

**Credit Risk Stress Testing and Financial Performance of Commercial Banks in
Kenya**

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**A thesis submitted in partial fulfillment of the Requirements for the Award of
Degree of Doctor of Philosophy Degree in Business Administration (Finance
Option) of Masinde Muliro University of Science and Technology**

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DECLARATION

This thesis is my original work prepared with no other than the indicated sources and support and has not been presented elsewhere for a degree or any other award.

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CERTIFICATION

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DEDICATION

I dedicate this work to my lovely wife CPA Colletah Kerubo, my children, my mother Regina and my brother Dr. Philip Machuki Nyanumba for their unwavering love and overwhelming generosity.

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ABBREVIATIONS AND ACRONYMS

ANOVA	Analysis of Variance
BCBS	Basel Committee for Banking Supervision
CBK	Central Bank of Kenya
DFAST	DODD-Frank Act Stress Testing
EAD	Exposure at default
EBA	Emergency banking act
EPRA	Energy and Petroleum Regulation Authority
ELL	Expected Loan Loss
FINMA	Financial Market Supervisory Authority
FASB	Financial Accounting Standard Board
FSAP	Financial Sector Assessment Program
GARP	Global Association of Risk Professionals
IASB	International accounting standards board
IDT	Innovation Diffusion Theory
IFMIS	Integrated Financial Management Information System
IFM	International Monetary Fund
LGD	Loss given default
LLPCR	loan loss provision coverage ratio

LLP	Loan loss provision
MMUST	Masinde Muliro University of Science and Technology
PD	Probability of default
NAAV	National Association of Automotive Vehicles
NACOSTI	National Commission for Science Technology Innovation
NPA	Non performing assets
NPL	Non performing loans
5Cs	Character, Capacity, Capital, Collateral and Conditions
NPC	National Petroleum Council
RFQ	Online Request for Quotations
ROE	Return on Equity Capital
SPSS	Statistical Package for The Social Sciences
TCT	Transaction Cost Theory
TRWA	Total Risk Weighted Average
USA	United States of America

OPERATIONAL DEFINITION OF TERMS

Credit risk stress testing:	This refers to the process of determining the effect of a change to a portfolio or sub-portfolio due to extreme, realistic events. This is operationalized through expected loan loss, probability of default, exposure at default, and loss given default.
Expected loan loss	This refers to the total value of the loan at the time a borrower defaults. This is operationalized through loan loss provision to total risk weighted assets as well as loan loss provision to total capital.
Exposure of default	This refers to the realized value of what the bank may lose if one of its borrowers is unable to satisfy their debt obligation. This is operationalized through non performing loans to operating income as well as loan loss provision to operating income.
Financial Performance	This refers to the measure of how well a firm can use assets to generate revenues. This is operationalized through total income to total assets as well as total income to total equity.
Loss Given Default	This refers to the amount of money a financial institution loses when a borrower defaults on a loan, after taking into consideration any recovery. This is operationalized through non performing loans to total loans as well as loan loss provision to net loan and

advance.

Probability of Default

This refers to the likelihood that a borrower will fail to pay back a certain debt. This is operationalized through loans to deposit as well as deposits to liabilities.

Size of the Firm

This refers to composite measures of corporate magnitude. This is operationalized through log of total assets.

ABSTRACT

Banks in Kenya are subject to independent micro stress assessment by the Central Bank. According to data from 2022, the return on credit risk of stress tests precipitated a critical increase in nonperforming loans. Central Bank of Kenya (CBK) data from June 2022 indicates that the Kenyan banking sector has been unable to repay its debts at an alarming rate, with loan defaults totaling Ksh514.4 billion, which for the first time in history has surpassed the half-trillion-shilling threshold. The loan loss provisions experienced a decrease from Kshs. 110.30 billion in 2020 to Kshs. 58.97 billion in 2021. Default rates continue to increase, with rates of 8.923% in 2019, 10.617% in 2020, 11.61% in 2021, and 14.1% in 2022, according to default rate trends. The annual report of Equity Bank for the year 2022 revealed a surge in credit losses in comparison to the preceding data. The main objective of this study was to examine the effect of credit risk stress testing on financial performance of commercial Kenya. Specific Objectives are to establish the effect of expected loan loss, probability of default, exposure at default and loss given default on financial performance of commercial banks, Kenya. The study also examined the moderating effect of firm size on the relationship between credit risk testing and financial performance of commercial banks in Kenya. The theories guiding the study were: Credit risk theory, Information Asymmetry Theory and Portfolio Theory. The adopted mixed research comprising of causal and longitudinal research designs. The study used all commercial banks which are 42 in total. Positivism research philosophy was adopted. The study used secondary data from financial statements of banks. Data was analyzed by both descriptive and inferential statistics. Descriptive involved skewness, kurtosis, mean and standard deviation. Inferential statistics included Pearson correlation and multiple regression analysis. Data was presented using tables. The study may add body of knowledge on credit risk stress testing. This study may be of help to the government of Kenya on formulation of banking sector credit policy. The study findings may help banks in evaluating the significance of credit risk stress testing and the financial performance. The results revealed that expected loan loss causes a positive impact on the Performance of Commercial Banks as shown by a positive and significant coefficient of in the regression model in a fixed effect model. From the findings expected loan loss, probability of default, exposure at default and loss given default negatively and significantly affects the Performance of Commercial Banks in Kenya in the fixed effect model. All dependent variables were significant less than 0.05. The study suggested that financial institutions implement a stringent policy that escalates the loss in the event of default, thereby restricting loan approvals to clients who can guarantee they will repay the loan in full. Additional recommendations of the study are that banks diversify customer loans in order to reduce the risk of default. Additionally, the research suggests that financial institutions ought to devise tactics to fulfill their immediate liabilities by augmenting the distribution of loans to their clientele, thereby incorporating credit risk stress testing.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

According to Gersl *et al.* (2012), credit risk testing is the most vital stress test area. Credit risk is associated with banks' primary business; their goal is not to minimize credit risk but manage it. The main predicted variables are Expected loan loss probability of default, exposure at default and loss given default. Further, the banking sector forecast the volume of non-performing loans and credit growth. These estimates are used to calculate risk weighted average, capital requirement, and loan provisions and indicate banking portfolios' and sector's health.

Credit risk is at the heart of any financial intermediation which is one of the core businesses of a commercial bank. Alshatti (2015) indicates that commercial banking business is always exposed to numerous inherent risks and credit risk ranks among the critical risks particularly in a lending business. Due to the importance of the quality of assets on the financial performance of a bank, shareholders, managers, and the regulators take a very keen interest in the management of credit risks. The challenge of the deteriorating asset quality and nonperforming loans is described as a major headache to many banks and indeed to the global financial system by Sujeewa (2015) and Aladwan (2015). The rapport between credit risk stress testing and financial performance of banks can be influenced by various variables and may be internal or external.

Credit risk stress testing is the basis of whole banking stress testing. Credit risk represents a risk of the client's ability to meet its obligations and his or her probability of default. This risk usually presents 60-80% of all banking risks;

because it is the substance of the banking business and the primary source of income, the object of banks is not to minimize it but to assess, measure and manage it properly. Moreover, credit risk makes a substantial part of the total capital requirement, an amount of capital the bank should hold to cover all risks (Mejstřík et al., 2015). Therefore, the review and analyses in the thesis focus on credit risk.

The stability of the financial sector is crucial for the economic advancement of every nation. The 2008-2009 global economic crisis posed a direct danger to global financial stability. The banking sector's crucial function may be affected by several hazards, both internal and external, such as inept managers, inadequate regulation, and economic challenges (Naili & Lahrichi 2022; Tehulu & Olana 2014). Credit risk is considered the primary type of risk that might endanger a bank's survival and financial stability, given its potential impact (Caruso *et al.*, 2021). Regulators and commercial banks have recently become more concerned about non-performing loans due to their potential to destabilize banks and cause them to fail (Naili & Lahrichi 2022; Ghosh 2015). This type of risk is inherent in the traditional function of banks, which is primarily to offer credit.

