it} \]  

3.7a

Insolvency Risk

\[ \text{Insolvency Risk}_{it} = \alpha + \beta_1 \text{IFI}_{it} + \beta_2 \text{INF}_{it} + \beta_3 \text{IFI} \times \text{INF}_{it} + \epsilon_{it} \]  

3.7b

Insolvency Risk

\[ \text{Insolvency Risk}_{it} = \alpha + \beta_1 \text{IFI}_{it} + \beta_2 \text{GDP}_{it} + \beta_3 \text{IFI} \times \text{GDP}_{it} + \epsilon_{it} \]  

3.7c

Where:

\[ \text{Insolvency Risk}_{it} = \frac{[\text{ROA}_{it} + \text{EQA}_{it}]}{\delta(\text{ROA})_i}; \quad Z- \text{score which measures the risk of insolvency of bank } i \text{ at time } t. \]

Credit Risk

\[ \text{Credit Risk}_{it} = \text{The level of exposure to Credit risk for bank } i \text{ at time } t. \]

Liquidity Risk

\[ \text{Liquidity Risk}_{it} = \text{The level of exposure to Liquidity risk for bank } i \text{ at time } t. \]

IFI

\[ \text{IFI}_{it} = \text{A composite Index of Financial Inclusion for bank } i \text{ at time } t. \]

GDP

\[ \text{GDP}_{it} = \text{GDP growth rate of bank } i \text{ at time } t. \]

INF

\[ \text{INF}_{it} = \text{Inflation rate of bank } i \text{ at time } t. \]

\[ \alpha = \text{Constant term.} \]

\[ \beta_s = \text{Coefficients of the explanatory variables.} \]

\[ \epsilon_{it} = \text{Error term.} \]
Table 3.1 Summarizes the criteria that was used to decide if bank operating environment moderated the relationship between financial inclusion variables and stability of commercial banks in Kenya.

**Table 3.1 Moderation Decision Making Criteria**

<table>
<thead>
<tr>
<th>Analysis</th>
<th>Outcome</th>
<th>Criteria for Decision Making</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Step one:</em> Equation 3.5a, 3.6a and 3.7a GDP and Inflation as Independent variables</td>
<td>Significant coefficient of GDP and inflation</td>
<td>GDP and inflation are explanatory variables</td>
</tr>
<tr>
<td></td>
<td>Insignificant coefficient of GDP and inflation variables</td>
<td>GDP and inflation can moderate the relationship between financial inclusion and stability of commercial banks in Kenya</td>
</tr>
<tr>
<td><em>Step two:</em> Equation 3.5b, 3.5c, 3.6b, 3.6c, 3.7b and 3.7c GDP and Inflation as Moderator variables</td>
<td>Significant coefficient of GDP and inflation</td>
<td>GDP and inflation moderates the relationship between financial inclusion and Stability of commercial banks in Kenya</td>
</tr>
<tr>
<td></td>
<td>Insignificant coefficient of GDP and inflation</td>
<td>GDP and inflation do not moderate the relationship between financial inclusion and Stability of commercial banks in Kenya</td>
</tr>
<tr>
<td></td>
<td>Significant coefficient of interaction terms IFI* inflation IFI* GDP growth rate</td>
<td>GDP growth rate and inflation rate are moderators</td>
</tr>
<tr>
<td></td>
<td>Insignificant coefficient of interaction IFI * inflation IFI * GDP growth rate</td>
<td>GDP growth rate and inflation are not moderators</td>
</tr>
</tbody>
</table>

Source: Researcher (2016)
3.3.2 Testing of Mediating Effect of Bank Competitiveness

According to Baron and Kenny (1986) as well as Mwangi (2014), step wise regression process is applied when testing for mediation effect. If the relationship between financial inclusion (IFI) and stability of commercial banks in Kenya, was fully mediated by bank competitiveness, the path between the two sets of variables would be zero. If the path was to be significantly different from zero, however, then a condition of partial mediation was existing. The mediation path diagram is represented as shown in Figure 3.1.

![Mediation Analysis Model](image)

Figure 3.1: Mediation Analysis Model

Source: Baron and Kenny (1986, pp 1176)

Figure 3.1 was used to establish if any of the paths, that is, $a$, $b$ and $c$ was not significant. The study would then conclude that there was no mediation effect
(Mwangi, 2014). To establish the mediating effect of bank competitiveness on the relationship between the financial inclusion (IFI) as stated in Section 2.5.2 and the stability of commercial banks, the study specified equation 3.8, 3.9, 3.10 and 3.11 as follows:

Step 1: A panel regression analysis with financial inclusion (IFI) predicting bank stability.

\[ \text{Credit risk} = \alpha + \beta_1 \text{IFI} + \epsilon_{it} \] \hspace{1cm} 3.8a

\[ \text{Liquidity risk} = \alpha + \beta_1 \text{IFI} + \epsilon_{it} \] \hspace{1cm} 3.8b

\[ \text{Insolvency risk} = \alpha + \beta_1 \text{IFI} + \epsilon_{it} \] \hspace{1cm} 3.8c

Step 2: A regression analysis with financial inclusion (IFI) predicting bank competitiveness (HHI)

\[ \text{Bank Competitiveness (HHI)}_{it} = \alpha + \beta_1 \text{IFI} + \epsilon_{it} \] \hspace{1cm} 3.9

Step 3: A regression analysis with bank competitiveness predicting bank stability.

\[ \text{Credit Risk}_{it} = \alpha + \beta_1 \text{HHI}_{it} + \epsilon_{it} \] \hspace{1cm} 3.10a

\[ \text{Liquidity Risk}_{it} = \alpha + \beta_1 \text{HHI}_{it} + \epsilon_{it} \] \hspace{1cm} 3.10b

\[ \text{Insolvency Risk}_{it} = \alpha + \beta_1 \text{HHI}_{it} + \epsilon_{it} \] \hspace{1cm} 3.10c

Step 4: A regression analysis with Financial Inclusion and Bank Competitiveness predicting Bank Stability.

\[ \text{Credit Risk}_{it} = \alpha + \beta_1 \text{IFI} + \beta_2 \text{HHI}_{it} + \epsilon_{it} \] \hspace{1cm} 3.11a

\[ \text{Liquidity Risk}_{it} = \alpha + \beta_1 \text{IFI} + \beta_2 \text{HHI}_{it} + \epsilon_{it} \] \hspace{1cm} 3.11b

\[ \text{Insolvency Risk}_{it} = \alpha + \beta_1 \text{IFI} + \beta_2 \text{HHI}_{it} + \epsilon_{it} \] \hspace{1cm} 3.11c
Where:

$IFI_{it}$ = The Index of Financial Inclusion for bank $i$ at time $t$.

$HHI_{it}$ = Mediating variable Bank Competitiveness (HHI) of bank $i$ at time $t$.

$\alpha = $ Constant term.

$\beta_s = $ Coefficients of the explanatory variables.

$\varepsilon_{it} = $ Error term.

### Table 3.2 Mediation Decision making criteria

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Criteria for Decision Making</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ( \beta_1 ) significant in model 3.8&lt;br&gt;( \beta_1 ) significant in model 3.9&lt;br&gt;( \beta_1 ) significant in model 3.10&lt;br&gt;( \beta_1 ) insignificant and ( \beta_2 ) significant model 3.11</td>
<td>Complete Mediation</td>
</tr>
<tr>
<td>2 ( \beta_1 ) significant in model 3.8&lt;br&gt;( \beta_1 ) significant in model 3.9&lt;br&gt;( \beta_1 ) significant in model 3.10&lt;br&gt;( \beta_1 ) significant and ( \beta_2 ) significant model 3.11</td>
<td>Partial Mediation</td>
</tr>
<tr>
<td>3 ( \beta_1 ) significant in model 3.8&lt;br&gt;( \beta_1 ) significant in model 3.9&lt;br&gt;( \beta_1 ) significant in model 3.10&lt;br&gt;( \beta_1 ) insignificant and ( \beta_2 ) insignificant model 3.11</td>
<td>No Mediation</td>
</tr>
</tbody>
</table>

Source: Researcher (2016)

### 3.4 Target Population

A population is a group of objects or individuals with common observable characteristics (Mugenda & Mugenda, 2003). According to Zikmund et al., (2010), a population is any complete group of those conforming to a set of specifications.
The target population for this study comprised all the 43 commercial banks in Kenya in the years 2007-2015 as indicated by Appendix I. Commercial banks in Kenya are classified into large, medium and small peer groups as shown in Table 3.3.

**Table 3.3: Distribution of the Target population**

<table>
<thead>
<tr>
<th>Peer Group</th>
<th>No. of Banks</th>
<th>% Of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>8</td>
<td>18.60</td>
</tr>
<tr>
<td>Medium</td>
<td>12</td>
<td>27.91</td>
</tr>
<tr>
<td>Small</td>
<td>23</td>
<td>53.49</td>
</tr>
<tr>
<td>Total</td>
<td>43</td>
<td>100</td>
</tr>
</tbody>
</table>

*Source: CBK (2015)*

### 3.5 Data Collection Instruments

The study used secondary data that was quantitative in nature. The data was obtained from bank annual financial statements, bank supervision reports by CBK and KNBS for the period between 2007 and 2015. The study used document review guide attached in appendices II and III.

In order to understand a construct, it is important to consider how other studies operationalized and measured similar constructs in their works. The researcher operationalized and measured the study variables based on knowledge obtained from a literature review of previous related studies. The independent variable, financial inclusion used indicators which were bank availability, bank accessibility and bank usage as well as the Index of Financial Inclusion. These variables were
adapted from Sarma and Pias (2011); Mostak and Sushanta (2015) and Kalunda, (2015).

Bank stability indicators which were credit risk, liquidity risk, and insolvency risk were adapted from Beck (2009), Amatus and Alireza, (2015). Operating environment indicators which were Annual Inflation Rate and Annual GDP growth rate were operationalized as used by Mostak and Sushanta (2015). Bank competitiveness was measured using market share and represented by HHI Index developed by Hirschman, (1964) and recommended by Van et al. (2013).

Table 3.4 contains a list of the various study variables, their operational definitions and the measurements used to estimate these variables.

Table 3.4 Operationalization and Measurement of Study Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Operationalization</th>
<th>Indicator</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stability of Commercial Banks</td>
<td>Distance of an individual bank from insolvency and failure</td>
<td>Insolvency risk</td>
<td>Z-score = [ROA_{it} + EQA_{it}] / \delta(ROA)</td>
</tr>
<tr>
<td>(Dependent Variable)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Credit risk</td>
<td>NPL Ratio = \frac{NPL}{Total loans} \times 100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Liquidity risk</td>
<td>Liquidity Ratio = \frac{Total Loans \times 100}{Total Deposits}</td>
</tr>
<tr>
<td>Financial inclusion</td>
<td>This is the process of promoting affordable, timely and adequate access to financial services.</td>
<td>Bank availability</td>
<td>Number of Branch networks/100,000 adults Number of ATMs/100,000 adults Number of Agents/100,000 adults</td>
</tr>
<tr>
<td>(Independent Variable)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Index of Financial inclusion</td>
<td>Composite index of financial inclusion</td>
<td>Bank availability (d1)</td>
<td>Bank accessibility (d2)</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>--------------------------------------</td>
<td>------------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bank usage (d3)</td>
<td></td>
</tr>
<tr>
<td>Bank Competitiveness</td>
<td>This measures the market competitiveness of each bank.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Mediating Variable)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating Environment of GDP</td>
<td>It is a measure of the overall health of the economy.</td>
<td>GDP growth rate</td>
<td>Annual Average Growth Rate</td>
</tr>
<tr>
<td>(Moderating Variable)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating Environment of Inflation</td>
<td>This is a measure of Macroeconomic stability.</td>
<td>Level of inflation</td>
<td>Annual inflation rate</td>
</tr>
<tr>
<td>(Moderating Variable)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Researcher (2016)

3.5.1 Validity of the Instruments

Validity is the extent to which a set of measured items actually reflect the theoretical latent construct the items are designed to measure (Cooper & Schindler, 2008). This study ensured face validity, content validity and construct validity by using similar significant variables such as bank stability (dependent), financial inclusion
(independent), operating environment (moderator) and bank competitiveness (mediator) from numerous past studies that used the same test as the one being evaluated. Construct validity was ensured by including in the data review guide all those variables that were derived from the literature. Construct validity provides adequate coverage of investigation questions guiding the study (Alan & Emma, 2015).

3.5.2 Data Collection Procedure
The researcher obtained a research authorization letter from Kenyatta University Graduate School. This was forwarded to the (NACOSTI) to allow for data collection from three main sources which are: bank annual financial statements, bank supervision reports by CBK and KNBS. Panel data was obtained from the CBK and KNBS and summarized through use of document review guides as shown by Appendices II and III. The data collected was for the period 2007-2015 and was from forty one (41) commercial banks. The data was extracted in the period between December 2016 - February 2017.

3.6 Data Analysis Method
Data collected was analyzed using descriptive statistics and panel multiple regression analysis. Descriptive statistics was used to summarizes and profile the status of bank financial inclusion, commercial banks stability, operating environment (inflation and GDP) and bank competitiveness trends. Panel multiple regression analysis was carried out to test the nature of the relationship between financial inclusion stability of commercial bank in Kenya. Financial inclusion had
three dimensions; bank availability, bank accessibility and bank usage. These were decomposed to form the Index of Financial Inclusion (IFI) proposed by Sarma and Pias (2011). Stability was measured using three indicators namely credit risk, liquidity risk and insolvency risk of commercial banks in Kenya.

However, before testing of hypotheses, several diagnostic tests were conducted to establish suitability of the data to the panel multiple regression model. The diagnostic test was necessary to ensure no violation of the assumptions of the Classical Linear Regression Model (CLRM). The following diagnostic tests were carried out to ensure that panel multiple regression model was properly specified and the risk of obtaining biased, inefficient and inconsistent result was dealt with. These included: normality, correlation, heteroskedasticity multicollinearity, autocorrelation, stationary, and hausman test.

3.7.1 Diagnostic Test

It is necessary to ensure non-violation of the Classical Linear Regression Model (CLRM) assumptions. This is because estimating equations 3.2, 3.3, and 3.4 when the assumptions of the classical linear regression model have been violated produces estimates that are not best linear unbiased estimator (BLUE) that is, estimates that are biased, inefficient, and inconsistent. To deal with this problem, the following tests were carried out; normality, correlation, heteroskedasticity multicollinearity, autocorrelation, stationary, and hausman test (Fadhili, et al., 2011).
3.7.1.1 Normality
The study employed Jarque-Bera statistic because it utilizes the skewness and kurtosis to check for normality of variables. Skewness is the tilt of the distribution and should be within -2 and +2 for data to be normally distributed. Kurtosis measures the degree of peakedness and should be between -3 and +3 and the Jarque-Bera statistic should be greater than the level of significance. The null hypothesis was that the data was normally distributed (Brooks, 2008).

3.7.1.2 Correlation Analysis
The study used the Pearson’s correlation coefficient to test for linearity of the relationship between the variables as recommended by Dancey and Reidy (2004). The correlation coefficient indicates the strength and direction of a linear relationship. A negative coefficient indicates an inverse relationship whereby an increase in one variable causes a decrease in the other, while a positive correlation indicates direct influence, where an increase in one variable causes an increase in the other variable (Field, 2009).

3.7.1.3 Heteroskedasticity
The presence of heteroskedasticity was tested using the Modified Wald test as specified by White (1980). Heteroskedasticity implies that error terms among different values of financial inclusion do not have a constant variance. The null hypothesis was that the error term is homoscedastic and the alternative hypothesis was that the error term is heteroskedastic.
If the null hypothesis is rejected, then it implied that there is presence of heteroskedasticity. The Modified Wald test was used to test for Heteroskedasticity where the null hypothesis of the test is that error terms have a constant variance (i.e. should be Homoskedastic). The study failed to reject the null hypothesis given that the reported p-value 0.000 was less than the critical value and thus concluded that the observations had constant variance or did not have the problem of Heteroskedasticity.

3.7.1.4 Multicollinearity

Multicollinearity is a condition where two or more predictor variables in a multiple regression are highly correlated hence one can be linearly predicted from others with a high degree of accuracy. This study tested Multicollinearity using the correlation matrix and the threshold considered as 0.8 for severe multicollinearity (Cooper & Schindler, 2008). They recommended use of the Vector Inflation Factor (VIF) which was applied in the study the threshold being 10 for severe multicollinearity.

If perfect multicollinearity is not accounted for, the regression coefficients was indeterminate and the resultant standard errors will be infinite while existence of imperfect multicollinearity leads to large standard errors hence affecting precision on rejection or failure in rejection of the null hypothesis. Multicollinearity is not a contention of its existence; rather it implies its degree or severity.

If multicollinearity is present, then some variables will be dropped. These results indicated that the VIF values of the independent variables were within the threshold
of 10. This indicated that there was no threat of multicollinearity problem. Therefore, the study used linear regression model. The tolerance of less than 0.1 also indicates the problem of multicollinearity. As such, the tolerance values for the study variables further confirmed that there was no threat of severe multicollinearity.

3.7.1.5 Autocorrelation

Since panel data is involved, the test for autocorrelation is important. This study used Wooldridge (2002) test for serial correlation because it can be applied in several lags. The null hypothesis was that there is serial autocorrelation and the alternative hypothesis was that there was no serial autocorrelation.

If the null hypothesis is accepted then it implies that there is the presence of serial correlation hence the error terms were related to different values of financial inclusion variables are related or have a covariance. This would result in biased error terms and inefficient estimates hence wrong inferences. Wooldridge test for autocorrelation which is also an LM test was adopted in this study. The study failed to reject the null hypothesis and concluded that there was no serial autocorrelation of any order and that residuals were not autocorrelated (Brooks, 2008).