Credit risk has traditionally been the greatest risk facing financial institutions and has therefore required the most regulatory capital - that is, the minimum capital the institution must hold to be able to properly cover large losses in the event of e.g. a financial crisis, see Hull 2015. It is therefore crucial to financial institutions that they calculate these capital requirements correctly. The capital requirements are regulated by the Basel Capital Accords, which are regulatory standards for financial institutions. Albeit being only regulatory standards, they have been incorporated into European Union law, meaning all banks and financial institutions within the European Union must comply with certain demands. The largest of these accords,

the second Basel Capital Accord, Basel II, specifies among other things the minimum capital requirements.

Credit risk stress testing and its implications on banking sector performance have been characterized by a variety of challenges and obstacles that have ultimately resulted in poor banking performance. This has incubated a tendency that has led to unfavorable banking performance, including unclear balance sheets, bank failures, and financial sector crises. This has resulted in a systemic risk, which has a negative functional ramification on economic growth (Almekhlafi, Khalil, Kargbo & Hu, 2016). 4. Some of the tactics used in credit risk stress testing include shifting the responsibility to another entity, evading the risk altogether, mitigating its negative impact, or even embracing it in whole or in part.

The worldwide financial crisis is largely responsible for the incorporation of stress testing into frameworks for ensuring financial stability. Financial institutions, and banks in particular, can benefit from stress testing by modeling the effects of hypothetically bad economic and financial scenarios on their capacity to stay in business. A number of global financial institutions have issued recommendations for how to conduct stress tests, including the International Monetary Fund, the World Bank, and the Bank for International Settlements. For example, the Basel Committee for Banking Supervision (BCBS, 2018) published updated stress testing principles that give guidance to banks and supervisory authorities alike on essential aspects such as stress test objectives, use of stress tests as risk management tool in the supervisory process, comprehensive assessment of banking sector risks in stress tests, periodic review of the appropriateness of stress test models, and proper communication of stress tests and outcomes.

Credit risk stress testing is a procedure utilized by commercial banks to assess the soundness and security of their operations, as well as to reduce the likelihood of bank failure (Issackow, 2022). Credit risk stress testing at a regulatory level started to be developed in the 1990's, when financial institutions encouraged risk managers to go beyond the standard risk metrics and to imagine circumstances that could create extreme losses among banks (Matanda, 2020). They jumped into the spotlight with the 2007's tremendous financial crisis. The crisis peaked with the Lehman Brothers bankruptcy in the United States and continued in Europe with the sovereign debt crisis (World Bank, 2018). Regulatory entities decided subsequently that it is of extremely importance to supervise more clearly and efficiently the banking system, to prevent this type of events, because during crisis the potential losses that stress tests predicted were less than the losses that really occurred (Ouma, 2016).

Flannery *et al.* (2013) identified a lack of openness in bank financial health information as a major factor that worsened the 2008 financial crisis. Zheng (2020) and others demonstrate how the economy as a whole was negatively impacted by the propagation of mistrust due to the opaqueness of information, which in turn exacerbated the wholesale bank funding channel's liquidity crisis. According to Kok *et al.* (2023), industry regulators recognized the importance of greater risk control inside the system and increased access to information in order to enhance resilience and reduce credit risk for banks. A component of the new rule was a program to put the banking industry through its paces in the event of a severe economic slump or a rise in systemic risk. Another goal of the stress tests was to make the banking sector's information more transparent, which would increase investor trust and make risk assessment easier.

Goldstein and Sapra (2014) state that decision-makers may benefit from better price formation, more market discipline, and more faith in the supervision process if they were to see the outcomes of credit stress tests. Subjective interpretations and an increase in information asymmetry can occur when credit stress testing results programs are poorly structured or when given information is not sufficiently transparent (Gaballo, 2016). Another factor that can impact pricing is the information crowding-out effect, which occurs when ST disclosures overshadow other sources of private data, such as the data generated by the tested institutions (Jayaraman & Wu, 2018).

Prior studies have primarily examined indirect indicators, such as abnormal stock returns and credit default swaps spreads, to assess the informational value of credit risk stress testing results. These studies have focused on the period surrounding the disclosure date and have been conducted by researchers (Fernandes *et al*, 2020). The interpretations of market participants with varying positions and interests in the data presented by credit risk stress testing may vary. The examination of the general market response may conceal divergent responses and does not enable an accurate assessment of whether such disclosure leads to increased transparency (Abad *et al.*, 2020;

Dala *et al.*, (2020) indicates that a surrogate for information opacity, which is expressed as differences in the credit ratings assigned to the same reference (the issue or the issuer) by different rating agencies. These differences arise when the agencies have differing assessments of the credit risk of banks, which is a result of the inherent lack of transparency in the banking system. The research builds upon the primary literature by based on Abad *et al.*, (2020) to investigate the information

opacity resulting from the divergences in credit ratings assigned by different rating agencies to the same reference (either an issue or the issuer itself). These differences arise when the agencies have different assessments of banks' credit risk, which is a result of the lack of transparency in the banking industry.

Acharya and Ryan (2016) and Flannery *et al.* (2013) state that when stakeholders like investors and regulators don't understand the risk profiles, financial health, and potential crisis contagion of banks, it puts financial stability at risk. Increasing investor confidence, facilitating accurate risk assessment, and encouraging the distribution of information to strengthen resilience and decrease credit risk are all goals of credit stress testing (Kok *et al.*, 2023). The pros and cons of publicizing credit stress testing, as well as its effects on the process, are discussed by Goldstein and Sapra (2014). Disclosure of stress test results may lead to additional expenditure owing to operational and market difficulties, however the insights gained from stress testing can improve transparency and accountability.

Morgan *et al.* (2014) demonstrate that the US 2009 tests yield crucial insights, since banks with larger capital gaps see a more substantial decrease in returns. Fernandes *et al.* (2020) discovered that there were favorable returns in 2009, while unfavorable returns were observed from 2011 to 2013. Financial institutions that successfully pass the tests experience unusually high returns, whilst those that fail receive negative returns. They observe a substantial rise in trading activity following the release of credit risk stress testing findings for the latter. Flannery *et al.* (2017) and Bird *et al.* (2020) both observe a notable impact on prices and volumes after the publication of credit risk stress testing. Flannery *et al.* (2017) examine the fluctuations in returns and discover that the outcomes of stress testing for credit risk contain valuable information that is applicable to banks that were not specifically

evaluated. In their study, Sahin *et al.* (2020) analyze the relationship between systematic risk and returns in the stock and credit default swaps markets from 2009 to 2015. They discover aberrant behavior exclusively in the credit default swap market, while observing a decline in systematic risk in the years after credit risk stress testing. In times of heightened uncertainty, the impact of credit risk stress testing is more pronounced compared to periods of macroeconomic stability.

The most crucial components of credit risk are expected loan loss, probability of default, exposure at default, and loss-given default. Financial institutions utilize these components in various aspects of their operations, such as designing risk policies, establishing credit terms, assessing capital requirements, pricing loans, conducting credit follow-ups, formulating collection policies for defaulted companies, devising measures to mitigate defaults, and calculating both unexpected and expected losses (Hocht *et al.* 2022). The justification for stress testing, which was initiated as a result of the global financial crisis of 2008, emphasized the importance of maintaining stability in the monetary system as part of the overall macroeconomic framework (Muparuri & Gumbo 2022). Stress testing is utilized as a means of evaluating the susceptibility of portfolios to unexpected interruptions and market circumstances (World Bank, 2018).

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Globally Kanno (2015) did research in USA which established that stress testing is mainly used to assess the resilience of a bank, when it faces rare, but plausible, shocks that can cause huge losses. Stress tests started to be used in the 1980's, as a tool of primordial risk management used to specific large risks. In the early 1990's, financial institutions, like banks, started to apply stress tests focused in the trading books being this measure formalized in 1996 with an amendment to the international regulatory capital regime for market risk. In recent times, methodologies of a similar nature have been implemented to authenticate the stability of collections of financial institutions (Zik & Ilu, 2018). A recent subfield of credit risk modeling, credit risk stress testing has generated controversy among financial participants (Muya, 2017).