3.7.1.6 Stationary Test

Since the data to be used has both the cross-section and time series dimension, it is important to test for stationarity. In order to test for stationarity, Augmented Dickey Fuller was conducted (Kromtit & Tsenkwo, 2014). According to Fadhili et al.
(2011), stationarity is the statistical characteristics of a time series such as its mean and variance over time.

If both are constant over time, then the series is said to be a stationary process that is not a random walk or has no unit root. Otherwise, the series is described as being a non-stationary process, that is, a random walk and has unit root. If a series is stationary without any differencing , it is designated as I (0), or integrated of order 0. On the other hand, a series that has stationary first differences is designated I(1 % or integrated of order (1) (Shahbaz et al., 2015).

The presence of unit root implies that the data is not stationary and running regression on it would result to spurious regression. The null hypothesis of this test was that all data had unit root. The alternative hypothesis was that all data would not have unit roots (Choi, 2001). If any of the variables was found to have unit root, then the researcher differenced that variable, running the equations using the differenced variable.

Results indicated that liquidity ratio, credit GDP ratio, deposit accounts and eposit GDP atio were stationary (i.e. no unit roots) since the p value was less than 0.05. This implied that the null hypothesis that there was a unit root was rejected. Branch networks, bank agents, loan accounts, market share, GDP growth rate and inflation were non-stationary since their p-values were greater than 0.05. This therefore, called for first differencing of the non-stationary variables to make them stationary.
3.7.1.7 Test for Fixed(Random Effects

When using panel data, one has to determine whether to run a fixed effect model or a random effect model (Green, 2008). The decision is based on the Hausman specification test, on the consistency and efficiency of the random effect (RE) and fixed effect (FE) estimators, dependency on the correlation between the individual effects and the regressors.

The test seeks to determine whether there exists significant correlation between the unobserved bank specific random effects and the regressors. If the results indicate no such correlation exists then the random effect model shall be used in the presence of such correlation then the fixed model would be appropriate.

In addition, if the Hausman test identifies the fixed effect model as appropriate then the researcher tested for inclusion of time fixed effects in the study estimation. This tests if the dummies for all the years are equal to zero and if found so, then there is no need for time is fixed effect in the specification of the model to be estimated.

To determine whether the fixed or random effect estimates, tables 4.7, 4.8 and 4.9 were interpreted. The null hypothesis of the Hausman test was that there are no systemic differences between the estimates of the random effect model and the fixed effect model. For credit risk model, the Hausman test reported a chi-square of 9.23 with a p value of 0.003.
For liquidity risk model, the Hausman test reported a chi-square of 8.75 with a p value of 0.0019. For insolvency risk model, the Hausman test reported a chi-square of 10.31 with a p value of 0.0036, implying that at 5 percent, the chi-square obtained was statistically significant for the three models. The study, therefore, failed to reject the null hypothesis of no systematic difference between the estimates of the random effects model and fixed effects model. Thus the fixed effects model was interpreted.

3.8 Ethical Consideration

In this study, issues relating to the ethical conduct of research such as informed consent, confidentiality and privacy were upheld. According to Saunders et al., (2009), ethics is the norms or standards of behavior that guide moral choices about our behavior and our relationship with others.

A research permit was sought from the NACOSTI to allow use of secondary data from the CBK website and KNBS. Findings would be ultimately shared with NACOSTI. The NACOSTI permit appendix V, was to help address ethical concerns on collecting data (where consent has been provided). There was need to keep data collected strictly private and confidential with use only for academic research, ensuring privacy of the organizations from which data was collected.
CHAPTER FOUR
RESEARCH FINDINGS AND DISCUSSION

4.1 Introduction
This chapter presents the finding of the study and comprises of two main sections. The first section presents the research results using descriptive statistics showing the key characteristics of the study sample. The second section presents results of inferential statistics.

4.2 Descriptive Statistical Analysis
This section presents results on the following issues: trend analysis for the variables including financial inclusion, commercial bank stability, operating environment (GDP and Inflation) and bank competitiveness. It presents the trends and associations between the variables used in the study. The data was panel in nature composed of both cross sectional and time series. Therefore, the annual means for each variable are used in obtaining a representative figure for the entire industry for that year. The resulting time series is plotted against time to establish the industry trend for each of the covariates.

4.2.1 Trend in Bank Stability
Bank stability had three dimensions: credit risk, liquidity risk and insolvency risk. This section presents the trend of these measures of bank stability. The trend is summarized in Figure 4.1.
In Figure 4.1, the left hand side vertical axis represents the scale of the credit risk and the insolvency risk (Z-score). The right hand side vertical axis represents the scale of liquidity risk. The bottom horizontal axis represents the years. Credit risk was measured by the ratio of NPLs to gross loans. Therefore, an increase (decrease) in this ratio implied an increase (decrease) in credit risk. With respect to credit risk, Figure 4.1 shows that there has been a general decline. However, the decline in credit risk is up to year 2011 after which the risk assumes slight increase to the end of the study period. This implies that in general the threat to commercial banks from credit risk has been declining over the study period.

**Figure 4.1: Trend in Bank stability**

**Source:** Study data (2017)
The marginal increase in credit risk was associated with government borrowing to set up county governments. It is noteworthy that there is a mismatch between government’s fiscal year and the banks financial years. This causes unpaid loans that are offset in the following financial year once the government releases its funds. Therefore, it is safe to assume that in general the credit risk has been declined over the study period. This implies that commercial banks were fairly stable in terms of credit risk.

In terms of liquidity risk the trend posted mixed results. The risk declined consistently between 2008 and 2010. This may be explained by the slow lending adopted by commercial banks after the post-election violence (PEV) of 2007 and 2008. During this period, the banks approximately loaned 55 cents out of everyone shilling received as deposits. Between 2010 and 2014 liquidity risk as proxied by the ratio of loans to deposits rose consistently with stagnation between 2011 and 2012. This may be attributed to the expanded lending by commercial banks after occasioned by a stable political environment resulting from the promulgation of a progressive constitution in 2010.

Between 2014 and 2015 the risk declined following slow lending by commercial banks resulting from the debate on exceptional bank profitability and capping of interest rates. Overall, between 2007 and 2015 liquidity risk rose from 57 to 60 percent. This implies that over the study period commercial banks were fairly stable. The banks did not carelessly expose themselves to unforeseen fund needs; neither did they lose much opportunity to earn from lending the mobilized deposits.
Insolvency risk was measured using Z-score which could either take a negative, zero or positive value. A negative value implies that the bank does not have adequate levels of equity to cover for losses (negative values of ROA) a value of zero implies that the bank has enough equity to just cover the losses incurred; a positive figure implies that the bank has more than enough equity to cover any losses that might occur. Figure 4.1 show that the Z-score exhibits no clear trend (Insolvency risk).

However, throughout the study period, banks reported a positive Z-score. This means that over this period no bank made huge losses to wipe out its equity. The slowed lending between 2007 and 2008 triggered a decline in the Z-score (insolvency risk) and stagnation between 2008 and 2009. This means that the PEV of 2007 and 2008 negatively affected the bank stability. However, the expansion in lending between 2009 and 2011 led to a recovery in the insolvency risk as shown by Z-score, stabilizing more the commercial banks. Nevertheless, this recovery was short lived.

The insolvency risk (Z-score) shows a consistently declined from 2011 to the end of the study period. This was prompted by the declining profitability resulting from attempts to tame exceptional bank profitability among the commercial banks. Generally, the Z-score declined from 13.8 per cent to 7 per cent during the study period. This means that the reducing banks profitability made the commercial banks less stable.
4.2.2 Trend in Financial Inclusion

Financial inclusion was measured using bank availability (BAV), bank accessibility (BAC), bank usage (BUS) and an overall financial inclusion (IFI). Figure 4.2 shows the trend in these variables.

![Figure 4.2: Trend in Financial Inclusion](source)

In Figure 4.2, the left hand side vertical axis represents the scale of the bank accessibility (BAC), bank usage (BUS) and Index of Financial Inclusion (IFI), while the right hand side vertical axis represents the scale of bank availability. The bottom horizontal axis represents the years.

Overall with respect to financial inclusion Figure 4.2 shows that all the measures of financial inclusion had an upward trend in the entire study period. Bank availability was measured using a composite index comprising of the number of ATMs and
bank branches per 100,000 people. Being the primary means of accessibility bank branches was assigned a weight of two thirds while ATMs were assigned a third. The weighted average of the bank branches and ATMs yielded the composite index of bank availability. A value of zero would imply no availability at all while a value of 100 would mean perfect availability. From the findings, it implied that commercial banks in Kenya had a perfect availability.

Figure 4.2 shows that the index rose consistently during the study period to stand at eight. At the beginning of the study period the index stood at four percent. Comparing this figure to eight percent at the end of the period means that on average commercial banks availability doubled during the study period. Therefore, commercial banks customers had more variety in obtaining banking services bank with respect to branches and ATMs.

On the hand bank accessibility was proxied by the number of bank accounts per 100 people. A value of zero implies no accessibility at all while a value of 100 shows perfect accessibility. Figure 4.2 shows that bank accessibility rose rapidly from 19 accounts at the beginning of the study period to 92 accounts per 100 people. This implies that bank accessibility more than quadrupled during the study period. This means that the population of Kenyans with bank accounts more than quadrupled between 2007 and 2015. The holding of bank accounts by 92 persons per 100 people means that commercial banks accessibility in Kenya can be considered near perfect and this is in line with FSD report 2016 which placed Kenya to be above 75 per cent in financial inclusion.
Banks usage was measured by the ratio of lending to the private sector. This component measures those who are able to access commercial banks and use their services. A value of zero would mean no usage at all while a value of 100 would imply perfect usage. Figure 4.2 shows that bank usage grew from 23 to 34 per cent during the entire study period. The 11 percentage points are meager compared to the other domains of financial inclusion. This means that though a lot of people are able to access commercial banks through bank accounts only a small fraction is able to make use of the commercial banks’ lending opportunities. Therefore, commercial banking in Kenya is accessible but not largely usable.

The overall financial inclusion index was obtained applying the formula developed by Sarma and Pias (2011) Appendix IV. The index ranged from zero to 100 percent. A value of zero would imply imperfect inclusion while that of 100 implies perfect inclusion. Figure 4.2 shows that the index rose from 46 to 99.6 during the study period this means that in general financial inclusion in Kenya is nearing a perfect state. This is in line with FSD report on financial inclusion in Kenya 2016 that concluded that Kenya had attained above 75% financial inclusivity.

4.2.3 Trend in the GDP and Inflation

This section presents the trend of the perceived moderators: GDP and inflation. Figure 4.3 summarizes this trend.
Figure 4.3 shows that the gross domestic product consistently rose during the study period. GDP increased from KES1.833 trillion in 2007 to KES4.05 trillion in 2015. This means that during the study period commercial banks operated in an environment of expanding income. This further explains the growth in financial inclusion.

These results are in consensus with Honohan, (2008) who observed that operating environment variables namely: inflation and GDP are important determinants of financial inclusion and bank stability. He posited that economic development generally coincides with an increase in financial inclusion. Therefore, the rising
incomes confirm the expectation of expanding national income creating the rise in financial inclusion.

Inflation exhibited erratic behavior synonymous with economic cycles. The level was high during periods of economic shocks such as the post-election violence of 2007 and 2008 as well as the currency crisis of 2010 and 2011. The erratic behavior and moderate nature of inflation implies that commercial banks faced a population that was more motivated to spend ‘today’ rather than save during the study period.

4.2.4 Trend in Bank Competitiveness

This section discusses the trend in commercial bank’s competitiveness. Figure 4.4 summarizes this trend.

![Figure 4.4: Trend in Bank Competitiveness](image)

Source: Study data (2017)
Figure 4.4 presents the trend analysis for bank competitiveness. Commercial bank’s competitiveness was proxied using the HHI index that sums the square of commercial banks market share. The index can take a minimal value of zero and a maximal of one. A value of zero means that the industry is perfectly competitive and no single firm controls the sector. A value of one means that the industry is a monopoly under one firm. Figure 4.4 shows that in general the level of commercial bank’s competitiveness remained unchanged during the study period except during the year 2010.

The spike in the series in 2010 may be explained by the mergers and acquisitions occasioned by the radical change in the capital requirements for commercial banks in 2008. The increase in the core capital requirements occasioned mergers and acquisitions in the sector and thereby increasing the market share of the resulting institutions. Further entry into the market between 2011 and 2015 has diluted the shoot in 2010 and brought it almost the industry norm of about 0.05.

The trend is consistent with the results established by (Beck et al., 2013; Ryan et al., 2014) who found that the level of bank competitiveness to be instrumental in broadening financial access and also the inability to access and use financial services is highly depended on competition in the market. Greater market competitiveness persuades banks to establish relationship lending leading to increased credit availability (Ariss, 2014). Boyd and Conolo (2005) established that due to competition, banks are forced to reduce loan rates making it easier for credit
holders and minimizing the risk of default and therefore, banks are less likely to suffer from Non-Performing loans.

4.3 Inferential Statistics

Regression analysis was used to test the hypotheses. However, before proceeding with the analysis the study performed several tests to ensure non-violation of the CLRM and also to establish how well the data fitted in the models:

4.3.1 Diagnostic Test

As indicated in Chapter Three, the researcher conducted various diagnostic tests. This was to ensure that the assumptions of CLRM were not violated. It was also to assert that the tests were an appropriate model chosen for analysis in the event that CLRM assumption were not compromised. Estimating the regression models when the CLRM assumptions are violated would result in inefficient, inconsistent parameters estimates. The results of the diagnostic tests are as presented below: test for normality test, heteroskedasticity test, correlation test, multicollinearity test, stationary test, autocorrelation test and hausman test.

4.3.1.1 Normality Test

The normality test was conducted using the Jarque-Bera (JB) and normality graph. The results in the figure indicate that the residuals were normally distributed. The Jarque-Bera test was preferred since it is a more comprehensive test compared to the graphical approach of testing for normality (Gujarati, 2003; Razali & Wah, 2011). The results of test are shown in figure 4.5
The null hypothesis under this test was that the residuals are not significantly different from a normal distribution. Given that the p-value was greater than 5% for the residual, the study failed to reject Ho and this implied that the data followed a normal distribution. It’s clear that the residual were normally distributed and therefore, OLS regression methodology could be applied to estimate the panel multiple regression models (Brooks, 2008).

4.3.1.2 Correlation Test Analysis

The study used a correlation matrix to test the direction of the association amongst the study variables as recommended by (Dancy & Reidy, 2004)
### Table 4.1: Correlation Results on Financial Inclusion and Stability

<table>
<thead>
<tr>
<th>Credit</th>
<th>Liquidity</th>
<th>Insolvency</th>
<th>bank availability</th>
<th>bank usage</th>
<th>bank accessibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit liquidity</td>
<td>-0.202</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insolvency availability</td>
<td>0.101</td>
<td>-0.076</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>bank availability</td>
<td>-0.905</td>
<td>0.348</td>
<td>-0.19</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>bank usage</td>
<td>0.799</td>
<td>0.426</td>
<td>-0.17</td>
<td>0.3501</td>
<td>1</td>
</tr>
<tr>
<td>bank accessibility</td>
<td>-0.778</td>
<td>0.465</td>
<td>-0.163</td>
<td>0.3901</td>
<td>0.491</td>
</tr>
<tr>
<td>INF</td>
<td>-0.288</td>
<td>0.026</td>
<td>0.184</td>
<td>0.5106</td>
<td>0.480</td>
</tr>
<tr>
<td>GDP</td>
<td>0.32</td>
<td>-0.12</td>
<td>-0.076</td>
<td>0.38</td>
<td>0.30</td>
</tr>
<tr>
<td>Bank competition</td>
<td>0.752</td>
<td>-0.248</td>
<td>-0.023</td>
<td>0.637</td>
<td>0.344</td>
</tr>
</tbody>
</table>

**Source:** Study Data (2017)

The finding in Table 4.1 indicates that the correlation between credit risk and bank availability was -0.905 (p=0.015), bank accessibility -0.799 (p=0.028), bank usage -0.778 (p=0.004), financial inclusion -0.804 (p=0.013) and GDP growth rate -0.288 (p=0.031). The coefficients were significant and negative implying that increase in financial inclusion and GDP growth rate reduces the credit risk of commercial banks. The coefficients of Inflation rate 0.322 (p=0.014) and Bank competitiveness 0.752 (p=0.002). The coefficients are significant and positive implying that increase in inflation and bank competitiveness increases credit risk of commercial banks.

The correlation between liquidity risk and bank availability was 0.348 (p=0.002), bank accessibility 0.426 (p=0.012), bank usage 0.465 (p=0.002), financial inclusion 0.43 (p=0.032) and GDP growth rate 0.026 (p=0.005). The coefficients were significant and positive implying that increase in financial inclusion and GDP growth rate increase the liquidity risk of commercial banks. The coefficients of Inflation rate was -0.122 (p=0.021) and Bank competitiveness -0.248 (p=0.013). The
coefficients are significant and negative implying that increase in inflation and bank competitiveness decreases liquidity risk of commercial banks.

The correlation between insolvency risk and bank availability was -0.19 (p=0.001), bank accessibility -0.17 (p=0.013), bank usage -0.163 (p=0.008) financial inclusion -0.17 (p=0.005). GDP growth rate 0.184 (p=0.010). The coefficients were significant and negative implying that increase in financial inclusion decreases the insolvency risk of commercial banks. GDP growth rate was 0.184 (p=0.010). The coefficient is significant and positive indicating that increase in GDP growth rate increases insolvency risk.

The coefficients of Inflation rate was -0.076 (p=0.372) and Bank competitiveness w-0.023 (p=0.456). The coefficients are insignificant and negative which implied that inflation and bank competitiveness were not linearly related with insolvency risk of commercial banks. It is worth noting that inflation and bank competitiveness are not explanatory variables but perceived mediators. The variables enter the respective models in multiplicative forms with the independent variable, and therefore, the insignificant correlation coefficients do not imply misspecification errors.

4.3.1.3 Heteroskedasticity

The study further conducted heteroskedasticity analysis to test the assumption that the residuals have a constant variance (they should be homoskedastic). The Modified Wald test was used to test for heteroskedasticity where Ho assumes that
the error terms variance is constant (i.e. should be Homoscedastic) indicated by p<0.05. The results are presented in Table 4.2

Table 4.2 Test for Heteroskedasticity

<table>
<thead>
<tr>
<th>Test for Heteroskedasticity</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Modified Wald test heteroskedasticity</td>
<td></td>
</tr>
<tr>
<td>chi2 (41) = 2.4e+09</td>
<td></td>
</tr>
<tr>
<td>Prob&gt;chi2 = 0.0000</td>
<td></td>
</tr>
</tbody>
</table>

Source: Study Data (2017)

The study failed to reject the null hypothesis given that the reported p-value 0.000 was less than the critical level of significance at 0.05 as recommended by Dansey and Reidy (2004). The homoscedasticity assumption was ascertained and hence the data was suitable for analysis because the error term was homoscedastic over the time thereby making the standards errors appropriate for testing the significance of the co-efficient (Wooldridge, 2002).

4.3.1.4 Multicollinearity

The study conducted regression analysis to obtain tolerance and variance inflation factors (VIF) for use in determining whether multicollinearity would pose a problem in analysis. The independent variables of VIF of less than 10 and a tolerance value greater than 0.1 is recommendable for ruling out the possibility of multicollinearity (Field, 2009). The results of the test are shown in Table 4.3
Table 4.3: Results of Multicollinearity Test

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Collinearity</th>
<th>Statistics</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tolerance</td>
<td>VIF</td>
<td></td>
</tr>
<tr>
<td>(Constant)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bank Availability</td>
<td>0.893</td>
<td>1.119</td>
<td>No Multicollinearity</td>
</tr>
<tr>
<td>Bank Accessibility</td>
<td>0.734</td>
<td>1.362</td>
<td>No Multicollinearity</td>
</tr>
<tr>
<td>Bank Usage</td>
<td>0.711</td>
<td>1.407</td>
<td>No Multicollinearity</td>
</tr>
<tr>
<td>Inflation Rate</td>
<td>0.543</td>
<td>1.642</td>
<td>No Multicollinearity</td>
</tr>
<tr>
<td>GDP growth Rate</td>
<td>0.247</td>
<td>4.051</td>
<td>No Multicollinearity</td>
</tr>
<tr>
<td>Bank Competitiveness</td>
<td>0.901</td>
<td>1.111</td>
<td>No Multicollinearity</td>
</tr>
<tr>
<td>Credit Risk</td>
<td>0.454</td>
<td>2.347</td>
<td>No Multicollinearity</td>
</tr>
<tr>
<td>Liquidity Risk</td>
<td>0.348</td>
<td>2.871</td>
<td>No Multicollinearity</td>
</tr>
<tr>
<td>Insolvency Risk</td>
<td>0.425</td>
<td>2.351</td>
<td>No Multicollinearity</td>
</tr>
<tr>
<td>Mean VIF</td>
<td>0.584</td>
<td>2.029</td>
<td></td>
</tr>
</tbody>
</table>

Source: Study Data (2017)

Table 4.3 shows the VIF for bank availability (VIF=1.119); bank accessibility (VIF=1.362); bank usage (1.407); Inflation (1.642); GDP growth rate (4.051); bank competitiveness (1.111); credit risk (2.347); liquidity risk (2.87) and insolvency risk (VIF=2.351). The mean VIF was 2.029. The independent variables had a VIF of less than 10 and a tolerance value greater than 0.1 indicating absence of severe multicollinearity (Field, 2009). The result, therefore implied non- existence of a
multicollinearity problem among the variable and hence the level of multicollinearity in the model could be tolerated.

### 4.3.1.5 Autocorrelation

The study performed autocorrelation test to find out whether the residuals were correlated with respect to time. Regression analysis assumptions require that residuals should not be correlated across time and thus the Wooldridge test for autocorrelation which is also an LM test was adopted in this study. The null hypothesis was that no first order serial/auto correlation exists. The results of the analysis are presented in Table 4.4.

**Table 4.4 : Results of Serial Correlation Tests**

<table>
<thead>
<tr>
<th>Serial Correlation Tests</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Wooldridge test for autocorrelation in panel data</td>
<td></td>
</tr>
<tr>
<td>H0: no first order autocorrelation</td>
<td></td>
</tr>
<tr>
<td>F(1,41) = 0.222</td>
<td></td>
</tr>
<tr>
<td>Prob &gt; F = 0.8836</td>
<td></td>
</tr>
</tbody>
</table>

*Source: Study Data (2017)*

From the results, the F statistic had a value of 0.8836 and a P value of 0.222. Since the P value was greater than 5% level of significance then, the F test was statistically insignificant. Accordingly, the study failed to reject the null hypothesis and instead concluded that there was no problem of serial correlation covariance (Brooks, 2008).

### 4.3.1.6 Stationarity Tests

The study conducted a stationarity test on the variables used by the study to avoid spurious regressions. The study used Phillips–Perron (1988) stationarity. The test
has a null hypothesis that a variable has a unit root with the alternative that the variable is stationary (Phillips–Perron, 1988). The null hypothesis is rejected if the interpolated critical values are less than the calculated in absolute terms. Table 4.7 shows the results from this test.

Table 4.5: Results of Stationarity Test

<table>
<thead>
<tr>
<th>Variable</th>
<th>Calculated</th>
<th>Tabulated 1 %</th>
<th>Tabulated 5 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit Risk</td>
<td>-2.4376</td>
<td>-1.850</td>
<td>-1.750</td>
</tr>
<tr>
<td>Liquidity Risk</td>
<td>-2.8322</td>
<td>-1.850</td>
<td>-1.750</td>
</tr>
<tr>
<td>Insolvency Risk</td>
<td>-3.9402</td>
<td>-1.850</td>
<td>-1.750</td>
</tr>
<tr>
<td>Bank Availability</td>
<td>-9.5802</td>
<td>-1.850</td>
<td>-1.750</td>
</tr>
<tr>
<td>Bank Accessibility</td>
<td>-4.9202</td>
<td>-1.850</td>
<td>-1.750</td>
</tr>
<tr>
<td>Bank Usage</td>
<td>-3.7501</td>
<td>-1.850</td>
<td>-1.750</td>
</tr>
<tr>
<td>Financial Inclusion</td>
<td>-2.7930</td>
<td>-1.850</td>
<td>-1.750</td>
</tr>
<tr>
<td>Inflation Rate</td>
<td>-2.8110</td>
<td>-1.850</td>
<td>-1.750</td>
</tr>
<tr>
<td>GDP growth Rate</td>
<td>-2.7930</td>
<td>-1.850</td>
<td>-1.750</td>
</tr>
<tr>
<td>Bank competitiveness</td>
<td>-2.3049</td>
<td>-1.850</td>
<td>-1.750</td>
</tr>
</tbody>
</table>

Source: Study Data (2017)

Table 4.5 shows that for all the series the calculated Phillips-Perron test statistics in absolute terms are above the tabulated critical statistics at 1% and 5% significance levels. The implication is that the $H_0$ of a unit root is rejected at all common significance levels. This means that regressions can be carried out using the variables at all levels without the fear of spurious regressions (Bhargara, 1986).

4.3.1.7 Hausman Test

This being panel data the study performed the hausman test for model specification between fixed and random effect model for model 1 credit risk, the Hausman test was used as presented in Table 4.6. The null hypothesis of the Hausman test was
that there are no systemic differences between the estimates of the random effect model and the fixed effect model.

**Table 4.6: Hausman Test for Credit Risk**

<table>
<thead>
<tr>
<th></th>
<th>Fixed (b)</th>
<th>Random (B)</th>
<th>Difference (b-B)</th>
<th>sqrt(diag(V_b-V_B)) S.E.</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAV</td>
<td>-2.986118</td>
<td>-2.986118</td>
<td>-7.22e-13</td>
<td>0.0410677</td>
</tr>
<tr>
<td>BAC</td>
<td>0.60003</td>
<td>0.60003</td>
<td>3.36e-13</td>
<td>0.00266681</td>
</tr>
<tr>
<td>BAU</td>
<td>-0.0227047</td>
<td>-0.0227047</td>
<td>-2.13e-12</td>
<td>0.0138897</td>
</tr>
</tbody>
</table>

b= Consistent under H₀ and H₁; obtained from xtreg

B= Inconsistent under H₁, efficient under H₀; obtained from xtreg

Test H₀: differences in coefficients not systematic

\[ \text{chi2}(3) = (b-B)\left[V_b-V_B\right]^{(-1)}b-B = 9.23 \]

Prob>chi2 = 0.003

**Source: Study Data (2017)**

In Table 4.6, for credit risk model, the Hausman test had a chi-square of 9.23 with a p value of 0.003 implying that at 5%, the chi-square value was statistically significant. And therefore H₀ was not rejected implying that there was no systematic difference between the estimates of the Random effects model and fixed effects model. Thus the fixed effects model was interpreted as recommended by Green (2008).

In order to choose between fixed and random effect model for model 2 liquidity risk, the Hausman test was used as presented in Table 4.7. The null hypothesis of the Hausman test was that there are no systemic differences between the estimates of the random effect model and the fixed effect model.
Table 4.7: Hausman Test for Liquidity Risk

<table>
<thead>
<tr>
<th></th>
<th>Fixed (b)</th>
<th>Random (B)</th>
<th>Difference (b-B)</th>
<th>sqrt(diag(V_b-V_B))S.E.</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAV</td>
<td>-4.23001</td>
<td>-4.23001</td>
<td>6.19e-12</td>
<td>0.3339067</td>
</tr>
<tr>
<td>BAC</td>
<td>0.0499031</td>
<td>0.499031</td>
<td>-9.05e-13</td>
<td>0.0216931</td>
</tr>
<tr>
<td>BAU</td>
<td>1.553508</td>
<td>1.553508</td>
<td>4.51e-12</td>
<td>0.112932</td>
</tr>
</tbody>
</table>

b= Consistent under Ho and Ha; obtained from xtreg
B= Inconsistent under Ha, efficient under Ho; obtained from xtreg
Test Ho: differences in coefficients not systematic
\[ \chi^2(3) = (b-B)'[ V_b-V_B]^{-1}(b-B) = 8.75 \]
\[ \text{Prob}>\chi^2 = 0.0019 \]

Source: Study Data (2017)

In Table 4.7 for liquidity risk model, the Hausman test reported a chi-square of 8.75 with a p value of 0.0019 implying that at 5 percent level, the chi-square obtained was statistically significant. The study therefore failed to reject the null hypothesis of no systematic difference between the estimates of the Random effects model and fixed effects model as recommended by Green (2008). And thus the researcher applied the fixed effect model.

In order to choose between fixed and random effect model for model 3 Insolvency risk, the Hausman test was used as presented in Table 4.8. The null hypothesis of the Hausman test was that there are no systemic differences between the estimates of the random effect model and the fixed effect model.
Table 4.8: Hausman Test for Insolvency Risk

<table>
<thead>
<tr>
<th></th>
<th>Fixed (b)</th>
<th>Random (B)</th>
<th>Difference (b-B)</th>
<th>sqrt(diag(V_b-V_B))S.E.</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAV</td>
<td>1.4273</td>
<td>1.4273</td>
<td>-1.65e-13</td>
<td>0.0255976</td>
</tr>
<tr>
<td>BAC</td>
<td>-0.0313284</td>
<td>-0.0313284</td>
<td>8.53e-16</td>
<td>0.001663</td>
</tr>
<tr>
<td>BAU</td>
<td>-0.16560667</td>
<td>-0.16560667</td>
<td>3.56e-14</td>
<td>0.0086575</td>
</tr>
</tbody>
</table>

b= Consistent under Ho and Ha obtained from xtreg
B= Inconsistent under Ha, efficient under Ho obtained from xtreg
Test Ho: differences in coefficients not systematic
chi2(3) =(b-B)![( V_b-V_B)^(-1)]b-B= 10.31
Prob>chi2 =0.0036

Source: Study Data (2017)

In Table 4.8 for insolvency risk model, the Hausman test reported a chi-square of 10.31 with a p value of 0.0036 implying that at 5 percent level, the chi-square obtained was statistically significant. The study therefore failed to reject the null hypothesis of no systematic difference between the estimates of the Random effects model and fixed effects model. Thus the fixed effects model was interpreted as recommended by Green (2008).

4.3.2 Hypotheses Testing

This section presents results of hypothesis testing as they were presented in chapter two. Hypothesis $H_{01}$, $H_{02}$ and $H_{03}$ were based on financial inclusion dimensions and were analysed using panel multiple regression to establish the statistical significance at 95 percent confidence level ($\alpha=0.05$). The results are presented in Table 4.9, 4.10 and 4.11.
### 4.3.2.1 Financial Inclusion and Credit risk of Commercial Banks in Kenya

The following null hypotheses were tested:

- **$H_{01a}$**: Bank availability has no significant effect on credit risk of commercial banks in Kenya.
- **$H_{01b}$**: Bank accessibility has no significant effect on credit risk of commercial banks in Kenya.
- **$H_{01c}$**: Bank usage has no significant effect on credit risk of commercial banks in Kenya.

This section tests the hypotheses with respect to credit risk. The estimation of the respective models is reported in Table 4.9

#### Table 4.9: Effect of Financial Inclusion on Credit Risk

<table>
<thead>
<tr>
<th>Financial inclusion</th>
<th>Coeff.</th>
<th>Std. Err.</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bank Availability</td>
<td>-2.986118</td>
<td>0.117039</td>
<td>-25.51</td>
<td>0.000</td>
</tr>
<tr>
<td>Bank Accessibility</td>
<td>0.060003</td>
<td>0.0076037</td>
<td>7.89</td>
<td>0.000</td>
</tr>
<tr>
<td>Bank Usage</td>
<td>-0.0227049</td>
<td>0.0395843</td>
<td>-0.57</td>
<td>0.0026</td>
</tr>
<tr>
<td>_cons</td>
<td>21.96</td>
<td>0.927997</td>
<td>23.66</td>
<td>0.000</td>
</tr>
<tr>
<td>Observations</td>
<td>369</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

R-sq: within = 0.8683  
F statistics = 73.132  
Prob > chi2 = 0.0000

**Source: Study Data (2017)**

Based on the analysis in Table 4.9 the following model was formulated.

\[
\text{Credit Risk} = 21.96 - 2.986118 \text{ (BAV)} + 0.060003 \text{ (BAC)} - 0.0227049 \text{ (BUS)} + \epsilon
\]

Where:

- BAV = Bank Availability
- BAC = Bank Accessibility
- BUS = Bank Usage
The results in Table 4.9 indicate an R squared of 0.8683. This implies that the financial inclusion indicators (bank availability, bank accessibility and bank usage) had high explanatory power on credit risk. The F statistics value was 73.132 with a p value of 0.000 which is less than 0.05. This indicates that financial inclusion had significant effects on credit risk of commercial banks in Kenya.

**H₀₁ₐ: Bank availability has no significant effect on credit risk of commercial banks in Kenya.**

The first objective of the study sought to establish the effect of bank availability credit risk of commercial banks in Kenya and the findings are as shown in Table 4.9. To achieve this objective a null sub hypothesis, **H₀₁ₐ**, that bank availability has no significant affect on credit risk of commercial banks in Kenya was formulated. In Table 4.9 the coefficient of bank availability (β=-2.986118, p=0.000<0.05) shows a negative statistically significant relationship between bank availability and credit risk. Therefore, the null sub hypothesis that bank availability has no significant effect on credit risk of commercial banks in Kenya was rejected at five per cent level of significance.

The negative coefficient of -2.986 in the findings indicate that an increase in bank availability reduces credit risk and hence increases bank stability. Bank availability was measured using a composite index comprising of the number of, number of branches per100,000, number of ATMs per 100,000 people and number of agents per 100,000 people.
The findings therefore, imply that an increase in the number of branches, ATMs and bank agents reduces bank instability. This finding is plausible and expected since an increase in availability means that customers have more channels to obtain bank services and, are therefore, able to sort any issues to do with their loan payments. Hence the reduced credit risk in commercial banks.

However, the results are inconsistent with Ghosh (2008) in India who investigated the interaction between financial inclusion and financial fragility of state owned banks between 1997 and 2007. He concluded that an increased availability of banking services is associated with increased fragility due to banks compromising on their credit evaluation procedures and qualifications.

\textbf{H}_{01b}: \textbf{Bank accessibility has no significant effect on credit risk of commercial banks in Kenya.}

The second objective of the study sought to establish the effect of bank accessibility on the stability of commercial banks in Kenya. The findings summarizing this analysis are in Table 4.9.

To achieve this objective a null sub hypothesis, \(H_{01b}\), that bank accessibility has no significant affect on credit risk of commercial banks in Kenya was formulated. In Table 4.9 the coefficient of bank accessibility (\(\beta=0.060003, p=0.000<0.05\)) shows a positive statistically significant relationship between bank accessibility and credit risk. Therefore, the null sub hypothesis that bank accessibility has no significant
effect on credit risk of commercial banks in Kenya was rejected at five per cent level of significance.

Increase in credit risk is a sign of instability and the findings show that an increase in bank accessibility increases credit risk leading to bank instability. Bank accessibility was measured by the number of bank deposit, loan and mobile accounts per 100 people. The findings therefore, imply that an increase in the number of bank accounts per 100 people increases bank instability.