Indeed, its introduction occurred solely as a mandatory component of the Basel II framework (Basel Committee on Banking Supervision, 2015)..

Kanno (2015) further states that macro stress tests for credit risk are conducted in three distinct phases. Phase one involves the consideration of macroeconomic factors under a predetermined stress scenario at a specific risk horizon. Phase two is anticipated to generate credit risk characteristics for a financial institution, often in the form of Probability Default (PD) and Loss Given Default (LGD), as a result of the influence of stressed macroeconomic conditions. In the third phase, an assessment is conducted to determine the potential value of the financial institution at risk, taking into account the credit risk factors (Kanno, 2015).

The risk management landscape underwent a significant transformation in 2012 when Dodd-Frank Act Stress Testing (DFAST) conditions were revealed by US regulators. These conditions mandated that the banking sector conduct stress testing. The majority of respondents to a 2015 GARP survey indicated that their organizations possessed the personnel and knowledge necessary to manage DFAST's data management, risk model management, process management, and reporting requirements. Nevertheless, technological deficiencies persist, particularly in light of the ongoing evolution of regulatory demands more intricate inquiries necessitate more extensive data sets and quicker response times (Ofori *et al.*, 2016). As per Karim (2020), Malaysia and Singapore have encountered a significant setback in the form of attached companies reporting losses attributable to problematic debts. Following the financial turmoil of 2007-2009 and the European sovereign debt crisis, stress tests have experienced significant growth as an additional instrument within the realm of quantitative risk management. Several banks failed as a consequence of the crisis's swift transmission as a worldwide economic upheaval. In addition,

according to the International Monetary Fund, significant institutions in Europe and the United States lost in excess of \$1 trillion on toxic assets and bad loans (IMF, 2017) Stress tests are frequently conducted implicitly, which means that the accomplishments of unfavorable risk parameters are converted using a quantitative model from the accomplishments of adverse risk factors derived from an explicit scenario.

Gurny and Gurny (2015) did research on the Probability of Default for Bayesian regularized artificial neural networks. The findings of the study indicate that the Bayesian approach exhibits superior performance in neural networks when compared to the classical regularization approach. The research was initially conducted using data from East Europe; in contrast, the present study will utilize data from Kenya to bridge the geographical divide. In addition, the present investigation will focus on the effect of the Probability of Default on performance rather than the function of networks in determining the aforementioned factor.

Hidayat *et al.* (2018) performed a stress test on the Indonesian Islamic banking industry. Their study shows that Islamic banks in Indonesia are immune from losses if NPL is under 8.5%. They also found that, by assuming LGD is constant at 40%, the industry will not go bankrupt as long as PD is less than 9%. The study also concludes that there was no liquidity threat for Islamic banks in Indonesia. The stress tests were divided into three areas: profitability stress test, capital stress test, and liquidity stress test.

In Switzerland, the Financial Market Supervisory Authority, FINMA, had been conducting the various stress tests on Swiss banks since 2008, designed to assess the impact that a sharp deterioration in economic conditions might have on Swiss banks.

Since the beginning of 2009, FINMA has stepped up these stress tests at the two large banks, Credit Suisse and UBS, which identified that even after the effect of a severe stress event the banks, would still maintain a stable capital base with a Tier 1 capital ratio over 8%.

Credit risk stress testing has been studied based on expected loan loss, exposure of default, loss given default and probability of default. Chabachib, Yudha and Udin (2020) assert that expected loan loss is highly influenced by the models for loan loss accounting. The study was conducted in Spain where expected loan loss models were dictated by FASB and IASB. The study was conducted in Europe with different loan loss models and different regulators to the present study which is will be conducted in Kenya which are regulated by the Central Bank of Kenya (CBK).

Mazreku and Morina (2016) performed a stress test for credit risk on the banking sector in Kosovo. The test concluded that the Kosovo banking sector was capable of handling a rise in its credit risk. The study was performed through a series of scenario analysis where on the first scenario, the economy of Kosovo is hit with a 2.6% economic decline. The second scenario is the combination of the condition described in the first scenario with a 2% fall for interest on assets, a 1.5% rise for interest on liabilities, and a 20% depreciation of the Euro's exchange rate. The third scenario is the bankruptcy of three of the largest borrowers for each bank. The fourth scenario is the bankruptcy of five of the largest borrowers for each bank (Malini, 2021).

Stress tests assess the resilience and adaptability of a financial system primarily by deliberately exposing the system to extreme and highly unfavorable circumstances that were not anticipated beforehand (Ali & Dhiman, 2019). The primary risk faced

by microfinance institutions is credit risk, which necessitates precise measurement and effective management more than any other risk. According to the Basel Committee (2015), the escalation of credit risk leads to a rise in the minimum value of debt and equity, resulting in a twofold increase in the cost of funding for a financial organization. Arias, Jara-Bertin, and Rodriguez (2020) found a negative correlation between the performance of microfinance institutions and credit risk. According to Abbink (2011), tests are utilized to assess the debt position of a corporation, as well as the demonstrations of position and credit. The debt capacity, development structure, ease of repayment, and associated contracts are all crucial factors. Stress testing play a crucial role in ensuring the reliability and sustainability of a company.

Stress tests have come to represent a regulatory response to the 2008 financial crisis (Shahhosseini, 2022). But, there has been great interest in the characteristics of banks and their performance in emerging markets like Turkey (Saeed *et al.*, 2021; Çolak and Şenol, 2021), China (Lee *et al.*, 2021; Zhang *et al.*, 2021), Taiwan (Fang *et al.*, 2021), Mexico (Canon *et al.*, 2022) and BRICS market- BRICS: Brazil, Russia, India, China and South Africa (Fernandes *et al.*, 2021), but the study did not find the same amount of interest in the ability of banks in emerging markets to face crises; Except in rare studies such as Isik and Uygur (2021) in Turkey and Su et al. (2021) in China. On other hand, there effect of delays in updating prudential regulation on the likelihood of a country experiencing banking crises, and it disentangles the impact of different aspects of regulation on crisis onset (Garriga, 2017).

The implementation of credit risk assessment in the Nigerian banking sector was undertaken as a means to address challenges and forecast potential problems (Ali, Yassin & Aburawaya, 2020). The Nigerian central banks have implemented early

strategies that involve ongoing study and rigorous monitoring. The underlying basis for changes, such as data-producing institutions and the Treasury, is in the research and follow-up activities conducted by banks.

In Tunisia, the high level of nonperforming loans in the banking sector and the extent of losses supported on their loan portfolios have shown interest to understand the determinants of credit risk for banking institutions in order to manage this risk and maintain macroeconomic and financial stability. According to the recommendations of the Financial Sector Assessment Program (FSAP) conducted in Tunisia by the World Bank and the IMF in 2012, the prudential supervision in Tunisian Central Bank should be backed up by new techniques based on the "risk model" with rating and stress testing that anticipates banking difficulties (IMF, 2017).

Credit risk can lead to liquidity risk, resulting in heightened and significant concerns. Empirical evidence has demonstrated that within the banking sector, there exist several risks, including anticipated loss, default profitability, exposure to default, and loss incurred due to default. These factors are considered to be the primary determinants of insolvency challenges for micro finance institutions (Buncic & Melecky, 2013). By conducting stress testing on timely applications, an institution can strengthen its intellectual capacity and adjust its answers as circumstances unfold.

Ofori, Pickson and Opare (2016) in their study conducted in Ghana using one commercial bank as a case study found that it was imperative for banks to reduce expected loan loss in order to boost the performance of loans. The study used one bank which was limiting in terms of scope as compared to the current study which will collect data from several banks in Kenya.