This finding are in agreement with those of (Gokhale, 2009; Allen et al., 2012; Khan 2011) who established that increase in the number of banked individuals' through financial inclusion, may lead to risky clients in the banking system. Such individuals fail to pay their loans once extended a facility thereby increasing credit risk.

H01c. Bank usage has no significant effect on credit risk of commercial banks in Kenya.

The third objective of the study sought to establish the effect of bank usage on the stability of commercial banks in Kenya. The findings summarizing this analysis are in Table 4.9

To achieve this objective a null sub hypothesis, H01c, that bank usage has no significant affect on credit risk of commercial banks in Kenya was formulated. In Table 4.9 the coefficient of bank usage (β=−0.0227049, p=0.0026<0.05) shows that there is a positive statistically significant relationship between bank usage and credit risk of commercial banks in Kenya. Therefore, the null hypothesis that bank usage
has no significant effect on credit risk of commercial banks in Kenya was rejected at five per cent level of significance. A decrease in credit risk symbolizes improvement in stability. The findings, therefore, imply that an increase in bank usage decreases bank credit risk hence becoming more financially stable.

The findings therefore, imply that an increase in the amount of credit extended to the private sector reduces bank credit risk. This is also in line with (Beck et al., 2006) Khan, (2011) who observed that lending to more individuals has a pooling effect that reduces exposure to credit risk, through loaning to small firms which effectively reduces the level of riskiness of loan portfolio of a bank due to asset diversification.

4.3.2.2 Financial inclusion and liquidity risk of commercial banks in Kenya

The following null hypotheses were tested:

\( H_{0a} \): Bank availability has no significant effect on liquidity risk of commercial banks in Kenya.

\( H_{0b} \): Bank accessibility has no significant effect on liquidity risk of commercial banks in Kenya.

\( H_{0c} \): Bank usage has no significant effect on liquidity risk of commercial banks in Kenya.

This section tests the hypotheses with respect to financial inclusion and liquidity risk. The estimates are reported in Table 4.10.
Table 4.10: Effect of Financial Inclusion on Liquidity Risk

<table>
<thead>
<tr>
<th>Financial inclusion</th>
<th>Coef.</th>
<th>Std. Err.</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bank Availability</td>
<td>-4.23001</td>
<td>1.008484</td>
<td>-4.19</td>
<td>0.000</td>
</tr>
<tr>
<td>Bank Accessibility</td>
<td>0.0499031</td>
<td>0.0655186</td>
<td>0.76</td>
<td>0.447</td>
</tr>
<tr>
<td>Bank Usage</td>
<td>1.55350</td>
<td>0.3410835</td>
<td>4.55</td>
<td>0.0026</td>
</tr>
<tr>
<td>_cons</td>
<td>-18.2839</td>
<td>7.996225</td>
<td>-2.29</td>
<td>0.023</td>
</tr>
<tr>
<td>Observations</td>
<td>369</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

R-sq: within = 0.6670
F statistics = 69.43
Prob > chi2 = 0.0000

**Source:** Study Data (2017)

Based on the analysis in Table 4.10 the following model was formulated.

\[
\text{Liquidity Risk} = -18.2839 + 4.23001 \text{ (BAV)} + 0.0499031 \text{ (BAC)} + 1.55350 \text{ (BUS)} + \epsilon
\]

Where

BAV = Bank Availability
BAC = Bank Accessibility
BUS = Bank Usage

The results in Table 4.10 indicate an R squared of 0.6670. This implies that the financial inclusion indicators (bank availability, bank accessibility and bank usage) had high explanatory power on bank stability (Measured by Liquidity Risk). The F statistics value was 69.43 with a p value of 0.000 which is less than 0.05. This indicates that financial inclusion had significant effects on the stability of commercial banks in Kenya.
H02a: Bank availability has no significant effect on liquidity risk of commercial banks in Kenya.

The first objective of the study sought to establish the effect of bank availability on the financial stability of commercial banks in Kenya. When stability is measured using liquidity risk the findings of this analysis were presented in Table 4.10.

To achieve this objective a null sub hypothesis, H02a, that bank availability has no significant affect on liquidity risk of commercial banks in Kenya was formulated. In Table 4.10 the coefficient of (β=-4.23001, p=0.0000<0.05) shows a negative statistically significant effect of bank availability on liquidity risk of commercial banks. Hence, the study rejected the null sub hypothesis that bank availability has no significant effect on liquidity risk of commercial banks in Kenya at five per cent level of significance.

A decrease in liquidity risk is a sign of improving financial stability. The findings therefore indicate that an increase in bank availability reduces bank credit risk and hence increasing bank stability. Bank availability was measured using a composite index comprising of the number of bank branches, ATMs and agents per 100,000 people. The findings therefore, imply that an increase in the number of branches, ATMs and agents reduces bank liquidity risk. These findings are supported by the finance growth theory, which posits that an increase in availability means that customers have more channels to access financial services, as well as the banks boosting their deposit mobilization.
The finding are also in agreement with (Hanning & Jansen, 2010) who observed that by enlarging the savings from small depositors increases the deposit base stability. In return this reduces the risks associated with relying on non-core financing assets especially during financial crisis and therefore it supports financial inclusion being a measure of increasing bank stability.

**H02b: Bank accessibility has no significant effect on liquidity risk of commercial banks in Kenya.**

The second objective of the study sought to establish the effect of bank accessibility on the stability of commercial banks in Kenya. The findings summarizing this analysis are presented in Table 4.10.

To achieve this objective a null sub hypothesis, $H_{02b}$, that bank accessibility has no significant affect on liquidity risk of commercial banks in Kenya was formulated. In Table 4.10 the coefficient of accessibility was ($\beta=0.0499031$, $p=0.447>0.05$) shows a positive statistically insignificant effect of bank accessibility on liquidity risk of commercial banks in Kenya. Therefore, the null sub hypothesis that bank accessibility has no significant affect on liquidity risk of commercial banks in Kenya was not rejected at five per cent level of significance. Therefore, an increase in bank accessibility has no affect on liquidity risk faced by a commercial bank.

Bank accessibility was measured by the number of deposit, loan and mobile bank accounts per 100 people. The findings therefore, imply that an increase in the number of bank accounts per 100 people does not affect bank liquidity risk.
However, it implies that just having an account with the commercial banks does not influence the banks liquidity position.

The findings are in agreement with Sahrawat, (2010) who advised that mere ownership of a financial product does not mean one is financially included. Rather to be financially included depends on how well the financial products are utilized for economic reliance and growth which ultimately leads to financial inclusion. This implies that banks should consider all the dimensions of financial inclusion in totality and not in isolation.

**H02c: Bank usage has no significant effect on liquidity risk of commercial banks in Kenya.**

The third objective of the study sought to establish the effect of bank usage on the stability of commercial banks in Kenya. The findings summarizing this effect with respect to liquidity risk are presented in Table 4.10.

To achieve this objective, a null sub hypothesis, H02c, that bank usage has no significant effect on liquidity risk of commercial banks in Kenya was formulated. In Table 4.10 the coefficient of bank usage (β=1.55350, p=0.023<0.05) shows a positive statistically significant effect of bank usage on liquidity risk of commercial banks in Kenya. Therefore, the null hypothesis that bank usage has no significant effect on liquidity risk of commercial banks in Kenya was rejected at five per cent level of significance.
An increase in liquidity risk signifies decrease in financial stability. The finding, therefore, implies an increase in bank usage increases liquidity risk and hence decreases bank stability. Bank usage was measured using extension of credit to the private sector. The findings therefore, imply that an increase in the amount of credit extended to the private sector increases credit risk. It is expected that additional lending by a commercial bank would increase the proportion of loans to deposits, and therefore, increasing liquidity risk. Increased usage means that a commercial bank is able to lend more from every shilling deposited, therefore, exposing it to liquidity risk (Beck et al., 2006).

4.3.2.3 Financial inclusion and insolvency risk of commercial banks in Kenya

The following null hypotheses were tested:

**H₀₃ₐ**: Bank availability has no significant effect on insolvency risk of commercial banks in Kenya.

**H₀₃₉**: Bank accessibility has no significant effect on insolvency risk of commercial banks in Kenya.

**H₀₃ₑ**: Bank usage has no significant effect on insolvency risk of commercial banks in Kenya.

This section tests the hypotheses with respect to Insolvency risk. The estimates are reported in Table 4.11.
Table 4.11: Effect of Financial Inclusion on Insolvency Risk

<table>
<thead>
<tr>
<th>Financial inclusion</th>
<th>Coef.</th>
<th>Std. Err.</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bank Availability</td>
<td>1.42733</td>
<td>0.773144</td>
<td>18.46</td>
<td>0.000</td>
</tr>
<tr>
<td>Bank Accessibility</td>
<td>-0.0313284</td>
<td>0.0050227</td>
<td>-6.24</td>
<td>0.000</td>
</tr>
<tr>
<td>Bank Usage</td>
<td>-0.1656067</td>
<td>0.0261478</td>
<td>-6.33</td>
<td>0.000</td>
</tr>
<tr>
<td>_cons</td>
<td>0.8118455</td>
<td>0.6129987</td>
<td>1.32</td>
<td>0.186</td>
</tr>
</tbody>
</table>

Observations 369

R-sq: within = 0.7355
F statistics = 77.98
Prob > chi2 = 0.000

Source: Study Data (2017)

Based on the analysis in Table 4.11 the following model was formulated.

\[
\text{Insolvency Risk} = -0.8118455 + 1.42733 \times (\text{BAV}) + -0.0313284 \times (\text{BAC}) - 0.1656067 \times (\text{BUS}) + \varepsilon \]

Where:

BAV = Bank Availability

BAC = Bank Accessibility

BUS = Bank Usage

\( \varepsilon_{it} \) = error term

The results in Table 4.11 indicate an R squared of 0.7355. This implies that the financial inclusion indicators (bank availability, bank accessibility and bank usage) had high explanatory power on insolvency risk of commercial banks in Kenya. The F statistics value was 77.98 with a p value of 0.000 which is less than 0.05. This indicates that financial inclusion had significant effects on insolvency risk of commercial banks in Kenya.
**H_{03a}: Bank availability has no significant effect on insolvency risk of commercial banks in Kenya.**

The first objective of the study sought to establish the effect of bank availability on the stability of commercial banks in Kenya. When stability was measured using insolvency risk the findings of this analysis are presented in Table 4.11.

To achieve this objective a null sub hypothesis, \( H_{03a} \), that bank availability has no significant affect on insolvency risk of commercial banks in Kenya was formulated. In Table 4.11 the coefficient of bank availability (\( \beta = 1.42733, p = 0.000 < 0.05 \)) shows a positive statistically significant effect of bank availability on insolvency risk. Therefore, the null hypothesis that bank availability has no significant effect on insolvency risk of commercial banks in Kenya was rejected at five per cent level of significance. The coefficient of positive 1.427 indicates a decrease in insolvency risk of commercial banks.

Increase in availability means that customers have more channels to interact with the commercial banks. Frequent interactions with commercial banks through loan, deposit and mobile accounts means more transaction fees, more loans and more deposit mobilization for the commercial banks and hence more income. The earned transaction fees boost the commercial banks profitability, and therefore, the ROA hence a higher Z-score and better solvency. These results are supported by Kalunda, (2015) who established that financial stability increases with high profitability and capitalization levels. These improvements are brought about by financial inclusion.
**H03b: Bank accessibility has no significant effect on insolvency risk of commercial banks in Kenya.**

The second objective of the study sought to establish the effect of bank accessibility on the stability of commercial banks in Kenya. The findings summarizing this analysis with respect to insolvency risk are presented in Table 4.11.

To achieve this objective a null sub hypothesis, **H03b** that bank accessibility has no significant effect on insolvency risk of commercial banks was formulated. In Table 4.11 the coefficient of bank accessibility (β=-0.0313284, p=0.000<0.05) shows a negative statistically significant effect of bank accessibility on insolvency risk. Therefore, the null sub hypothesis that bank accessibility has no significant effect on insolvency risk of commercial banks in Kenya was rejected at five per cent level of significance. The coefficient of negative -0.0313 implies an increase in insolvency risk.

Since an increase in insolvency risk is a sign of instability, the finding imply that an increase in bank accessibility decreases bank stability. Bank accessibility was measured by the number of bank accounts per 100 people. The findings therefore, indicate an increase in the number of bank accounts per 100 people increases bank instability with respect to the Z-score. The increase in the number of banked individuals means that bank facilities in terms of branches and ATM networks have to be expanded rapidly increasing the operating costs and hence reducing the profitability to the commercial banks.
**H03c**: Bank usage has no significant effect on insolvency risk of commercial banks in Kenya.

The third objective of the study sought to establish the effect of bank usage on the stability of commercial banks in Kenya. The findings summarizing this effect with respect to the insolvency risk (Z-score) are presented in Table 4.11.

To achieve this objective a null sub hypothesis, $H_{03c}$, that bank usage has no significant effect on insolvency risk of commercial banks in Kenya was formulated. In Table 4.11 the coefficient of bank usage ($\beta=-0.1656067$, $p=0.000<0.05$) shows a negative statistically significant effect of bank usage on insolvency risk. Therefore, the null sub hypothesis that bank usage has no significant effect on insolvency risk of commercial banks in Kenya was rejected at five per cent level of significance. The coefficient was negative -0.166 which indicates an increase in insolvency risk.

An increase in the insolvency risk (Z-score) signifies bank instability. The findings, therefore, means that an increase in bank usage decreases bank stability. Bank usage was measured by extension of credit to the private sector. The findings therefore, imply that an increase in the amount of credit extended to the private sector increases bank instability. This finding is contrary to the expectations. It is expected that additional lending by a commercial bank would increase the banks profit margins from interest income. However, this appears not to be the case.

It is noteworthy that lending of money has two components: the income and the cost components. When the costs component exceeds the income component losses,
and therefore, reductions in the Z-score are bound to occur meaning a reduction in insolvency risk. The findings therefore, imply that increased usage may be causing more costs than interest income generated from lending to the private sector. An inspection of the industry reveals that this could be the case since the most profitable banks rely on lending to the government and non-funded income rather than interest income from the loans to shore up their profitability, and therefore, insolvency risk.

4.3.3 Moderating Effect of Bank Operating Environment on the relationship between Financial Inclusion and Stability of Commercial Banks in Kenya.

The study tested the following null hypotheses to establish the moderation effect of bank operating environment on relationship between financial inclusion and financial stability of commercial banks in Kenya. To test this hypothesis, the researcher adopted a three step procedure as specified by Baron and Kenny (1986). The first step entailed determining the effect of financial inclusion which was measured using the Index of Financial Inclusion (IFI) on financial stability of commercial banks in Kenya. The regression results were discussed earlier in Table 4.12. Bank stability was represented by three measures namely credit risk, liquidity risk and insolvency risk. Bank operating environment was measured using Annual Inflation Rate annual GDP growth rate.
4.3.3.1 Bank Operating Environment and the relationship between Financial Inclusion and Credit Risk.

The following null hypotheses were tested:

**H₀₄ᵃ:** Inflation rate has no significant moderating effect on the relationship between financial inclusion and credit risk.

**H₀₄ᵈ:** GDP growth rate has no significant moderating effect on the relationship between financial inclusion and credit risk.

In order to establish the statistical significance of the hypothesised relationships, multiple linear regression was conducted at 95 percent confidence level (α=0.05).

**Table 4.12: Effect of Financial Inclusion on Stability of Commercial Bank**

<table>
<thead>
<tr>
<th></th>
<th>Model 1 (Credit Risk)</th>
<th>Model 2 (Liquidity Risk)</th>
<th>Model 3 (Insolvency Risk)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coeff. (p-value)</td>
<td>Coeff. (p-value)</td>
<td>Coeff. (p-value)</td>
</tr>
<tr>
<td>Constant</td>
<td>11.4089 (0.000)</td>
<td>-5.16328 (0.001)</td>
<td>12.68399 (0.000)</td>
</tr>
<tr>
<td>IFI</td>
<td>-5.16174 (0.000)</td>
<td>9.52426 (0.046)</td>
<td>-3.66629 (0.002)</td>
</tr>
<tr>
<td>R-Squared</td>
<td>0.7495</td>
<td>0.76011</td>
<td>0.637</td>
</tr>
<tr>
<td>F stat. (p-value)</td>
<td>81.28 (0.000)</td>
<td>83.54 (0.0059)</td>
<td>79.47 (0.0023)</td>
</tr>
</tbody>
</table>

**Source:** Study Data (2017)

**Where:**

**IFI=Index of Financial Inclusion**

The results in Table 4.12 indicate R-squared of 0.7495, 0.76011 and 0.637 for credit risk, liquidity risk and insolvency risk respectively. This implies that financial inclusion had high explanatory power on credit risk, liquidity risk and insolvency risk respectively as it accounted for 74.95 percent of credit risk, 76.011 percent of liquidity risk and 63.47 percent of insolvency risk of commercial banks in Kenya. This indicates that financial inclusion can adequately explain variation in stability of commercial banks in Kenya.
The F statistics value was 81.28, 83.54 and 79.47 for all the three models with a p value of 0.000, 0.0059 and 0.0023 which was less than 0.05. This indicates that financial inclusion was significant in explaining variations in stability of commercial banks in Kenya.