According to Kanyare and Mungai (2017), it is imperative for effective credit risk management procedures to be closely integrated with the organizational management of commercial banks in Kenya within the framework of enterprise risk management. As a reaction, banks have widely committed to updating their management systems and risk control measures. Furthermore, the primary motivation for this research is from the recognition of the impact that the decline in credit value has on the profitability of a financial system.

Regionally, research looks at what factors affect the likelihood of default for both audited and unaudited private banks in Zimbabwe when times are tough. It is crucial to examine the factors that influence the likelihood of commercial banks defaulting in a financially underdeveloped economy like Zimbabwe. Commercial banks play a crucial role in the foundation of numerous economies. According to Karas & Reznakova (2021), Roy & Shaw (2021), and Luo et al. (2020), they serve as a catalyst for consistent job opportunities, enduring economic expansion, and groundbreaking advancements. Also, commercial banks are the most important businesses in both emerging and developed economies (Mashingaidze et al. 2021; Altman et al. 2010).

Kenya has made significant strides in enhancing the robustness and efficiency of its financial framework. The progression of the management framework is accompanied by the elimination of non-performing loans and a reduction in the government's involvement in the commercial sector. The recent decline in interest rates can be attributed to reduced loan loss requirements and general expenses, in addition to the most stringent profit constraints. These factors indicate a considerable degree of competition (Matanda & Mhizha, 2021).

This was accompanied by a reduction in inflation and the financial deficit, as well as stable exchange rates, which enabled a decrease in interest rates. Additionally, there were enhancements in state-operated institutions. Nevertheless, Kenya's economic systems continue to face persistent issues. The banking sector continues to have an uneven structure, characterized by the presence of numerous small banks catering to niche markets, which in turn hinders competition within the industry. According to Ofori et al. (2016), the impact of the Kenyan financial system remains constrained.

Tanui and Serebemuony (2021) conducted a study and concluded that lower levels of loan loss provision coverage ratio (LLPCR) increase financial performance. Their study collected data from micro finance banks while the present study will collect data from commercial banks in Kenya. This will fill the knowledge gap existing in the different industries.

1.1.2 Financial Performance

Financial performance encompasses a range of methodologies aimed at evaluating the effectiveness with which a business utilizes its assets to create revenue (Omondi, 2016). The initial step in evaluating the financial performance of banks is assessing their ability to achieve predetermined objectives as determined by stakeholders. The financial performance of banks indicate whether micro finance is making success in achieving its set goals during a specific phase. Typically, the financial performance of a corporation is assessed using four fundamental ratios. According to Muhindi and Ngaba (2018), the aforementioned ratios encompass liquidity ratios, profitability ratios, efficiency ratios, and solvency ratios. Solvency ratios assess the financial robustness of a company by comparing its debt to its assets and equity.

Performance of banks and the stability of the banking industry depends on an interaction between the bank's characteristics -Such as Bank's style (Sbeiti & Alqatan, 2021); Bank's ownership structure (Maswadeh, 2021); bank's Corporate governance and credit risk (Dibra & Bezo, 2021) addition to bank's size, banks ratios for deposit, loan, profitability and leverage, affect Capital Adequacy adjustment (Dibra & Bezo, 2021) and economic variables such as regulatory pressure, GDP growth rate and banking system restructuring (Dibra & Bezo, 2021) as well as the role of the regulatory authorities (Helmy & Wagdi, 2019). Finally; the stability of banks depends on a purposeful balance of market sector interests under elite control and market crises in the banking industry (Yue *et al.*, 2013).

Node *et al* (2016) argue that in order to assess bank performance, it is essential to take into account the metrics of Return on Equity Capital (ROE) and Return on Assets (ROA). There are multiple methods available for assessing financial success, one of which is the return on sales (ROS). ROS quantifies the company's earnings in relation to its sales. The metric known as return on assets (ROA) assesses an organization's ability to effectively utilize its assets, whereas return on equity (ROE) provides insight into the returns that investors receive for their investments (Muya, 2017).

The banking environment is relevant to the discussion on banking regulation. Before the 1970s, when banks were functioning in a stable environment and focusing on a restricted range of businesses, the need for managerial control was less of a concern (Billings & Capie, 2004). The business environment has developed since the 1970s, problems of credit risk, guaranteeing depositors' money appear, leading to greater market risk, and hence, the Basel Committee was established in 1974.

Understanding the dynamics of contagion across financial institutions is the primary goal for regulators and policymakers who want to promote financial stability and avert financial catastrophes (Ballester *et al.*, 2016). In 1988; Basel I mandated that banks must keep at least 8% of their total assets as capital to protect themselves from credit risk; this has raised the relevance of the capital adequacy concept and its evolution in this context. However, Basel I failed to define how much capital banks should have. Subsequently, in 2001, Basel II rules were developed to define the capital adequacy concept, assure the quality of controlling systems, and keep the market discipline in place (Gordy & Howells, 2006).

The quality of banking assets has become increasingly important. Following the 2008 financial crisis, a number of flaws in the Basel II rules and norms surfaced; these included issues associated with high-risk investments, risk management operations, asset assessment, disclosure and transparency, stress testing and liquidity management, as well as capital adequacy and capital sufficiency (Sbeiti & Alqatan, 2021). Based on the inadequacies of Basel II, Basel III standards and norms were formulated in 2010. The Basel IV implementation deadline of 1 January 2023 is quickly approaching. Basel IV introduced new standards for ‘credit risk’, ‘operational risk’, and ‘a credit valuation adjustment’ under part one (Batten & Vo, 2019). Part two comprises the newly introduced concept of ‘output floor’, coupled with revisions to the definition of the leverage ratio and its application to global systemically important banks. A revised market risk framework had already been largely finalized under part two. Presently, the banks have raised concerns regarding the application of the ‘output floor’ at a consolidated and solo level, in addition to the elements of the capital stack to be considered for the output floor (Dibra & Bezo, 2021)

Liquidity measurements establish a business's capacity to meet its financial obligations when they arise (Maswadeh, 2021). The majority of banks utilize ROA as a metric to evaluate their performance, as it provides investors with insight into the extent to which the bank is able to transform its invested capital into net income. The current study will measure and determine FP based on ROA. This study employed the metrics of ROA and ROE to assess the FP of banks in Kenya. The ROE ratio is a financial metric used to assess the profitability of an organization (Dibra & Bezo, 2021). It is calculated by dividing the total net income generated by the company by the shareholders' equity. The ROE metric evaluates the performance of a company by indicating the level of profitability achieved through the utilization of shareholders' invested capital.

1.1.3 Commercial banks in Kenya

According to Adam (2013), commercial banks play a significant role in the global financial system across the majority of nations. The primary functions of financial institutions, including the mobilization of deposits, provision of project funding, and implementation of global and domestic policies, have a significant impact on a nation's overall economic growth (Dibra & Bezo, 2021).

In Palestine, the monetary regulatory authority has been diligently and persistently trying to modernize the country's financial sector in order to enhance its usability. Consequently, the financial system in Palestine has successfully achieved stabilization, so serving as a stimulus for substantial economic growth through the reduction of bank loans (Sariez & Germano, 2020). Stress tests primarily target European banks, particularly the largest and most significant ones in the region. The European Bank Authority (EBA) conducts stress tests in Europe, which were initially

mandated by the Committee of European Banking Supervisors (CEBS) in 2009, shortly after the onset of the crisis, with the aim of averting further losses and managing the financial system.

The Central Bank of Kenya devises and executes policies, overseeing and enforcing the soundness of the banking industry. The banking industry is regulated by the banking legislation. By the conclusion of 2019, there existed a total of 42 officially registered commercial banks. In 2015, Dubai was placed under receivership and subsequently underwent liquidation. Chase bank also went into a bank run in 2016. Following the acquisition of Giro Bank by DTB Bank, I&M Bank took over Habib Bank. In 2019, the merging of NIC and CBA resulted in the formation of NCBA. According to CBK (2019), KCB acquired a 100% stake in National Bank in 2019.