The coefficient of IFI (β=-5.16174, p=0.000<0.05) for credit risk, (β= 9.52426, p=0.046<0.05) for liquidity risk and (β= -3.66629, p=0.002<0.05) for insolvency risk, shows a statistically significant relationship between financial inclusion and all the measures of stability of commercial banks in Kenya. The findings implied that a unit increase of financial inclusion would lead to 5.16174 decreases in credit risk, 9.52426 increases in liquidity risk and finally 3.66629 decreases in insolvency risk of commercial banks in Kenya. Based on the result in table 4.19, the following model 3.8a, b and c were formulated

Credit Risk=11.4089- 5.16174*IFI+ε_{it} ..................................................3.8a

Liquidity Risk=-5.16328 +9.52426*IFI+ε_{it} ..................................................3.8b

Insolvency Risk=12.68399-3.66629*IFI+ε_{it} ..................................................3.8c

Where

IFI= Index of Financial Inclusion

In the second step, Inflation rate and GDP growth rate were introduced as explanatory variables. The moderator Bank operating environment was measured using Annual Inflation Rate and Annual GDP Growth Rate. The regression results are presented in Table 4.13.
Table 4.13: Effect of Inflation Rate and GDP growth rate as Explanatory Variables on Credit Risk

<table>
<thead>
<tr>
<th>Credit risk</th>
<th>Coef.</th>
<th>Std. Err.</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>IFI</td>
<td>-5.16747</td>
<td>0.20851</td>
<td>-24.75</td>
<td>0.008</td>
</tr>
<tr>
<td>Inflation</td>
<td>-0.00977</td>
<td>0.001191</td>
<td>-8.21</td>
<td>0.360</td>
</tr>
<tr>
<td>GDP growth rate</td>
<td>-0.01046</td>
<td>0.001919</td>
<td>-5.45</td>
<td>0.403</td>
</tr>
<tr>
<td>_cons</td>
<td>0.277066</td>
<td>0.034188</td>
<td>8.1</td>
<td>0.000</td>
</tr>
</tbody>
</table>

R-sq: within = 0.6819  
F statistic= 86.93  
p= 0.0005

Source: Study Data (2017)

The result in Table 4.13 indicates an R squared of 0.6819. This implies that financial inclusion, inflation rate and GDP growth rate had high explanatory power on credit risk as they accounted for 68.19 percent of credit risk of commercial banks in Kenya. This indicates that a combination of these variables can adequately explain variation in credit risk.

The F statistics value was 86.93 with a p value of 0.0005 which is less than 0.05. This indicates that financial inclusion and moderator variables namely Inflation rate and GDP growth rate were jointly significant in explaining variations in credit risk and that financial inclusion, Inflation rate and GDP growth rate jointly contributes significantly to changes in the credit risk of commercial banks in Kenya.

The coefficient of IFI (β=-5.16747, p=0.008, >0.05) shows a negative statistically significant relationship between IFI and stability (Credit Risk) of commercial banks in Kenya. The regression coefficient of -5.16747 obtained in this case implies that a unit increase of the financial inclusion would lead to 5.16747 decreases in credit risk, hence stability.
The coefficient of inflation ($\beta=-0.00977$, $p=0.360>0.05$) shows a negative statistically insignificant relationship between inflation rate and Credit Risk of commercial banks in Kenya. This indicates that inflation rate does not directly affect credit risk and thus can moderate the relationship between financial inclusion and credit risk.

The coefficient of GDP growth rate at ($\beta=-0.01046$, $p=0.403>0.05$) shows a negative statistically insignificant relationship between GDP growth rate and credit risk. This indicates that GDP growth rate does not directly affect credit risk and thus can moderate the relationship between financial inclusion and credit risk. The regression coefficient of 0.277066 under constant indicates the value of credit risk when financial inclusion, Inflation rate and GDP growth rate were zero. Based on the result in Table 4.13, the following model 3.5a was formulated

$$
\text{Credit Risk}=0.277066-5.16747*\text{IFI}_{it}-0.00977*\text{INF}_{it}-0.01046\text{GDP}_{it}+\epsilon_{it}.............3.5a
$$

Where:

$\text{IFI}_{i}$ = The Index of Financial Inclusion rate of Bank $i$ at time $t$

$\text{INF}_{i}$ = Inflation rate of Bank $i$ at time $t$

$\text{GDP}_{i}$ = GDP Growth rate of Bank $i$ at time $t$

Cons = constant

In the third step, Inflation rate and GDP growth rate were introduced as moderator variables. The regression results are presented in Table 4.14.
Table 4.14: Effect of Inflation rate and GDP growth rate as Moderator

Variables between Financial Inclusion and Credit Risk

<table>
<thead>
<tr>
<th>Credit Risk</th>
<th>Coef.</th>
<th>Std. Err.</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>IFI</td>
<td>-5.16747</td>
<td>0.20851</td>
<td>-24.75</td>
<td>0.000</td>
</tr>
<tr>
<td>Inflation</td>
<td>-0.0185704</td>
<td>0.008517</td>
<td>-2.18</td>
<td>0.029</td>
</tr>
<tr>
<td>GDP growth</td>
<td>-0.09663</td>
<td>0.028927</td>
<td>-3.34</td>
<td>0.032</td>
</tr>
<tr>
<td>IFI*Inflation</td>
<td>-0.040645</td>
<td>0.090696</td>
<td>-4.48</td>
<td>0.009</td>
</tr>
<tr>
<td>IFI*GDP growth rate</td>
<td>-0.94854</td>
<td>0.28704</td>
<td>-1.30</td>
<td>0.001</td>
</tr>
<tr>
<td>_cons</td>
<td>0.255286</td>
<td>0.084022</td>
<td>3.04</td>
<td>0.002</td>
</tr>
</tbody>
</table>

R-sq: within = 0.6865
F statistic = 89.24
P = 0.0000

Source: Study Data (2017)

The result in Table 4.14 indicates an R squared of 0.6865. This implies that when inflation rate and GDP growth rate were introduced as moderators, the model had high explanatory power on credit risk as they accounted for 68.65 percent of credit risk of commercial banks in Kenya. This means that a combination financial inclusion and Inflation rate and GDP growth rate as moderators can adequately explain variation in credit risk.

The F statistics value was 89.24 with a p value of 0.000 which is less than 0.05. This indicates that financial inclusion and Inflation rate and GDP growth rate as moderators were jointly significant in explaining variations in credit risk and that financial inclusion, Inflation rate and GDP growth rate jointly contributes significantly to changes in the credit risk of commercial banks in Kenya.
The coefficient financial inclusion at (β=-5.16747, p=0.000, <0.05) shows a statistically significant relationship between financial inclusion and credit risk of commercial banks. The regression coefficient of -5.16747 obtained in this case implies that a unit increase of the financial inclusion would lead to 5.16747 decreases in credit risk.

The coefficient of Inflation rate at (β=-0.0185704, p=0.029, <0.05) shows a statistically significant relationship between inflation rate and credit risk of commercial banks. This indicates that inflation rate does directly affect the credit risk of commercial banks and thus can moderate the relationship between financial inclusion and credit risk. The negative coefficient of -0.0185704 obtained in this case implies that a unit increase in Inflation rate would lead to 0.0185704 decreases in credit risk.

The coefficient of GDP growth rate at (β= -0.09663, p=0.032, <0.05) shows a statistically significant relationship between GDP growth rate and credit risk of commercial banks. This indicates that GDP growth rate does directly affect the credit risk of commercial banks and thus can moderate the relationship between financial inclusion and credit risk. The negative coefficient of -0.09663 obtained in this case implies that a unit increase of the GDP growth rate would lead to 0.09663 decreases in credit risk.

Table 4.14 indicates that when financial inclusion and Inflation rate are interacted, there is a negative and significant relationship and when financial inclusion and
GDP growth rate are interacted, there is a negative and significant relationship. The significant interactions imply that Inflation rate and GDP growth rate affect the credit risk of commercial financial inclusion.

The regression coefficient of 0.255286 under constant indicates the value of credit risk when financial inclusion, Inflation rate and GDP growth rate as moderator variable were zero. Based on the result in Table 4.14, the following model 3.5b was formulated

\[
\text{Credit Risk} = 0.255286 - 5.16747*\text{IFI}_{it} - 0.0185704*\text{INF}_{it} - 0.09663\text{GDP}_{it} - 0.040645 \text{IFI*INF} - 0.94854 \text{IFI*GDP} + \epsilon_{it} \]

Where:

\(\text{IFI}\) = The Index of Financial Inclusion rate of Bank \(i\) at time \(t\)

\(\text{INF}\) = Inflation rate of Bank \(i\) at time \(t\)

\(\text{GDP}\) = GDP Growth rate of Bank \(i\) at time \(t\)

\(\text{Cons}\) = Constants

A summary of the tests for moderation effect of Inflation rate and GDP growth rate on the relationship between financial inclusion and credit risk as presented by model 3.5a and 3.5b formulated in the three respective steps.
Table 4.15 Summary of Results of moderating effect of Inflation rate and GDP growth rate on Financial Inclusion and Credit Risk

<table>
<thead>
<tr>
<th>Analysis</th>
<th>Coefficients</th>
<th>Results</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step one:</strong> Equation 3.5a Inflation and GDP as an independent variable</td>
<td>Fstat 86.93 (0.0005)</td>
<td>Significant</td>
<td>Model is fit</td>
</tr>
<tr>
<td>Inflation rate</td>
<td>-0.0098(0.360)</td>
<td>Insignificant</td>
<td>No direct effect</td>
</tr>
<tr>
<td>GDP growth rate</td>
<td>-0.0110(0.403)</td>
<td>Insignificant</td>
<td>No direct effect</td>
</tr>
<tr>
<td><strong>Step two:</strong> Equation 3.5b Inflation rate and GDP as a moderator variable</td>
<td>Fstat 89.24(0.00)</td>
<td>Significant</td>
<td>Model is fit</td>
</tr>
<tr>
<td>Inflation rate</td>
<td>-0.019(0.029)</td>
<td>Significant</td>
<td>Moderates</td>
</tr>
<tr>
<td>GDP growth rate</td>
<td>-0.097(0.032)</td>
<td>Significant</td>
<td>Moderates</td>
</tr>
<tr>
<td>IFI*Inflation rate</td>
<td>-0.04(0.009)</td>
<td>Significant</td>
<td>Moderates</td>
</tr>
<tr>
<td>IFI*GDP growth</td>
<td>-0.95(0.001)</td>
<td>Significant</td>
<td>Moderates</td>
</tr>
</tbody>
</table>

Source: Study Data (2017)

The result indicated in the summary above are adopted from the decision making criteria matrix as indicated by Table 3.2 the study rejected sub hypothesis H₄ₐ at α=0.05 and concluded that Inflation rate and GDP growth rate moderate the relationship between financial inclusion and credit risk of commercial banks in Kenya.

4.3.3.2 Bank Operating Environment and the relationship between Financial Inclusion and Liquidity Risk.

The following null hypotheses were tested:

H₀₄₇: Inflation Rate has no significant moderation effect on the relationship between financial inclusion and liquidity risk.
H_{04e}. GDP growth rate has no significant moderating effect on the relationship between financial inclusion and liquidity risk.

To test these hypotheses, the researcher adopted a three step procedure as specified by Baron and Kenny (1986). The first step entailed determining the effect of financial inclusion which was measured using the Index of Financial Inclusion (IFI) on financial stability (Liquidity risk risk) of commercial banks. The regression results were presented and discussed earlier in Table 4.12. The moderator Bank operating environment was measured using annual inflation rate and annual GDP growth rate.

In the second step, Inflation rate and GDP growth rate were introduced as explanatory variables. The regression results are presented in Table 4.16.

Table 4.16: Effect of Inflation rate and GDP growth rate as Explanatory Variables on Liquidity Risk

<table>
<thead>
<tr>
<th>liquidity Risk</th>
<th>Coef.</th>
<th>Std. Err.</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>IFI</td>
<td>9.52426</td>
<td>1.09100</td>
<td>8.73</td>
<td>0.008</td>
</tr>
<tr>
<td>Inflation</td>
<td>0.550576</td>
<td>0.09825</td>
<td>8.38</td>
<td>0.576</td>
</tr>
<tr>
<td>GDP growth rate</td>
<td>-0.22960</td>
<td>0.15335</td>
<td>-1.50</td>
<td>0.394</td>
</tr>
<tr>
<td>_cons</td>
<td>0.02592</td>
<td>0.421317</td>
<td>-0.06</td>
<td>0.019</td>
</tr>
</tbody>
</table>

R-sq: within = 0.640  
F statistic = 0.7911  
p = 0.0000

Source: Study Data (2017)
The results in Table 4.16 indicate an R squared of 0.640. This implies that financial inclusion, inflation rate and GDP growth rate had high explanatory power on Liquidity risk as they accounted for 64.0 percent of Liquidity risk of commercial banks in Kenya. This indicates that a combination of these variables can adequately explain variation in credit risk.

The F statistics value was 0.7911 with a p value of 0.000 which is less than 0.05. This indicates that financial inclusion and moderator variables namely Inflation rate and GDP growth rate were jointly significant in explaining variations in liquidity risk and that financial inclusion, Inflation rate and GDP growth rate jointly contributes significantly to changes in the liquidity risk of commercial banks in Kenya.

The coefficient of IFI (β=9.52426, p=0.008, >0.05) shows a positive statistically significant relationship between IFI and liquidity risk of commercial banks in Kenya. The regression coefficient of 9.52426 obtained in this case implies that a unit increase of the financial inclusion would lead to 9.52426 increases in liquidity risk, hence stability.

The coefficient of inflation (β=0.55057, p=0.567 > 0.05) shows a positive statistically insignificant relationship between inflation rate and liquidity risk of commercial banks in Kenya. This indicates that inflation rate does not directly affect liquidity risk and thus can moderate the relationship between financial inclusion and credit risk.
The coefficient of GDP growth rate at ($\beta$=-0.2296, $p=0.394>0.05$) shows a negative statistically insignificant relationship between GDP growth rate and liquidity risk. This indicates that GDP growth rate does not directly affect liquidity risk and thus can moderate the relationship between financial inclusion and liquidity risk. The regression coefficient of 0.02592 under constant indicates the value of liquidity risk when financial inclusion, Inflation rate and GDP growth rate were zero. Based on the result in Table 4.17, the following model 3.6a was formulated

$$\text{Liquidity Risk}=0.02592+9.52426*\text{IFI}_t+0.55057*\text{INF}_t-0.2296\text{GDP}_t+\epsilon_t....3.6a$$

Where:

$\text{IFI}_t$ = The Index of Financial Inclusion rate of Bank $i$ at time $t$

$\text{INF}_t$ = Inflation rate of Bank $i$ at time $t$

$\text{GDP}_t$ = GDP Growth rate of Bank $i$ at time $t$

Cons = constants

In the third step, GDP growth rate and inflation were introduced as moderator variables. The regression results are presented in Table 4.17

**Table 4.17: Effect of Inflation rate and GDP growth rate as Moderator**

<table>
<thead>
<tr>
<th>Liquidity risk</th>
<th>Coef.</th>
<th>Std. Err.</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>IFI</td>
<td>9.52426</td>
<td>1.09100</td>
<td>8.73</td>
<td>0.000</td>
</tr>
<tr>
<td>Inflation</td>
<td>0.149962</td>
<td>0.024923</td>
<td>6.02</td>
<td>0.000</td>
</tr>
<tr>
<td>GDP growth rate</td>
<td>-0.412976</td>
<td>0.149937</td>
<td>2.75</td>
<td>0.004</td>
</tr>
<tr>
<td>IFI*Inflation</td>
<td>-0.81658</td>
<td>0.48805</td>
<td>-1.67</td>
<td>0.006</td>
</tr>
<tr>
<td>IFI*GDP growth rate</td>
<td>-5.87299</td>
<td>1.20599</td>
<td>-4.78</td>
<td>0.001</td>
</tr>
<tr>
<td>_cons</td>
<td>-0.21251</td>
<td>1.194666</td>
<td>-0.18</td>
<td>0.009</td>
</tr>
</tbody>
</table>

R-sq: within = 0.7646
F statistic= 128.15
p = 0.0000

**Source: Study Data (2017)**
The result in Table 4.17 indicates an R squared of 0.7846. This implies that when inflation rate and GDP growth rate were introduced as moderators, the model had high explanatory power on liquidity risk as they accounted for 78.46 percent of liquidity risk of commercial banks in Kenya. This means that a combination financial inclusion and Inflation rate and GDP growth rate as moderators can adequately explain variation in liquidity risk.

The F statistics value was 128.15 with a p value of 0.000 which is less than 0.05. This indicates that financial inclusion and Inflation rate and GDP growth rate as moderators were jointly significant in explaining variations in liquidity risk and that financial inclusion, Inflation rate and GDP growth rate jointly contributes significantly to changes in the liquidity risk of commercial banks in Kenya.

The coefficient financial inclusion at (β=9.52426, p=0.000,<0.05) shows a statistically significant relationship between financial inclusion and liquidity risk of commercial banks. The regression coefficient of 9.52426 obtained in this case implies that a unit increase of the financial inclusion would lead to 9.52426 increases in liquidity risk.

The coefficient of Inflation rate at (β=0.149962, p=0.000, <0.05) shows a statistically significant relationship between inflation rate and liquidity risk of commercial banks. This indicates that inflation rate does directly affect the liquidity risk of commercial banks and thus can moderate the relationship between financial inclusion and liquidity risk. The coefficient of 0.149962 obtained in this case
implies that a unit increase in Inflation rate would lead to 0.149962 increases in liquidity risk.

The coefficient of GDP growth rate at (β=-0.412976, p=0.004, <0.05) shows a statistically significant relationship between GDP growth rate and liquidity risk of commercial banks. This indicates that GDP growth rate does directly affect the liquidity risk of commercial banks and thus can moderate the relationship between financial inclusion and liquidity risk. The negative coefficient of −0.412976 obtained in this case implies that a unit increase of the GDP growth rate would lead to 0.412976 decreases in liquidity risk.

Table 4.17 indicates that when financial inclusion and Inflation rate are interacted, there is a positive and significant relationship and when financial inclusion and GDP growth rate are interacted, there is a negative and significant relationship. The significant interactions imply that Inflation rate and GDP growth rate affect the liquidity risk of commercial financial inclusion.

The regression coefficient of -0.21251 under constant indicates the value of liquidity risk when financial inclusion, Inflation rate and GDP growth rate as moderator variable were zero. Based on the result in Table 4.17, the following model 3.6b was formulated

\[
\text{Liquidity Risk} = -0.21251 + 9.52426 \times \text{IFI}_{it} + 0.149962 \times \text{INF}_{it} - 0.412976 \times \text{GDP}_{it} - 0.81658 \times \text{IFI} \times \text{INF} - 5.87299 \times \text{IFI} \times \text{GDP} + \varepsilon_{it}
\] 3.6b
Where:

\( \text{IFI} \) = The Index of Financial Inclusion rate of Bank \( i \) at time \( t \)

\( \text{INF} \) = Inflation rate of Bank \( i \) at time \( t \)

\( \text{GDP} \) = GDP Growth rate of Bank \( i \) at time \( t \)

\( \text{Cons} \) = constants

A summary of the tests for moderation effect of Inflation rate and GDP growth rate on the relationship between financial inclusion and liquidity risk as presented by model 3.6a and 3.6b formulated in the three respective steps.

**Table 4.18 Summary of Results of Moderating Effect of Inflation rate and GDP growth rate on Financial Inclusion and Liquidity Risk**

<table>
<thead>
<tr>
<th>Analysis</th>
<th>Coefficients</th>
<th>Results</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial inclusion and Liquidity risk</td>
<td><strong>Step one:</strong> Equation 3.6a Inflation and GDP as an independent variable</td>
<td>F stat 79.11 (0.0005)</td>
<td>Significant</td>
</tr>
<tr>
<td></td>
<td>Inflation rate 0.5506 (0.576)</td>
<td>Insignificant</td>
<td>No direct effect</td>
</tr>
<tr>
<td></td>
<td>GDP growth rate -0.2296 (0.394)</td>
<td>Insignificant</td>
<td>No direct effect</td>
</tr>
<tr>
<td>Financial inclusion and Liquidity risk</td>
<td><strong>Step two:</strong> Equation 3.6b Inflation rate and GDP as a moderator variable</td>
<td>Fstat 128.15 (0.00)</td>
<td>Significant</td>
</tr>
<tr>
<td></td>
<td>Inflation rate 0.1499 (0.000)</td>
<td>Significant</td>
<td>Moderates</td>
</tr>
<tr>
<td></td>
<td>GDP growth rate -0.4129 (0.004)</td>
<td>Significant</td>
<td>Moderates</td>
</tr>
<tr>
<td></td>
<td>IFI*Inflation rate -0.8165 (0.006)</td>
<td>Significant</td>
<td>Moderates</td>
</tr>
<tr>
<td></td>
<td>IFI*GDP growth -5.8729 (0.001)</td>
<td>Significant</td>
<td>Moderates</td>
</tr>
</tbody>
</table>

**Source:** Study Data (2017)

The result indicated in the summary above are adopted from the decision making criteria matrix as indicated by Table 3.2 the study rejected sub hypothesis \( H_{4b} \) at.
α=0.05 and concluded that Inflation rate and GDP growth rate moderate the relationship between financial inclusion and liquidity risk of commercial banks in Kenya.

4.3.3.3 Bank Operating Environment and the relationship between Financial Inclusion and Insolvency risk

The following null hypotheses were tested:

\( H_{04c} \): Inflation rate has no significant moderating effect on the relationship between financial inclusion and insolvency risk

\( H_{04f} \): GDP growth rate has no significant moderating effect on the relationship between financial inclusion and insolvency risk

To test this hypothesis, the researcher adopted a three step procedure as specified by Baron and Kenny (1986). The first step entailed determining the effect of financial inclusion which was measured using the Index of Financial Inclusion (IFI) on financial stability (credit risk) of commercial banks. The regression results were discussed earlier and presented in Table 4.12.

In the second step, Inflation rate and GDP growth rate were introduced as explanatory variable. The regression results are presented in Table 4.19.
Table 4.19: Effect of Inflation rate and GDP growth rate as Explanatory Variables on Insolvency Risk

<table>
<thead>
<tr>
<th>Insolvency risk</th>
<th>Coef.</th>
<th>Std. Err.</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>IFI</td>
<td>-3.66629</td>
<td>1.10946</td>
<td>-3.30</td>
<td>0.000</td>
</tr>
<tr>
<td>inflation</td>
<td>-5.16328</td>
<td>1.07786</td>
<td>-4.79</td>
<td>0.355</td>
</tr>
<tr>
<td>GDP growth rate</td>
<td>-5.88550</td>
<td>1.6396</td>
<td>-3.57</td>
<td>0.001</td>
</tr>
<tr>
<td>_cons</td>
<td>1.60609</td>
<td>3.8082</td>
<td>3.05</td>
<td>0.000</td>
</tr>
</tbody>
</table>

R-sq: within = 0.6459
F statistic = 0.7753
Prob > chi2 = 0.0000

*Source: Study Data (2017)*

The result in Table 4.19 indicates an R squared of 0.6459. This implies that financial inclusion, inflation rate and GDP growth rate had high explanatory power on insolvency risk as they accounted for 64.59 percent of insolvency risk of commercial banks in Kenya. This indicates that a combination of these variables can adequately explain variation in insolvency risk.

The F statistics value was 0.7753 with a p value of 0.000 which is less than 0.05. This indicates that financial inclusion and moderator variables namely Inflation rate and GDP growth rate were jointly significant in explaining variations in insolvency risk and that financial inclusion, Inflation rate and GDP growth rate jointly contributes significantly to changes in the insolvency risk of commercial banks in Kenya.

The coefficient of IFI ($\beta=-3.66629$, p=0.001, >0.05) shows a negative statistically significant relationship between IFI and insolvency risk of commercial banks in Kenya. The regression coefficient of -3.66629 obtained in this case implies that a
unit increase of the financial inclusion would lead to 3.66629 decreases in insolvency risk, hence stability.

The coefficient of inflation ($\beta=-5.163280$, $p=0.355>0.05$) shows a negative statistically insignificant relationship between inflation rate and insolvency risk of commercial banks in Kenya. This indicates that inflation rate does not directly affect insolvency risk and thus can moderate the relationship between financial inclusion and credit risk.

The coefficient of GDP growth rate at ($\beta=-5.88550$, $p=0.001>0.05$) shows a negative statistically significant relationship between GDP growth rate and insolvency risk. This indicates that GDP growth rate directly affect insolvency risk and thus cannot moderate but explain the relationship between financial inclusion and insolvency risk.

The regression coefficient of 1.60609 under constant indicates the value of insolvency risk when financial inclusion, Inflation rate and GDP growth rate were zero. Based on the result in Table 4.17, the following model 3.7a was formulated

$$\text{Insolvency Risk}=1.60609-3.6629*\text{IFI}_{it}-5.16328*\text{INF}_{it}-5.88550*\text{GDP}_{it}+\varepsilon_{it}$$

Where:

$\text{IFI}_i$ = The Index of Financial Inclusion rate of Bank $i$ at time $t$

$\text{INF}_i$ = Inflation rate of Bank $i$ at time $t$

$\text{GDP}_i$ = GDP Growth rate of Bank $i$ at time $t$

Cons = constants
In the third step, GDP growth rate and inflation were introduced as moderator variables. The regression results are presented in Table 4.20

**Table 4.20: Effect of Inflation rate and GDP growth rate as Moderator**

<table>
<thead>
<tr>
<th>Variables between Financial Inclusion and Insolvency Risk</th>
<th>Coef.</th>
<th>Std. Err.</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>IFI</td>
<td>-3.66629</td>
<td>1.10946</td>
<td>-3.30</td>
<td>0.001</td>
</tr>
<tr>
<td>inflation</td>
<td>-0.27817</td>
<td>0.09880</td>
<td>-2.82</td>
<td>0.005</td>
</tr>
<tr>
<td>GDP growth rate</td>
<td>1.301137</td>
<td>0.32984</td>
<td>3.94</td>
<td>0.004</td>
</tr>
<tr>
<td>IFI*Inflation</td>
<td>1.02266</td>
<td>0.48961</td>
<td>2.09</td>
<td>0.006</td>
</tr>
<tr>
<td>IFI*GDP growth rate</td>
<td>10.4194</td>
<td>6.74273</td>
<td>1.55</td>
<td>0.123</td>
</tr>
<tr>
<td>_cons</td>
<td>23.3861</td>
<td>3.82044</td>
<td>6.12</td>
<td>0.009</td>
</tr>
</tbody>
</table>

R-sq: within = 0.7446  
F statistic = 0.7815  
p = 0.0000

**Source: Study Data (2017)**

The result in Table 4.20 indicates an R squared of 0.7446. This implies that when inflation rate and GDP growth rate were introduced as moderators, the model had high explanatory power on insolvency risk as they accounted for 74.76 percent of insolvency risk of commercial banks in Kenya. This means that a combination of financial inclusion and Inflation rate and GDP growth rate as moderators can adequately explain variation in insolvency risk.

The F statistics value was 0.7815 with a p value of 0.000 which is less than 0.05. This indicates that financial inclusion and Inflation rate and GDP growth rate as moderators were jointly significant in explaining variations in insolvency risk and that financial inclusion, Inflation rate and GDP growth rate jointly contributes significantly to changes in the insolvency risk of commercial banks in Kenya.
The coefficient financial inclusion at ($\beta=-3.66629$, $p=0.001,<0.05$) shows a negative statistically significant relationship between financial inclusion and insolvency risk of commercial banks. The regression coefficient of -3.6629 obtained in this case implies that a unit increase of the financial inclusion would lead to 3.6629 decreases in insolvency risk.

The coefficient of Inflation rate at ($\beta=-0.27817$, $p=0.005,<0.05$) shows a negative statistically significant relationship between inflation rate and insolvency risk of commercial banks. This indicates that inflation rate does directly affect the insolvency risk of commercial banks and thus can moderate the relationship between financial inclusion and insolvency risk. The coefficient of -0.278170 obtained in this case implies that a unit increase in Inflation rate would lead to 0.278170 decreases in insolvency risk.

The coefficient of GDP growth rate at ($\beta=-1.301137$, $p=0.004,<0.05$) shows a positive statistically significant relationship between GDP growth rate and insolvency risk of commercial banks. This indicates that GDP growth rate is an explanatory variable and not a moderator since it has a direct affect on the insolvency risk of commercial banks. The positive coefficient of 1.3011370 obtained in this case implies that a unit increase of the GDP growth rate would lead to 1.3011370 increases in insolvency risk.

Table 4.20 indicates that when financial inclusion and Inflation rate are interacted, there is a positive and significant relationship and when financial inclusion and GDP
growth rate are interacted, there is a negative and significant relationship. The significant interactions imply that Inflation rate and GDP growth rate affect the insolvency risk of commercial banks through financial inclusion.

The regression coefficient of 23.3861 under constant indicates the value of insolvency risk when financial inclusion, Inflation rate and GDP growth rate as moderator variable were zero. Based on the result in Table 4.18, the following model 3.6b was formulated

\[
\text{Insolvency Risk} = 23.3861 - 3.66629 \times \text{IFI}_t - 0.27817 \times \text{INF}_t + 1.301137 \times \text{GDP}_t + 10.41194 \times \text{IFI}_t \times \text{INF}_t + 1.02266 \times \text{IFI}_t \times \text{GDP}_t + \epsilon_t
\]

Where:
- **IFI**: The Index of Financial Inclusion rate of Bank \(i\) at time \(t\)
- **INF**: Inflation rate of Bank \(i\) at time \(t\)
- **GDP**: GDP Growth rate of Bank \(i\) at time \(t\)
- **Cons**: constant

A summary of the tests for moderation effect of Inflation rate and GDP growth rate on the relationship between financial inclusion and Insolvency risk as presented by model 3.7a and 3.7b formulated in the three respective steps.
Table 4.21: Summary of Results of Moderating Effect of Inflation rate and GDP growth rate on Financial Inclusion and Insolvency Risk

<table>
<thead>
<tr>
<th>Analysis</th>
<th>Coefficients</th>
<th>Results</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial inclusion and Insolvency risk</td>
<td><strong>Step one:</strong> Equation 3.7a</td>
<td>Fstat 77.53 (0.0005)</td>
<td>Significant</td>
</tr>
<tr>
<td>Inflation and GDP as an independent variable</td>
<td>Inflation rate</td>
<td>-5.16328 (0.355)</td>
<td>Insignificant</td>
</tr>
<tr>
<td></td>
<td>GDP growth rate</td>
<td>-5.88550 (0.001)</td>
<td>Significant</td>
</tr>
<tr>
<td>Financial inclusion and Insolvency risk</td>
<td><strong>Step two:</strong> Equation 3.7b</td>
<td>Fstat 78.15 (0.00)</td>
<td>Significant</td>
</tr>
<tr>
<td>Inflation rate and GDP as a moderator variable</td>
<td>Inflation rate</td>
<td>-0.278 (0.005)</td>
<td>Significant</td>
</tr>
<tr>
<td></td>
<td>GDP growth rate</td>
<td>1.3011 (0.004)</td>
<td>Significant</td>
</tr>
<tr>
<td></td>
<td>IFI*Inflation rate</td>
<td>1.02266 (0.006)</td>
<td>Significant</td>
</tr>
<tr>
<td></td>
<td>IFI*GDP growth</td>
<td>10.4194 (0.123)</td>
<td>Insignificant</td>
</tr>
</tbody>
</table>

Source: Study Data (2017)

The result indicated in the summary above are adopted from the decision making criteria matrix as indicated by Table 3.2 the study rejected sub hypothesis H4b at α=0.05 For inflation rate and concluded that Inflation rate moderate the relationship between financial inclusion and insolvency risk of commercial banks in Kenya. However, the study failed to reject sub hypothesis H4b at α=0.05 for GDP rate and concluded that GDP growth rate does not moderate the relationship between financial inclusion and insolvency risk of commercial banks in Kenya.

The finding was consistent with those found by (Hoggarth et al., 1998; Amatus & Alizera, 2015) that Bank stability is affected by inflation depending on whether the inflation was anticipated or unexpected. When it is anticipated, it has a positive
implication on stability since interest rates are adjusted accordingly to match the inflation rate. This study established that the relationship between financial inclusion and stability is improved when inflation is anticipated.

On the other hand, Hoggarth, Milne and Wood (2012) observed that high and variable inflation may create loan planning and negotiation difficulties. However, unexpected inflation has an adverse implication on bank stability since it causes disruptions in expected cash flows creating challenges in loan repayments.

In terms of GDP, the findings are consistent with those of Kosmidou (2008) who established that GDP growth rate moderates the association between financial inclusion and stability of banks. Contrary, Tan and Floros (2012) suggests that growth in GDP adversely affects stability since it provides an environment for increasing competition and hence reduction in profitability by banks.

4.3.4 Bank Competitiveness and the relationship between Financial Inclusion and Stability of Commercial Banks in Kenya

The study tested the following null hypotheses to establish the mediating effect of bank competitiveness on the relationship between financial inclusion and financial stability of commercial banks in Kenya. The study had three measures of bank stability namely credit risk, liquidity risk, and insolvency risk. Therefore, three hypotheses were tested creating three models.
H_{05a}: Bank competitiveness has no significant mediating effect on the relationship between financial inclusion and credit risk of commercial banks in Kenya.

H_{05b}: Bank competitiveness has no significant mediating effect on the relationship between financial inclusion and liquidity risk of commercial banks in Kenya.

H_{05c}: Bank competitiveness has no significant mediating effect on the relationship between financial inclusion and Insolvency risk of commercial banks in Kenya.

In order to achieve this objective the study used the Baron and Kenny (1986) four step approach to test for mediation and to predict equations 3.8, 3.9, 3.10 and 3.11. The study first tested whether the paths between the independent variable and the dependent variable; between the independent variable and the mediator and the mediator and the dependent variable were statistically significant. By specifying a model 3.8 where the effect of the financial inclusion (independent variable) was regressed on financial stability measures.

The first step entailed determining the effect of financial inclusion which was measured using the Index of Financial Inclusion (IFI) on financial stability (credit risk, liquidity risk and insolvency risk) of commercial banks. The regression results were presented and discussed earlier in Table 4.12.

In the second step, Financial Inclusion measured by IFI (independent variable) was regressed on Bank competitiveness measured by HHI (dependent variable). The regression results are as shown Table 4.22.
Table 4.22: Effect of Financial Inclusion on Bank Competitiveness

<table>
<thead>
<tr>
<th></th>
<th>Coeff.</th>
<th>Std. Err.</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>IFI</td>
<td>0.01705</td>
<td>0.00184</td>
<td>9.28</td>
<td>0.004</td>
</tr>
<tr>
<td>Constant</td>
<td>0.076136</td>
<td>0.000181</td>
<td>40.45</td>
<td>0.000</td>
</tr>
</tbody>
</table>

R-sq: within = 0.412  
F-statistic = 0.8616  
P value = 0.0003

Source: Study Data (2017)

Where:

IFI= Index of Financial Inclusion  
HHI= Herfindahl-Hirschman Index (Bank Competitiveness)

The results in Table 4.22 indicate R squared of 0.412. This implies that financial inclusion had high explanatory power on bank competitiveness (HHI) as it accounted for 41.2 percent of bank competitiveness of commercial banks in Kenya. This indicates that financial inclusion can adequately explain variation in bank competitiveness of commercial banks in Kenya. The F statistics value was 0.8616 with a p value of 0.0003 which was less than 0.05. This indicates that financial inclusion was significant in explaining variations in bank competitiveness of commercial banks in Kenya.