The management of commercial banks in Kenya is governed by several legislative acts, including the Companies Act (Cap, 486), the CBK Act (Cap, 491), the Banking Act (Cap, 488), and several rules imposed by the CBK. As per the 2016 supervisory report by the CBK, there are presently 42 licensed commercial banks and one home financing firm. Among the 43 institutions, 39 belong to the private sector, including commercial banks and the mortgage finance institution, while the Kenyan Government has majority ownership in the other 3 commercial banks (Dibra & Bezo, 2021). A total of 25 out of the 39 mortgage finance institutions are owned by local entities, whereas 14 are owned by foreign entities. The oversight of financial performance and risk management in Kenya falls under the purview of the CBK. To achieve this, the bank develops and implements fiscal guidelines that promote the solvency, liquidity, and appropriate operations of commercial banks in the country (CBK, 2016).

The Kenyan banking sector has been experiencing a concerning rate of inability to repay their debt. According to the CBK's latest report in June 2022, the total amount of loan defaults has exceeded Ksh514.4 billion, marking the first instance in history where this figure has surpassed half a trillion shillings (CBK, 2022). Moreover, there was a gradual increase in the amount of non-performing loans within the banking system, rising from Kshs. 436 billion in 2020 to around Kshs. 460 billion in 2021. The loan loss provisions in 2021 amounted to Kshs. 58.97 billion, representing an increase from Kshs. 110.30 billion in 2020. The data indicates a consistent upward trend in default rates, with values of 8.923% in 2019, 10.617% in 2020, 11.61% in 2021, and 14.1% in 2022 (CBK, 2022). According to the annual report of Equity Bank for the year 2022, there was a notable rise in credit losses compared to the preceding data (Equity Bank, 2017). The liquidation of Dubai Bank, Prudential Bank, Trust Bank, Euro Bank, and Charter House Bank may be attributed to the utilization of credit risk stress testing indicators.

Loss given default is a crucial factor in the calculation of minimum capital for institutions using the Internal Ratings-Based (IRB) approach. Since the incorporation of the Internal Ratings-Based (IRB) approach into the Basel framework in 2004, banks have been able to internally calculate the Loss Given Default (LGD) for their exposures. The text "(BCBS 2006)" remains unchanged. Despite more than 15 years of active IRB banks, there is still no established market consensus on the matter. One factor contributing to this is because the internal models are constructed with a specific focus on the institution, rendering the solution non-transferable. IRB methodology is strictly controlled for the same reason. Supervisors permit banks to utilize their own tools and analytics, but they must also guarantee that the resulting models are strong and reliable (Schuermann 2004).

The IRB approach follows a linear development model, often known as a life cycle, for risk components as outlined by the supervisor (EBA 16/2017). The internal systems of the institution for assessing risk metrics. This thesis will focus on the early stage of the cycle, which entails the development of a model. Within the framework of an authorized Institutional Review Board (IRB) bank, all processes are deemed equally important as supervisors assess institutions as a cohesive entity. The IRB method adheres to a thorough framework for evaluating risks, as outlined in Regulation (EU) No 575/2013, namely in article 143. Internal iteration of risk parameter estimations. EBA 16/2017, 11 Development of a model Adjustment Verification conducted by a separate entity Authorization from a supervisor Integration with internal workflows Utilization of risk parameters Evaluation of approximations Eighteen Prior research on Loss Given Default (LGD) has primarily focused on corporate loans and bonds, with limited attention given to retail lending. One factor contributing to this is the accessibility of company data. For instance, the annual financial reports of companies are accessible to the public, yet the personal information of private persons is not readily accessible (Leow 2012). The internal ratings-based system was not implemented until 2004, as part of Basel II (BCBS 2006). When it comes to bank capital regulation, loss given default (LGD) is a complex issue that involves estimating LGD for both performing (non-default) loans and in-default loans. In order to accurately assess the entire amount of losses, it is necessary to include the best estimate of expected losses for loans in default, resulting in a total of three loss estimates.

Gurtler & Hibbeln (2013) distinguish between LGD models for defaults and non-defaults based on post-default information. The primary determinants are the

duration of default and the amount of cash flows recovered subsequent to default. According to the definition, performing loans do not include this information and it is not taken into account in the proposed LGD model. ELBE models are also utilized for estimating losses on loans that are currently in default, which is not within the scope of this thesis. Despite their similarities, research publications on these models are intriguing since EBA (16/2017, 35) highlights the need of ensuring that the shift of a loan from performing status to defaulted does not lead to discrepancies or abrupt changes in LGD estimates.

According to Basel II The Basel Accord was intended to undergo gradual development, resulting in the release of a more sophisticated framework known as Basel II in 2004 (BIS 2021). The framework comprises three fundamental components, known as pillars: enhanced minimum capital requirements, supervisory review mechanism, and market discipline (BCBS 2006). The Basel Committee sought to link risk weights to the real exposures of banks in order to prevent regulatory arbitrage opportunities, as highlighted by Jones (2000). A paradigm shift occurred, transitioning from borrower-centric attention to risk assessment based on third-party credit rating organizations. The source cited is Herring (2018). The first pillar holds the utmost significance for this thesis. The document comprises regulations and systematic approaches for determining the minimum amount of capital needed to cover credit, operational, and market risks. The text "(BCBS 2006)" remains unchanged. This capital must be in position to mitigate unforeseen losses. The sum of risk-weighted assets takes into account all three risks, which are individually calculated and then combined using a specific method. The reference is to the work of Atkinson and Blundell-Wignall in 2010. Supervisors began to perceive the simplicity of the original Basel Accord as a weakness. Basel II

expanded the range of risk weights that banks could use and permitted them to utilize their own internal models for credit risk assessment. This results in increased regulatory complexity and less market transparency. The source cited is Herring (2018). The IRB methodology is a more intricate strategy that can result in risk weights that are more responsive to risk. In the Internal Ratings-Based (IRB) approach, banks are obligated to calculate the Probability of Default (PD), Loss Given Default (LGD), and Exposure at Default (EAD) for each individual loan. (Atkinson & Blundell-Wignall, 2010) When comparing it to the usual model 12, it is evident that the computation of risk-weighted capital is much more demanding and resource-intensive under the IRB approach. This is because the IRB technique does not rely on externally provided risk-weights.

Both the standardized and IRB approach are fundamentally flawed. The IRB technique may be susceptible to deliberate credit risk modeling in order to circumvent stringent capital requirements. However, the conventional method depends on external credit rating agencies, which might be problematic due to the potential for underestimating risks in certain assessment systems. The source cited is Herring (2018). Since risk-weights only consider the risk of individual credits and not the overall portfolio, they do not factor in portfolio diversification. According to Atkinson & Blundell-Wignall (2010), this conduct fails to incentivize portfolio diversity, which in turn reduces risks. Additionally, they perceive the regulatory environment as pro-cyclical since credit policies tend to be lenient during favorable economic conditions and become more stringent during periods of economic downturn.

Basel III Following the financial crisis that occurred between 2007 and 2009, the Basel Committee on Banking Supervision (BCBS) aimed to enhance the Basel

framework, resulting in the publication of the Basel III framework. It was a direct reaction to the issues faced by banks that led to the financial crisis, including excessive leverage, insufficient liquidity buffers, and inadequate governance. Basel III has undergone multiple revisions since its first publication, with the most recent one occurring in 2019. The year is 2021. A novel paradigm improves the risk coverage of banks and reinforces minimum capital ratios by incorporating multiple additional reserve buffers. The Basel Committee has established rules for liquidity risks, including the liquidity coverage ratio and net stable funding ratio (Nguyen, 2019). The former ratio emphasizes short-term resilience, while the later ratio is more oriented towards longer-term outcomes. The text (BCBS 2011) remains unchanged. The IRB approach to minimum capital requirements, as adopted in Basel II, has not undergone any significant modifications. This finding was unexpected, considering that previous research has identified conceptual weaknesses in the IRB models. A significant issue arises from the inconsistencies in risk weights assigned by banks to obligations with identical characteristics.

Stupariu et al. 2019) The existing regulatory procedures can result in varying capital requirements for the same borrower in two separate banks. According to Stupariu et al. (2019), the rule for validating IRB models is weak. The historical validation data set should have a sufficient length of at least 13 in order to encompass a diverse variety of observations. According to the authors, this data set is seldom derived exclusively from internal data. In order to meet the criterion, institutions combine internal data with external data. Utilizing external data in the IRB technique contradicts its fundamental ideology, because combining data from several sources might result in estimating mistake, perhaps resulting in insufficient capital reserves.

The Basel Committee introduced major revisions to the Basel III framework in 2017. These improvements are commonly referred to as Basel IV, while the Basel Committee on Banking Supervision (BCBS) considers them to be the completion of reforms to the current Basel framework. The recent regulatory updates encompass the use of improved standardized and IRB approaches to credit risk, modifications to the market risk framework, and the inclusion of interest rate risk in the banking book. The abbreviation BCBS stands for Blue Cross Blue Shield, and it refers to the year 2017. In their study, Koch et al. (2017) calculate that the implemented modifications will have a substantial and positive effect on the capital of banks. According to the authors' estimation, European Union banks will require an additional 120 billion Euros of capital, without considering any measures taken by the banks to reduce this amount. The proposed modifications will be implemented gradually over several years, spanning from 2023 to 2028 (BCBS 2017).

As per the Central Bank of Kenya (CBK) report from 2022, the Nairobi Securities Exchange in Kenya consists of a total of 12 commercial banks that are listed. The Housing Finance business of Kenya is the only company in Kenya that provides mortgage finance. The Central Bank of Kenya (CBK) announced the prudential guideline on stress testing for individual banks that subscribed in 2013. Financial institutions are obligated to periodically perform stress tests and promptly submit the findings to the Central Bank of Kenya (CBK) in order to adhere to regulatory directives and constantly execute robust contingency plans to protect banks from potential risks and vulnerabilities. Nevertheless, the IMF's most recent mission in March 2014 suggested reforms aimed at increasing stability and achieving better results, including the adoption of regular stress testing. This discovery emphasizes the significance of implementing effective risk management methods in the banking

industry, thus requiring a research study to evaluate the influence of credit stress testing on the financial performance of commercial banks in Kenya.

1.2 Research Problem

An efficient and resilient banking system is crucial for fostering economic growth and stability, as it serves as the foundation of a nation's financial sector. Banks are essential in ensuring the stability and growth of the economy in the financial services industry (Koch & McDonald, 2014). Commercial banks play a crucial role in the financial services industry by maintaining positive economic stability and growth, as stated by Koch and McDonald (2013).

It is necessary for them to possess profits that can be anticipated or foreseen (Faris, 2014). Nevertheless, the volatile financial performance of commercial banks from 2013 to 2022 is concerning. The return on equity (ROE) of Equity Bank decreased from 47.2% to 37.2%, Absa Bank from 30.4% to 26.4%, Stanbic Bank from 25.1% to 21.2%, and Bank of India from 20.15% to 18.0%. The dropping ROA for KCB 5.18%-3.12%, Equity bank 2.9%-2.6%, DTB Bank 4.94%-3.64%, Sidian Bank 3.21%-0.30%, Jamii Bora bank 1.52%--3.10%, and Paramount Universal Bank 1.24%-1.11% (CBK 2022)

The International Monetary Fund estimates that major U.S. and European banks lost over \$1 trillion due to toxic assets and bad loans following the financial crisis (IMF, 2017). The decline of Crane Bank Ltd in Uganda can be attributed to a significant increase in the prevalence of non-performing loans, as reported by the Central Bank of Uganda in 2020. Kenyan banks have experienced a fall in profitability, as evidenced by the National Bank of Kenya (NBK) declaring a profit of KES 177

million for the financial year ending on December 31, 2020. This figure signifies a decline of 26.2% compared to the KES 675 million recorded in 2019.

Financial difficulties are indicated by the liquidation of Dubai Bank, Prudential Bank, Trust Bank, Euro Bank, and Charterhouse Bank and the merger and acquisition deals which was accelerated by the Basel III requirement in which the merger of Kenya Commercial Bank and the Nation Bank of Kenya was orchestrated signaled financial distress in the banking sector. Moreover, as of June 2022, the total amount of bank loans stands at Ksh514.4 billion, with loan defaults exceeding the milestone of half a trillion shillings, marking a significant milestone in history (CBK, 2022).

Equally the stock of non-performing loans in the banking system continued to edge upwards to approximately Kshs. 460 billion in 2021 from Kshs. 436 billion in 2020. In 2021, the loan loss provisions stood at Kshs. 58.97 billion compared to Kshs. 110.30 billion in 2020. Trends in default rate shows continuous rise in defaults in 2019 at 8.923%, 2020 at 10.617%, 2021 at 11.61%, 2022 at 14.1% (CBK, 2022). Tanoue, Kawada and Yamashita (2017) found Loan loss had a significant effect on performance of firms in Japan. However Offiong and Egbuka (2017) noted insignificant negative relationship between loan given defaults and bank performance. Furthermore research on stress testing on banks was conducted by Bushman and William (2015) on credit risk stress testing of Commercial Banks in Tunisia focused on distinctive risk handling strategies, Kanno (2015) conducted a study on loan loss provision as Wachira (2017) established the effects of credits risk management practice on loan performance of commercial banks in Kenya using Nyeri County as case study. The current study was to evaluate the effect of credit risk stress testing and FP of commercial banks in Kenya. Issackow (2022) conducted

a study on credit risk testing on a 5 year period unlike the current study that covered 10 year period. In summary, the study sought to answer the question what is the relationship between credit risk stress testing and performance of banks? The outcome of the study will be very useful in informing the policy makers on how to effectively minimize credit risk in commercial banks.

1.3 Objectives of the Study

1.3.1 General Objectives

The main objective of this study was to examine the effect of credit risk stress testing and financial performance of Commercial Banks in Kenya.

1.3.2 Specific Objective

The study was guided by the following specific objectives:

- i. To establish the effect of expected loan loss and financial performance of Commercial Banks in Kenya.
- ii. To determine the effect of Probability of Default and financial performance of Commercial Banks in Kenya.
- iii. To establish the effect of Exposure at Default and financial performance of Commercial Banks in Kenya.
- iv. To determine the effect of loss given default and financial performance of Commercial Banks in Kenya.
- v. To determine the moderating effect of the firm size and financial performance of Commercial Banks in Kenya.

1.4 Hypothesis of the Study

H₀₁: Expected loan loss does not significantly affect financial performance of Commercial Banks in Kenya.

H₀₂: Probability of Default does not significantly affect financial performance of Commercial Banks in Kenya.

H₀₃: Exposure at Default does not significantly affect financial performance of commercial banks in Kenya.

H₀₄: loss given default does not significantly affect financial performance of Commercial Banks in Kenya.

H₀₅: Firm size does not significantly affect the relationship between credit risk stress testing and financial performance of commercial banks in Kenya

1.5 Significance of the Study

1.5.1 Policy making

This study is of help to the government of Kenya on formulation of banking sector credit policy through the act of parliament. This will lead to a healthy financial situation right from financial lenders. Through the findings of the study, the government of Kenya will be able to analyze the credit risk stress testing.

1.5.2 Commercial Banks

The study results will assist financial institutions in assessing the importance of credit risk stress testing and its impact on financial performance. This phenomenon will push banks to recognize the importance of credit management.

This study aims to offer bank managers a valuable resource for making informed decisions regarding credit risk stress testing. This study aims to offer significant insights into the benefits and drawbacks associated with the implementation of credit

risk stress testing. A positive correlation shown in the results suggests that managers ought to make actions that result in adherence to credit risk stress testing.