The coefficient of financial inclusion (IFI) at (β= 0.01705, p=0.004, <0.05) shows a statistically significant relationship between Financial inclusion and bank competitiveness (HHI) of commercial banks in Kenya. The regression coefficient of 0.01705 obtained in this case implies that a unit increase of the financial inclusion would lead to 0.01705 increases in bank competitiveness.
The regression coefficient of 0.076136 under constant indicates the value of Bank competitiveness of commercial banks when financial inclusion was zero.

Based on the result in table 4.20, the following model 3.9 was formulated

**Bank Competitiveness = 0.076136 +0.017050*IFI + ε..........................3.9**

Where

IFI = Index of Financial Inclusion

HHI = Herfindahl Hirschman Index (Bank Competitiveness)

In step three, bank competitiveness (independent variable) was regressed on stability of commercial bank measures (dependent variable). The results are shown in Table 4.23.

**Table 4.23: Effect of Bank Competitiveness on Stability of commercial banks**

<table>
<thead>
<tr>
<th>Stability</th>
<th>Model 1 (Credit Risk)</th>
<th>Model 2 (Liquidity Risk)</th>
<th>Model 3 (Insolvency Risk)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.8110 (0.002)</td>
<td>12.15554 (0.001)</td>
<td>9.98670 (0.000)</td>
</tr>
<tr>
<td>HHI</td>
<td>127.926(0.004)</td>
<td>145.2104 (0.006)</td>
<td>-13.0558 (0.662)</td>
</tr>
<tr>
<td>R-Squared</td>
<td>0.43481</td>
<td>0.416</td>
<td>0.515</td>
</tr>
<tr>
<td>F statistic</td>
<td>65.20 (0.003)</td>
<td>56.03 (0.0024)</td>
<td>72.45 (0.0001)</td>
</tr>
</tbody>
</table>

**Source:** Study Data (2017)

The results in Table 4.23 indicate R squared of 0.43481, 0.416 and 0.515 for credit risk, liquidity risk and insolvency risk respectively. This implies that Bank competitiveness (HHI) had high explanatory power on credit risk, liquidity risk and insolvency risk respectively as it accounted for 43.481 percent of credit, 41.6 percent liquidity risk and 51.5 percent of insolvency risk of commercial banks in
Kenya. This indicates that bank competitiveness (HHI) can adequately explain variation in stability of commercial banks in Kenya.

The F statistics value was 65.20, 56.03 and 72.45 for all the three models with a p value of 0.003, 0.0024 and 0.0001 which was less than 0.05. This indicates that Bank competitiveness (HHI) was significant in explaining variations in stability of commercial banks in Kenya.

The coefficient of bank competitiveness (HHI) \( (\beta=127.9260, p=0.004<0.05) \), shows a statistically significant relationship between bank competitiveness and credit risk of commercial banks in Kenya \( (\beta=145.2104, p=0.006<0.05) \) shows a statistically significant relationship between bank competitiveness and liquidity risk of commercial banks in Kenya while \( (\beta=-13.0558, p=0.066>0.05) \), shows a statistically insignificant relationship between bank competitiveness and insolvency risk of commercial banks in Kenya.

The findings implied that a unit increase of bank competitiveness (HHI) would lead to 127.9260 increases in credit risk, 145.2104 increase in liquidity risk and finally unit 13.0558 increases in insolvency risk of commercial banks in Kenya. Based on the result in table 4.21, the following model 3.10a, b and c were formulated.

\[
\text{Credit Risk} = 0.8110 + 127.9260 \times \text{HHI} + \epsilon_{it} \tag{3.10a}
\]
\[
\text{Liquidity Risk} = 12.1554 + 145.2104 \times \text{HHI} + \epsilon_{it} \tag{3.10b}
\]
\[
\text{Insolvency Risk} = 9.98670 - 13.0558 \times \text{HHI} + \epsilon_{it} \tag{3.10c}
\]
Where

\[ \text{HHI} = \text{Herfindahl Hirschman Index (Bank Competitiveness)} \]

In the fourth step, financial inclusion (IFI) and Bank competitiveness (HHI) (independent variable) were regressed on stability measures (dependent variable). The results are shown in Table 4.24.

Table 4.24: Effect of Bank Competitiveness and Financial Inclusion on Stability of Commercial

<table>
<thead>
<tr>
<th>Stability</th>
<th>Model 1 (Credit Risk)</th>
<th>Model 2 (Liquidity Risk)</th>
<th>Model 3 (Insolvency Risk)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coeff. (p-value)</td>
<td>Coeff. (p-value)</td>
<td>Coeff. (p-value)</td>
</tr>
<tr>
<td>Con</td>
<td>(-7.592 (0.000))</td>
<td>(-106.818 (0.004))</td>
<td>(31.0405 (0.006))</td>
</tr>
<tr>
<td>IFI</td>
<td>(8.51010 (0.001))</td>
<td>(108.2332 (0.001))</td>
<td>(-17.3239 (0.096))</td>
</tr>
<tr>
<td>HHI</td>
<td>(283.03 (0.002))</td>
<td>(1582.46 (0.007))</td>
<td>(-274.582 (0.110))</td>
</tr>
<tr>
<td>R-Squared</td>
<td>(0.6492)</td>
<td>(0.612)</td>
<td>(0.755)</td>
</tr>
<tr>
<td>F statistic</td>
<td>(79.71 (0.001))</td>
<td>(80.32 (0.003))</td>
<td>(74.12 (0.000))</td>
</tr>
</tbody>
</table>

Source: Study Data (2017)

Where;

\[ \text{HHI} = \text{Herfindahl Hirschman Index (Bank Competitiveness)} \]

\[ \text{IFI} = \text{Index of Financial Inclusion} \]

The results in Table 4.24 indicate R squared of 0.649, 0.612 and 0.755 for credit risk, liquidity risk and insolvency risk models. This implies that financial inclusion (IFI) and Bank competitiveness (HHI) had high explanatory power on bank financial stability as it accounted for 64.9 percent of credit risk, 61.2 percent of liquidity risk and 75.5 percent of insolvency risk of commercial banks in Kenya.

This indicates that financial inclusion and bank competitiveness can adequately explain variation in stability of commercial banks in Kenya. The F statistics value
was 79.71, 80.32 and 74.12 for all the three models with a p value of 0.001, 0.003 and 0.000 respectively which was less than 0.05. This indicates that financial inclusion and bank competitiveness were statistically significant in explaining variations in stability of commercial banks in Kenya.

The coefficient of financial inclusion IFI (β=8.51010, p=0.001<0.05) for credit risk model shows a statistically significant relationship between financial inclusion and credit risk. The regression coefficient of 8.51010 obtained in this case implies that a unit increase of financial inclusion would lead to 8.51010 increases in credit risk commercial banks in Kenya.

The coefficient of financial inclusion IFI, (β=108.2332,p=0.001<0.05) for liquidity risk model shows a statistically significant relationship between financial inclusion and liquidity risk. The regression coefficient of 108.2332 obtained in this case implies that a unit increase of financial inclusion would lead to 108.2332 increases in liquidity risk commercial banks in Kenya.

The coefficient of financial inclusion IFI (β= -17.3239 p=0.096<0.05), shows a statistically significant relationship between financial inclusion and insolvency risk. The regression coefficient of -17.3239 obtained in this case implies that a unit increase of financial inclusion would lead to 17.3239 increases in insolvency risk of commercial banks in Kenya.
The coefficient of bank competitiveness HHI ($\beta=283.03 \ p=0.002<0.05$) for credit risk model showing a statistically significant relationship between bank competitiveness and credit risk, The regression coefficient of 283.03 obtained in this case implies that a unit increase of the bank competitiveness would lead to 283.03 increases in credit risk commercial banks in Kenya.

The coefficient of bank competitiveness HHI ($\beta=1582.46 \ p=0.007<0.05$) for liquidity risk model shows a statistically significant relationship between bank competitiveness and liquidity risk. The regression coefficient of 1582.46 obtained in this case implies that a unit increase of the bank competitiveness would lead to 1582 increases liquidity risk commercial banks in Kenya.

The coefficient of bank competitiveness HHI ($\beta=-274.582, \ p=0.110>0.05$) for insolvency risk model shows a statistically insignificant relationship between bank competitiveness and insolvency risk of commercial banks in Kenya. The regression coefficient of -274.582 obtained in this case implies that a unit increase of the bank competitiveness would lead to 274.582 increases insolvency risk commercial banks in Kenya.

The regression coefficient of 7.592 for credit risk model, 106.818 for liquidity risk model and 31.0405 for insolvency risk model under constant indicates the value of bank stability when financial inclusion and bank competitiveness were zero. Based on the result in table 4.22, the following model 3.11a, b and c were formulated.
Credit Risk = 7.592 + 8.510 * IFI_t + 283.03 * HHI_t + ε_t..........................3.11a

Liquidity Risk = 106.818 + 108.233 * IFI_t + 1582.46 * HHI_t + ε_t..........................3.11b

Insolvency Risk = 31.045 - 17.329 * IFI_t - 274.582 * HHI_t + ε_t..........................3.11c

Where

IFI = Index of Financial Inclusion

HHI = Herfindahl Hirschman Index (Bank Competitiveness)

Table 4.25 Summary Results of Mediating Effect of Bank Competitiveness on the relationship between Financial Inclusion and stability of commercial banks in Kenya

<table>
<thead>
<tr>
<th>Analysis of step 1</th>
<th>Dependent Variable</th>
<th>R²</th>
<th>Independent Variable Coefficients</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit Risk</td>
<td>74.95</td>
<td>IFI</td>
<td>-5.162 (0.000)</td>
<td>Significant</td>
</tr>
<tr>
<td>Liquidity Risk</td>
<td>76.011</td>
<td>IFI</td>
<td>9.524 (0.004)</td>
<td>Significant</td>
</tr>
<tr>
<td>Insolvency Risk</td>
<td>63.7</td>
<td>IFI</td>
<td>-3.666 (0.002)</td>
<td>Significant</td>
</tr>
</tbody>
</table>

| Analysis of step 2 | HHI                | IFI | 0.01705 (0.004)                  | Significant |

<table>
<thead>
<tr>
<th>Analysis of step 3</th>
<th>Dependent Variable</th>
<th>R²</th>
<th>Independent Variable Coefficients</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit Risk</td>
<td>43.48</td>
<td>IFI</td>
<td>127.926 (0.004)</td>
<td>Significant</td>
</tr>
<tr>
<td>Liquidity Risk</td>
<td>41.6</td>
<td>HHI</td>
<td>145.21 (0.006)</td>
<td>Significant</td>
</tr>
<tr>
<td>Insolvency Risk</td>
<td>51.5</td>
<td>HHI</td>
<td>-13.055 (0.662)</td>
<td>Insignificant</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analysis of step 4</th>
<th>Credit Risk</th>
<th>IFI</th>
<th>8.510 (0.001)</th>
<th>Significant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>HHI</td>
<td>283.03 (0.002)</td>
<td>Significant</td>
</tr>
<tr>
<td>Liquidity Risk</td>
<td>61.2</td>
<td>IFI</td>
<td>108.233 (0.001)</td>
<td>Significant</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HHI</td>
<td>1582.46 (0.001)</td>
<td>Significant</td>
</tr>
<tr>
<td>Insolvency Risk</td>
<td>75.5</td>
<td>IFI</td>
<td>-17.322 (0.096)</td>
<td>Insignificant</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HHI</td>
<td>-274.58 (0.110)</td>
<td>Insignificant</td>
</tr>
</tbody>
</table>

Source: Study Data (2017)

Following the Result in Table 4.25 above, the study rejected H_05a and H_05b at α=0.05 and concluded that Bank competitiveness partially mediates the relationship
between financial inclusion and credit risk and liquidity risk of commercial bank in Kenya. However, the study failed to reject $H_{05}$ at $\alpha=0.05$ and concluded that bank competitiveness does not mediate the relationship between financial inclusion and insolvency risk of commercial banks in Kenya.

The findings on bank competitiveness seem to agree with studies by (Beck et al., 2006; Ryan et al., 2014). They established that the level of competitiveness is instrumental in broadening financial access and also the inability to access financial services is directly linked to competitiveness in the market. Greater market competition also persuades banks to establish relationship lending leading to increased credit availability (Ariss, 2014). Boyd and Conolo (2005) established that due to competition, banks are forced to reduce loan rates assisting borrowers to repay loans and hence contributing to lower default risk and banks are less likely to suffer from Non-Performing loans.

The mediating results on insolvency risk agree with results by (Ariss, 2010) who concluded that financial inclusion leads to intense competition in the banking sector. He asserts that banks aggressiveness undermine stability largely due to increased risk-taking behavior associated with heightened competitive behavior among banks. Fiercer competition has been found to not only induces banks to acquire less information on borrowers, but also persuade them towards more risky and opaque clients obtained in the newly created markets by financial inclusion (Hauswald, 2006). This is consistent with information asymmetry theory. Therefore, stiff
interbank competition in a new unbanked area leads banks into building a portfolio of risky borrowers hence undermining their stability.

Table 4.26: Summary of Hypotheses Testing

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Results</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>H01 (a)</strong>: Bank availability has no significant effect on credit risk of commercial banks in Kenya.</td>
<td>p=0.000</td>
<td>Rejected H01 (a)</td>
</tr>
<tr>
<td><strong>H01 (b)</strong>: Bank accessibility has no significant effect on credit risk of commercial banks in Kenya.</td>
<td>p=0.000</td>
<td>Rejected H01 (b)</td>
</tr>
<tr>
<td><strong>H01 (c)</strong>: Bank usage has no significant effect on credit risk of commercial banks in Kenya.</td>
<td>p=0.000</td>
<td>Rejected H01 (c)</td>
</tr>
<tr>
<td><strong>H02 (a)</strong>: Bank availability has no significant effect on liquidity risk of commercial banks in Kenya.</td>
<td>p=0.000</td>
<td>Rejected H02 (a)</td>
</tr>
<tr>
<td><strong>H02 (b)</strong>: Bank accessibility has no significant effect on liquidity risk of commercial banks in Kenya.</td>
<td>p=0.447</td>
<td>Failed to Reject H02 (b)</td>
</tr>
<tr>
<td><strong>H02 (c)</strong>: Bank usage has no significant effect on liquidity risk of commercial banks in Kenya.</td>
<td>p=0.004</td>
<td>Rejected H02 (c)</td>
</tr>
<tr>
<td><strong>H03 (a)</strong>: Bank availability has no significant effect on insolvency risk of commercial banks in Kenya.</td>
<td>p=0.002</td>
<td>Rejected H03 (a)</td>
</tr>
<tr>
<td><strong>H03 (b)</strong>: Bank accessibility has no significant effect on insolvency risk of commercial banks in Kenya.</td>
<td>p=0.000</td>
<td>Rejected H03 (b)</td>
</tr>
<tr>
<td><strong>H03 (c)</strong>: Bank usage has no significant effect on insolvency risk of commercial banks in Kenya.</td>
<td>p=0.000</td>
<td>Rejected H03 (c)</td>
</tr>
<tr>
<td><strong>H04 (a)</strong>: Inflation rate has no significant moderating effect on the relationship between Financial Inclusion and Credit Risk of commercial banks in Kenya.</td>
<td>Moderate effect</td>
<td>Rejected H04 (a)</td>
</tr>
<tr>
<td><strong>H04 (b)</strong>: Inflation rate has no significant moderating effect on the relationship between Financial Inclusion and Liquidity Risk of commercial banks in Kenya.</td>
<td>Moderate effect</td>
<td>Rejected H04 (b)</td>
</tr>
<tr>
<td><strong>H04 (c)</strong>: Inflation rate has no significant moderating effect on the relationship between Financial Inclusion and insolvency Risk of commercial banks in Kenya.</td>
<td>Moderate effect</td>
<td>Rejected H04 (c)</td>
</tr>
<tr>
<td><strong>H04 (d)</strong>: GDP growth rate has no significant moderating effect on the relationship between Financial Inclusion and Credit Risk of commercial banks in Kenya.</td>
<td>Moderate effect</td>
<td>Rejected H04 (d)</td>
</tr>
</tbody>
</table>

145
<table>
<thead>
<tr>
<th>$H_{04}$ (e): GDP growth rate has no significant moderating effect on the relationship between Financial Inclusion and Liquidity Risk of commercial banks in Kenya.</th>
<th></th>
<th></th>
<th>Moderation effect</th>
<th>Reject $H_{04}$ (e)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$H_{04}$ (f): GDP growth rate has no significant moderating effect on the relationship between Financial Inclusion and Insolvency Risk of commercial banks in Kenya.</td>
<td></td>
<td></td>
<td>No Moderation</td>
<td>Failed to Reject $H_{04}$ (f)</td>
</tr>
<tr>
<td>$H_{05}$ (a): Bank competitiveness has no significant mediating effect on the relationship between Financial Inclusion and Credit Risk of commercial banks in Kenya.</td>
<td></td>
<td></td>
<td>Partial mediation</td>
<td>Rejected $H_{05}$ (a)</td>
</tr>
<tr>
<td>$H_{05}$ (b): Bank competitiveness has no significant mediating effect on the relationship between Financial Inclusion and liquidity Risk of commercial banks in Kenya.</td>
<td></td>
<td></td>
<td>Partial mediation</td>
<td>Rejected $H_{05}$ (b)</td>
</tr>
<tr>
<td>$H_{05}$ (c): Bank Competitiveness has no significant mediating effect on the relationship between Financial Inclusion and insolvency Risk of commercial banks in Kenya.</td>
<td></td>
<td></td>
<td>No mediation</td>
<td>Failed to Reject $H_{05}$ (c)</td>
</tr>
</tbody>
</table>

**Source:** Study Data (2017)
CHAPTER FIVE
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction
This chapter presents the summary of findings, conclusion, recommendations, contributions of the study to knowledge and suggestions for further studies. The summary was based on the research objectives of the study. The conclusions and recommendations were based on the findings of this study. This chapter further provides the contribution of this study to existing knowledge.

5.2 Summary
Earlier studies on financial inclusion and stability noted contradicting findings concerning the effect of financial inclusion on stability of financial institutions. Some argued for financial inclusion-stability synergy outcome while others underlined financial inclusion-instability trade-off outcome. Kenya’s Vision 2030 economic blueprint seeks to transform Kenya into a middle-income country that provides high quality of life to its citizens. This is by improving access and deepening of financial services and products.

Commercial banks play a key part in the economic growth of any country. They are usually recognized for their contribution to the monetary operations, employment, innovation and wealth creation of a nation. The GoK, thorough the CBK has provided an enabling environment, even by supporting legal and regulatory frameworks such as the Banking Amendment Act (2015). This was with a view to cap the commercial bank lending rates at not more than 4% above the CBR. This is
made to ensure that commercial banks continue to provide financial access and contribute towards realization of Vision 2030 prosperous economy. The Banking Amendment Act (2012) increased the minimum core capital from Ksh. 1 billion to Ksh. 5 billion in a bid to improve the financial stability of banks.

Despite these initiatives by the government and banks, commercial banks have presented mixed results in terms of their financial stability. In 2015 CBK warned that commercial banks were facing challenges. They included fraudulent loans, inadequate provisions for bad loans, capital inadequacy and low cash ratio, have eroding the market confidence in the banking sector. This was informed by the collapse of Charter House Bank in 2005, Imperial Bank and Dubai Bank in 2015. Indeed, Chase Bank was further put under receivership in 2016.

This study therefore, sought to investigate the effect of financial inclusion on the stability of commercial banks in Kenya. Specifically, the study was to establish the effect of bank availability, bank accessibility and bank usage on stability of commercial banks in Kenya. The study also sought to determine the moderating effect of the operating environment and mediating effect of bank competitiveness on the relationship between financial inclusion and stability of commercial banks in Kenya.

This study was anchored on financial intermediation, finance growth, asymmetry information and competition-stability theories. The study used longitudinal and explanatory non-experimental designs. Panel data was collected from three main
sources; bank annual financial statements, bank supervision reports by CBK, KNBS from 2007-2015. Descriptive statistics were used to describe and summarize data characteristics while inferential statistics, particularly panel multiple regression was used to predict the effect of financial inclusion on stability of commercial banks in Kenya.

Bank availability was found to have a statistical significant influence on stability of commercial banks measured by credit risk and liquidity risk and a positive significant influence on insolvency risk. Bank accessibility had a positive significant effect on credit risk and a negative significant effect on insolvency risk. However, it had a positive insignificant effect on liquidity risk. Lastly, bank usage was found to have a negative significant effect on credit risk and liquidity risk and a negative significant effect on insolvency risk.

Operating environment measured by inflation rate was found to moderate the relationship between financial inclusion represented by Index of Financial Inclusion (IFI) and stability of commercial banks in Kenya. However, GDP growth rate was found to moderate when stability was measured by credit risk and liquidity risk and no moderation for insolvency risk. Further, the study established that bank competitiveness partially mediated when stability was measured by credit risk. However, there was no mediation effect when stability was measured by insolvency risk.
5.3 Conclusions

For commercial banks to efficiently perform their intermediation role of providing liquidity, they need to be financially stable, available and accessible by the people they serve. Access to bank credit and other bank services is absolutely essential for any country. This justifies the need to make banking services accessible, available and attractive to all without any form of discrimination, achievable through financial inclusion.

The current study noted that commercial banks had increased financial inclusion during the study period which affected the stability of commercial banks. The key driving forces of financial inclusion were the availability, accessibility and usage dimensions. The study established that bank availability had increased during the study period which affected the level of stability of commercial banks in Kenya.

The increased penetration was driven by branch networks, ATMs and Agents. Hence, commercial banks that have expanded their branch networks, ATMs and agent networks strategically are likely to increase bank availability. Consequently, this translates to increased stability of commercial bank in terms of reducing credit risk, liquidity risk and insolvency risk.

The study noted that bank accessibility had increased during the study period, affecting the stability of commercial banks. This increased access was driven by increased number of deposit accounts, loan accounts and mobile accounts through digital finance. Therefore, based on these findings, the study concluded that those
banks that have enhanced accessibility are likely to be more stable. However, accessibility on liquidity risk which is a measure of stability was found to be insignificant. It therefore implies that banks should not put a lot of attention on access only. Rather, they would do so together with usage dimension, since a mere ownership of an account does not amount to inclusion.

In addition, bank usage was found to affect insolvency risk, credit risk and liquidity risk of commercial banks in Kenya hence affecting stability of the commercial banks. Based on these findings, the study concluded that bank usage is an important aspect of financial inclusion that enhances stability of commercial banks in Kenya.

Moreover, bank operating environment was found to influence the relationship between financial inclusion and stability of commercial banks in Kenya. This implies that increase in GDP growth rate coincided with increases in financial inclusion in the country. Therefore, the study concluded that it is necessary for commercial bank managers to pay attention to external operating environmental factors, specifically the inflation and GDP the growth rates. The reason for this is that they were found to statistically significantly affect the relationship between financial inclusion and stability of commercial banks in Kenya.

However, GDP growth rate was found to have no moderation effect on insolvency risk which is a measure of stability. It, therefore, implies that banks should not put a lot of attention to GDP alone. In addition, bank competitiveness was found to explain the relationship between financial inclusion and stability of commercial
banks in Kenya. Hence banks that have developed strategies that make them remain competitive are likely to be more stable than those who have not invested in competitive strategies.

5.4 Contribution to Knowledge

The findings of this study have various contributions to the existing body of knowledge on the relationship between financial inclusion, operating environment, bank competitiveness and stability of commercial banks in Kenya. This section provides the contribution of the study to theory building, to practice for improvement and to policy making. This study was anchored on various theories; finance growth theory, financial intermediation theory, asymmetric information theory and competition-stability theories.

The study contributed to expanding the applicability of finance growth theory to explaining the effect of financial inclusion in building an all-inclusive financial sector as a social and profitable venture. Financial intermediation theory was expounded to relate the role of banks in intermediating funds through inclusion of the population which were considered ‘unbankable’.

Asymmetry theory was adopted to explain the effect of financial inclusion policies and bank competition on the effectiveness of banks to reduce information opaqueness associated with the financial inclusion targeted customers. Therefore, future researchers that intend to focus on the relationship between financial
inclusion and stability of commercial banks can adopt these theories in their literature review.

This study finding has contributed to knowledge by successfully testing the research hypotheses that bank availability, bank accessibility and bank usage do not significantly affect the stability of commercial banks. The study further successfully tested hypothesis that operating environment has no significant moderating effect of on the relationship between financial inclusion and stability of commercial banks in Kenya. Bank competitiveness ha no significant mediating effect on the relationship between financial inclusion and stability of commercial banks in Kenya.

The conceptual framework was enriched to further create more awareness and understanding of the research scenario under study. The conceptual framework diagram assists the researcher in deriving insightful meaning from subsequent study findings and link them with the current study. It presented the study variables diagrammatically in linking their relationships.

Panel multiple regression includes bringing together many predictor variables into a single regression equation. Thus the effect of multiple predictor variables on the dependent measure was assessed. The goal of analysis for using this model was to find the best fitting and most parsimonious reasonable model to describe the relationship between the dependent variable bank stability and a set of independent variables financial inclusion.
5.5 Recommendations

The results of this study have significant implications to; regulators, policy makers, general public and academicians. As a result, several recommendations can be derived from the findings of this study. The study established that financial inclusion has an implication on financial stability of commercial banks.

Based on the findings, the study recommends that managers of commercial banks in Kenya should spearhead reforms in the financial sector aimed at increasing financial inclusion through enhancing bank availability, accessibility and usage. Financial inclusivity can be enhanced through increasing the number of branches, ATMs and agents. Further, it can be through internet banking and digital finance which is a cost cutting measure. This has been found to be critical in enhancing banks penetration and presence among the population. These in turn will support stability (synergy) due to increased deposit mobilization.

Commercial bank’s managers should pursue financial inclusivity with the main aim of increasing the numbers of their customer base. Consequently, they would boost their deposits accounts, loans accounts and mobile accounts, hence broadening the access dimension and becoming more stable. To increase the access dimension, commercial bank should relax the requirements for opening and holding an account with them in order to facilitate the low income group to access financial services. This increases the banking population and advance affordable and accessible banking services to disadvantaged groups in different regions in the country.
Since bank usage was found to significantly affect stability, the study recommends that banks should relax the requirements for accessing financial services and try to reduce the procedures followed in accessing finance by making use of financial innovations and financial engineering driven channels which are easily accessed and used by clients like digital finance and agency banking. At the same time, they should strengthen the implementation of the available regulatory framework provided by the CBK, for instance the CBR for vetting financial inclusion clients. This would minimize on their exposure to credit risk, liquidity risk and insolvency risk.

Bank competitiveness was found to significantly mediate the relationship between financial inclusion and bank stability. Therefore, the study recommends that banks’ operating managers through the Department of Research and Development should design innovative products which are technology-driven and more customer friendly but which cannot be easily replicated by rivals so as to maintain their competitive advantage.

Additionally, the marketing managers should indulge in the use of strong and persuasive marketing communication efforts to promote their products, consider providing financial literacy among the population to enable them appreciate and use the products and position of the banks to cope best within the industry environment or to influence that environment to their favor so as to gain competitive advantage. This increases the number of their customer base and consequently, boost their deposits and loans accounts and becoming more stable.
Further, it recommends that bank managers, should lobby the regulator and policy makers in Kenya, including CBK and the National Treasury, through the monetary policy to put remedies that can assist in maintaining a favorable operating environment, address rampant insolvency problems, and minimize the risk of emerging crises in the financial sector in Kenya. This will lead to deepening of financial inclusion which was found to be influenced by the prevailing operating environmental conditions. This will enable the banks to manage the totality of their competencies to achieve profitability and stability of commercial banks in Kenya.

Policymakers including the Central Bank, National Treasury, commercial banks and other stakeholders face trade-offs when deciding whether to focus on reforms that promote financial inclusion (such as greater use of credit) or reforms that improve stability (such as stricter prudential regulation). Policy makers in commercial banks in Kenya will be more informed in policy formulation and decision making in respect to financial inclusion and stability. The finding further also informs finance and banking fields with regard to commercial banks as financial intermediation agents. Stakeholders in the banking sector will understand the role played by competition in the relationship between financial inclusion and stability of commercial banks in Kenya.

Finally, the study recommends that other researchers and academicians in the field of finance can use the findings in this study to enhance the robustness in analyzing financial inclusion by establishing the interaction effect between the regressors on the dependent variable. The researchers can build on the body of knowledge
established by the study on how finance growth theory, financial intermediation theory, asymmetric information theory and competitive stability theories are applied in financial inclusion and stability of commercial banks.

5.6 Suggestions for Further Research

This study focused on commercial banks in Kenya. This study recommends that further study should be conducted to measure the impact of financial inclusion interventions in Kenya in other non-banking financial institutions. These include Savings and SACCOs, MFIs as well as government revolving funds. Studies on informal financial services should be done as they continue to thrive despite the financial inclusion initiatives and their exorbitant costs.
REFERENCES


Christersen, B., & Vibe. (2010), *Have Monetary Transmission Mechanism in Africa changed?* In bank of international settlement, Central Banking in Africa


165


APPENDICES

Appendix I: Commercial Banks

1. African Banking Corporation Ltd.
2. Bank of Africa Kenya Ltd.
3. Bank of Baroda (K) Ltd.
4. Bank of India
5. Barclays Bank of Kenya Ltd.
6. CFC Stanbic Bank Ltd.
7. Chase Bank (K) Ltd. (receivership 2016)
8. Citibank N.A Kenya
9. Commercial Bank of Africa Ltd.
10. Consolidated Bank of Kenya Ltd.
12. Credit Bank Ltd.
14. Diamond Trust Bank (K) Ltd.
15. Dubai Bank Kenya Ltd. (receivership 2015)
16. Ecobank Kenya Ltd
17. Equatorial Commercial Bank Ltd.
18. Equity Bank Ltd.
19. Family Bank Ltd
20. Fidelity Commercial Bank Ltd
21. Fina Bank Ltd
22. First Community Bank Limited
23. Giro Commercial Bank Ltd.
24. Guaranty Trust Bank Kenya
25. Guardian Bank Ltd
27. Habib Bank A.G Zurich
28. Habib Bank Ltd.
29. I & M Bank Ltd.
30. Imperial Bank Ltd. (receivership 2015)
31. Jamii Bora Bank Ltd.
32. Kenya Commercial Bank Ltd
33. K-Rep Bank Ltd
34. Middle East Bank (K) Ltd
35. National Bank of Kenya Ltd
36. NIC Bank Ltd
37. Oriental Commercial Bank Ltd
38. Paramount Universal Bank Ltd
39. Prime Bank Ltd
40. Standard Chartered Bank (K) Ltd
41. Trans-National Bank Ltd
42. Victoria Commercial Bank Ltd
43. UBA Kenya Bank LTD

## Appendix II: Stability Data Review Form

<table>
<thead>
<tr>
<th>Year</th>
<th>Profit Before Tax</th>
<th>Profit After Tax</th>
<th>Total Loans</th>
<th>Total Non Performing Loans</th>
<th>Total Assets</th>
<th>Equity Capital</th>
<th>Interest Expense</th>
<th>Interest Income</th>
<th>Total Earning to Assets</th>
<th>Bank Competition</th>
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### Appendix III: Financial Inclusion Data Review Form

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of bank branches</th>
<th>Number of ATMs</th>
<th>Number of bank Agent(s)</th>
<th>Total population</th>
<th>Number of deposit Bank accounts</th>
<th>Number of Mobile Account(s)</th>
<th>Country’s GDP</th>
<th>Total loans</th>
<th>Total Deposits</th>
<th>Inflation Rate</th>
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Appendix IV: Index of Financial Inclusion (IFI)

A dimension index for each of the three dimensions was first computed by the following formula:

\[
d_i = w_i \frac{A_i - m_i}{M_i - m_i}
\]  

Where:

- \(d_i\) = Financial inclusion dimension (availability, accessibility and usage)
- \(w_i\) = weight attached to the dimension \(i\), \(0 \leq w_i \leq 1\)
- \(A_i\) = Actual value of dimension \(i\)
- \(m_i\) = lower limit for dimension \(i\), given by the observed minimum for dimension \(i\)
- \(M_i\) = upper limit for dimension \(i\),

\[
X_1 = \frac{\sqrt{d_1^2 + d_2^2 + \ldots + d_n^2}}{\sqrt{(w_1^2 + w_2^2 + \ldots + w_n^2)}}
\]

\[
X_2 = 1 - \frac{\sqrt{(w_1 - d_1)^2 + (w_2 - d_2)^2 + \ldots + (w_n - d_n)^2}}{\sqrt{(w_1^2 + w_2^2 + \ldots + w_n^2)}}
\]

\[
IFI = \frac{1}{2} [X_1 + X_2]
\]

Where:

- \(d_i\) = Financial inclusion dimension (availability, accessibility and usage)
- \(w_i\) = weight attached to the dimension \(i\), \(0 \leq w_i \leq 1\)
- \(A_i\) = Actual value of dimension \(i\)
- \(m_i\) = lower limit for dimension \(i\), given by the observed minimum for dimension \(i\)
- \(M_i\) = upper limit for dimension \(i\),
- \(X_1\) = distance between bank \(k\) and \(O\), complete exclusion
- \(X_2\) = (inverse distance between \(X\) and \(W\)).
- \(IFI\) = The simple average of \(X_1\) and \(X_2\)
Ref. No: NACOSTI/P/16/85426/14952

Date: 8th December, 2016

Salome Mwongeli Musau
Kenyatta University
P.O. Box 43844-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on “Financial inclusion, macroeconomic variables, competition and stability of commercial banks in Kenya,” I am pleased to inform you that you have been authorized to undertake research in Nairobi county for the period ending 7th December, 2017.

You are advised to report to the Chief Executive Officers of selected banks, the County Commissioner and the County Director of Education, Nairobi County before embarking on the research project.

On completion of the research, you are expected to submit two hard copies and one soft copy in pdf of the research report/thesis to our office.

Boniface Wanyama
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The Chief Executive Officers
Selected Banks.

The County Commissioner
Nairobi county
Our Ref: D86/CTY/28540/14

Date: 17th October, 2016

The Director General,
National Commission for Science, Technology & Innovation
P.O. BOX 30623-00100
NAIROBI

Dear Sir/Madam,

RE: RESEARCH AUTHORIZATION FOR MS. SALOME M. MUSAU REG. NO D86/CTY/28540/14

I write to introduce Ms. Musau who is a Postgraduate Student of this University. She is registered for Ph.D. degree programme in the Department of Accounting & Finance in the School of Business.

Ms. Musau intends to conduct research for Ph.D. Degree thesis entitled “Financial Inclusion, Macroeconomic Variables, Competition and Stability of Commercial Banks in Kenya”.

Any assistance given will be highly appreciated.

Yours faithfully,

MRS. LUCY N. MBAABU
FOR: DEAN, GRADUATE SCHOOL

RM/cao
THIS IS TO CERTIFY THAT:

MS. SALOME MWONGEI MUSAU
of KENYATTA UNIVERSITY, 43844-100
Nairobi, has been permitted to conduct
research in Nairobi County

on the topic: FINANCIAL INCLUSION,
MACROECONOMIC VARIABLES,
COMPETITION AND STABILITY OF
COMMERCIAL BANKS IN KENYA

for the period ending:
7th December, 2017

Permit No.: NACOSTI/P/16/85426/14952
Date of Issue: 8th December, 2016
Fee Recived: KSh 2000

Applicant's Signature:

Director General
National Commission for Science,
Technology & Innovation