1.5.3 Knowledge addition

The study will enhance the researcher's understanding of credit risk stress testing, FP, and commercial banks by offering ideas for enhancing this practice.

1.6 Scope of the Study

The probe was restricted to all commercial banks in Kenya. The study focused on performing credit risk stress testing and assessing the financial performance of officially recognized commercial banks in Kenya. The main elements of this research study encompassed projected loan loss, likelihood of default, exposure at default, and loss given default. The study explicitly investigated the influence of many elements on the financial performance of banks, such as the expected loan loss, the probability of default, the exposure at default, and the loss given default. Data was gathered from 2013 to 2022 in order to address the declining return on equity (ROE) seen over that period. According to CBK (2019), there were initially 42 registered banks with commercial licenses. However, four banks were excluded from this count due to their closure or change in status. Chase Bank and Imperial Bank ceased operations, Dubai Bank also went out of business, and Charter House Bank was placed under statutory administration. Consequently, the current target audience consists of 38 commercial banks. The data was acquired via CBK supervisory reports and the secondary data of individual bank financial statements. The banks that discontinued their operations throughout the study period were excluded from the data.

1.7 Limitations of the Study

The study faced several constraints. The study utilized existing data in determining the ratios. Secondary data is inflexible and relates to past events. Secondary data may not provide a reliable depiction of the future due to potential unidentified errors, absence of standardization, and insufficient data. Therefore, only authorized, audited, and published data should be used as the primary source. Additionally, the study was specifically done on registered commercial banks in Kenya. Therefore, the findings cannot be generalized to other institutions in the economy due to their inflexibility.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter aims to conduct a comprehensive assessment and critical analysis of the current literature pertaining to various aspects that define the credit stress testing level of financial institutions. Specifically, it focuses on the performance of commercial banks within the context of credit stress testing. The objective of this chapter is to conduct a comprehensive literature analysis on the utilization of credit stress testing as a risk management tool within the banking industry, as well as to examine the impact of credit stress testing on the FP of banks. The chapter aims to delineate the study's theoretical framework, which serves as the lens through which it examines the subject.

2.2 Theoretical Review

The theories guiding the study were: Portfolio Theory, information asymmetry theory and credit risk theory.

2.2.1 Credit Risk Theory

This theory was introduced by Robert Merton (1974). It explains the default model concept. It explains credit risk of an entity by characterizing company equity as call option for its assets. It explains credit risk exposure. A borrower may not be able to pay back the loan; this may lead to the lender losing the interest tied to the loan or the entire principal. The lending firm has to assess the borrower's ability to repay the loan. By looking at his or her loaning history, the capital in his ownership, the borrower's ability to repay the loan and the collateral to be used to cater for the loan in case of inability to pay back the loan (Aebi, Sabato & Schmid, 2012).

Credit risk is very essential for investors, banks and obligation issuers. It's subjected at the same time to economic trends, situation of the business sector, political stability and to events related to the life of a company. It decreases in phase of economic expansion, because the considerable earnings by companies during this period reduce their probability of failure. On the contrary, it increases in period of recession, because of the decreasing company earnings. Credit Risk, thus, should be managed to limit risk as it represents banks principle income generating (Sangare, 2017).

Wasike (2019) indicates that credit underwriting is applied in financial institutions with the objective of having a quality credit portfolio which is crucial for the bottom-line of the company. It helps in reducing impact of asymmetric information in credit underwriting by employing underwriting techniques such as the five C's of credit appraisal. This study used the credit risk theory to explain the effect of credit risk stress testing and performance of commercial banks in Kenya.

The banking sector has seen a sharp decline in the ten years between 2008 and 2018, with organizations that had been operating profitably in the past declaring large losses as a result of credit risk (Mukhtarov, Yuksel, & Mammadov, 2018). The credit risk exposures in the banking industry have negatively impacted lending, interest rate positions, and derivative exposures that may or may not have been taken to mitigate balance sheet risk (Olusanya, Oyebo & Ohadebere, 2012). In response to this, commercial banks have undertaken efforts to enhance their credit risk detection procedures and risk control systems in order to mitigate the potential impact of borrower defaults (Zhong, 2013).

Given the significant reliance on credit in modern banking operations, it has become a crucial factor in determining the performance of banks due to the large amount of activity that revolves around credit. Therefore, scholars and policy-makers are nonetheless interested in the performance of portfolios. (Abraham & Anifowose, 2020) stress the need of having financially strong institutions as a fundamental element for maintaining a high standard of asset quality throughout time. The primary function of financial institutions is to provide credit, which in turn exposes them to the risk of Nonperforming Assets (NPAs). This risk is mitigated by the implementation of a provision rate, which directly impacts the institution's capital (Area, 2016). Financial organizations must exercise prudence while extending loans. An in-depth analysis of lending procedures is necessary to ensure the adoption of sound practices throughout the industry (Saba, Kouser, & Azeem, 2012).

The field of Credit Risk has undergone changes over time, incorporating new ideas that involve the evaluation and examination of a portfolio (Egesa, 2009). Various theories have emerged to both question and confirm the performance of portfolios (Tejvan, 2013). These theories highlight the impact of powerful international financial institutions on local financial institutions, which in turn amplifies the spread of non-performing assets.

Gahamanyi *et al.* (2009) argue that the deregulation of the financial system led to more investment, but it also resulted in credit issues due to insufficient risk management. Moreover, Longstaff (2010) indicate that deregulation is the main cause of the mismatch between credit supply and demand, together with inadequate risk management methods, which significantly contribute to the failure of financial institutions. The study was related to various papers on credit risk, studying both quantitative and qualitative aspects against the background that credit risk has

become one of banks' main activities and essentially one of banks' core competences (Hellwig, 2010). The research that study qualitative dimensions of credit risk include Ellul and Yerramilli (2013), who link organizational risk controls and risk taking at bank holding level and Fahlenbrach *et al.* (2012), who show that persistence in (bad) risk culture make banks sensitive to crises.

Credit risks fluctuate over the business cycle due to multiple factors. For instance, Bekaert *et al.* (2013) present evidence indicating that this phenomenon is influenced, at least partially, by alterations in risk aversion that are associated with shifts in monetary policy. Furthermore, the "balance-sheet channel" can be utilized by monetary policy and other shocks to alter the distribution of wealth, which can result in changes in spreads within the general equilibrium. However, there is significant empirical data indicating that lending requirements fluctuate across the business cycle, which in turn leads to variations in spreads.

Asea and Blomberg (2014) analyze quarterly data from two million commercial loans spanning the time period of 1977 to 1993. They observe consistent trends in lending requirements. Researchers have discovered that lending requirements tend to decrease and loan terms become more favorable for borrowers during periods of economic growth, while they become stricter during economic downturns. Similarly, Bassett *et al.* (2014) report that lending requirements in the U.S. began to loosen in late 2003 and this relaxation remained until early 2006, followed by a period of tightening that began in early 2007. Dell'Ariccia *et al.* (2012) present more data indicating that the loosening of credit criteria, prompted by a rise in loan demand, played a role in the economic boom and subsequent financial crisis of 2007-2009.

An asset of models refers to a progression in this category where the loss, based on default, is accurately determined externally. According to Kipngetich and Muturi (2015), default can manifest at any point during the whole duration of a corporate bond, rather than solely upon maturity. This theory holds significance in the context of the study as it enables banks to comprehend the level of default exposure and the likelihood of default. Consequently, banks can provide loans to creditworthy individuals who are less likely to default, thereby safeguarding their credit portfolio and contributing to the establishment of a robust financial system. The primary focus of this study revolves around the theory that market risk plays a crucial role in determining loan loss provision, loss by default, default probabilities, and exposure at default. The size of a bank dictates the selection of investment portfolios, and hence, a larger portfolio is indicative of larger firms and this make credit risk theory the main theory.

2.2.2 Information Asymmetry Theory

The theory of asymmetric information was initially elucidated by Akerlof in the 1970s. The idea posits that the presence of information asymmetry is evident during the evaluation of banking credit applications. This theory elucidates the scenario in which crucial information remains undisclosed to all parties involved in a transaction, hence necessitating the implementation of a suitable credit risk testing methodology.

The establishment of clientele power in loan management is facilitated through the implementation of assessment procedures (Keitany, 2013). Zik and Ilu (2018) elucidate the phenomenon in which the involved parties in a transaction lack comprehensive knowledge of crucial information. This analysis will effectively determine the likelihood of loan default and provide insights into the projected loan

loss. The theory posits that when financial institutions perceive information asymmetry, they face two primary challenges: moral hazard, which involves monitoring the behavior of entrepreneurs, and adverse selection, which occurs when the firm makes errors by lending to the wrong individuals.

Financial markets demonstrate asymmetric information in transactions where one party possesses more information than the other, enabling them to make more informed decisions. In the market, the party that possesses more information on a given item being transacted has an advantage in negotiating the most favorable terms for the transaction compared to the other side. The party with less knowledge about the specific object being transacted is consequently in a position to make either the correct or incorrect decision regarding the transaction. The occurrence of adverse selection and moral hazards has resulted in a substantial number of loan defaults in commercial banks (Akmel, 2019).

The transaction cost theory offers a significant paradigm for decision-making pertaining to the vertical borders of organizations. Loan loss and default will be evaluated based on transaction expenses. According to Nsambu (2014), a transaction occurs when a service or good is transferred between interfaces that are technologically separate. As one activity concludes, another begins. Ali (2015) asserts that suppliers possess a competitive advantage over lenders due to their ability to access information regarding the creditworthiness of their clients. Suppliers possess the capability to oversee and guarantee complete remittance of debts from their clients. Suppliers have a cost advantage over traditional lenders due to these benefits.

According to De Moraes (2008), this theory posits that it is imperative for banking institutions to conduct credit risk assessment as a means of screening borrowers. In

accordance with comparable information theory, the acquisition of dependable data from potential borrowers assumes paramount importance in facilitating influence screening. This approach is significant to the study since it will help in knowing members rather borrowers loan history to be able to determine if one can pay or is a non-payer allowing the issue of credit to modest individuals thus better-informed decisions. However this theory can be criticized on basis that financial institutions may fail to gather borrowers' information accurately or the borrower may intentionally provide false information that may be wrong basis leading to loan defaults. This theory addresses the credit risk testing approach on probability of default as a study variable. When information is given in the right manner default cases will be avoided and loan loss won't arise.

The theory has faced criticism on multiple grounds. Cowgill and Tucker (2019) highlight that there are individuals that possess knowledge and understanding in credit markets, and are not uninformed. Banks actively seek out consumers to provide loans to, leveraging their expertise to understand and fulfill their customers' specific financial requirements. Tchamyu (2019) argues that models that rely on the ignorance of one party are faulty due to the presence of information provided by third parties, such as customer reports.

2.2.3 Portfolio Theory

Harry Markowitz (1952) formulated this theory. It explains the risk and return aspects of a portfolio. The current portfolio theory posits that the risk and return characteristics of an investment should not be considered in isolation, but rather assessed in relation to its impact on the entire risk and return of the portfolio. In other words, an investor has the ability to create a portfolio of several assets, which can yield higher returns while minimizing risk.

According to Markowitz, each asset has its own risk/return and by quantifying risk, an investor can design a portfolio that maximizes returns at a given risk level. Here he introduces the two main variables that will be used in this study: risk and return. Understanding the relationship between the two is fundamental to a successful investment strategy. Markowitz proposes that the reduction of risk can be achieved by selecting assets that have less than perfect positive correlation with each other. This means that when one asset performs poorly, the other asset may not necessarily exhibit the same behavior (Chen *et al.*, 2009). Portfolio performance is defined as the ability of a financial institution to extend credit and pursue new opportunities. According to Potvin and Hasni (2014), this performance is measured by factors such as non-performing loans (NPL) and provisions for bad loans, which can have a detrimental effect on the institution's income statement or capital position. Multiple studies have assessed performance by examining Nonperforming Assets (NPA), Loan Loss provisions, Portfolio at Risk, and profitability measures such as Return on assets and Return on equity (Kjosevski & Petkovski, 2017). According to scholars such as Afriyie and Akotey (2012) it has been confirmed that NPL and NPA are used interchangeably because they have the same meaning. However, they have additionally indicated that loans that satisfy the criteria of being overdue for 90 days or more are categorized as non-performing loans (NPL) or non-performing assets (NPA).

However, other researchers such as Alexander and Pezier (2003), Rajeev and Mahesh (2010), and Karki (2019) argue that certain countries consider delays of more beyond 30 or 60 days as Non-Performing Assets/Non-Performing Loans (NPA/NPL). In Uganda, there is a 90-day timeframe during which provisions are imposed at a rate of 100% to loans that exceed 90 days.

The success of portfolios in numerous financial institutions has been linked to various elements, including credit risk management, interest rates, market circumstances, the institutional level of risk such as knowledge and expertise, risk perception, and ethics (Louzis *et al.*, 2012). Academics like Antunes and Gonzelaz (2015) emphasize the significance of objectivity in attaining institutional objectives through the utilization of the Risk Management Framework. The framework stresses the significance of knowing the internal and external environments, establishing goals, carrying out risk analysis, risk treatment, and risk control procedures, communicating and exchanging information, and monitoring. Credit Risk Management aims to mitigate the lending institution's risk adjusted pricing rate of return by maintaining the risk within acceptable thresholds.

Margrabe (2007) utilized this idea, which asserts that the application of current portfolio theory to credit risk has been slow, despite credit risk being the primary risk faced by most commercial banks. In addition, Kairu (2009) employed this theory and discovered that corporations recognize the adverse effects that credit concentrations might have on loan performance. As a result, many institutions have adopted quantitative methodologies for assessing or evaluating credit risk. Furthermore, the industry is making significant progress in developing tools that assess credit risk within the context of a portfolio. Furthermore, it has been determined that the sector is employing credit derivatives to effectively manage risk while simultaneously preserving client relationships. Portfolio quality ratios and productivity indicators have been advocated. The combination of these technologies has significantly accelerated progress in the management of credit risk within a portfolio framework.

Harry Markowitz (1952) was the pioneer of portfolio theory. Banks have effectively implemented contemporary portfolio theory in the context of market risk. According to the portfolio theory, banks have typically employed an asset-by-asset strategy for managing credit risk. Each bank employs a different strategy, but generally, this approach entails regularly assessing the creditworthiness of loans and other credit exposures, assigning a credit risk rating, and consolidating the findings of this research to determine the anticipated losses of a portfolio (Omondi, 2016). Markowitz (1952) posits that the fundamental basis of the asset-by-asset method lies in the implementation of a robust loan evaluation and internal credit risk assessment framework.

Muhindi and Ngaba (2018) contend that the implementation of a loan review and credit risk assessment system allows management to promptly detect alterations in individual credits or portfolio trends. The management can rapidly make necessary adjustments to portfolio strategies or enhance credit supervision based on the outcomes of problem loan detection, loan review, and credit risk rating system management. Critics contend that while the asset-by-asset approach holds significance in managing credit risk, it falls short in providing a holistic viewpoint on portfolio credit risk. Within this particular context, the term "risk" pertains to the possibility of real losses exceeding projected losses. Hence, in order to enhance their understanding of credit risk, financial institutions are progressively seeking to supplement the asset-by-asset methodology with a quantitative evaluation of their portfolio through the utilization of a credit model. Banks are making more efforts to overcome the limitations of the asset-by-asset method in accurately measuring unforeseen losses by adopting a portfolio strategy.

Muya (2017) posits that the portfolio operates under the fundamental assumption that investors often aim to optimize their investment returns while maintaining a certain degree of risk. It offers a structure for defining and quantifying investment risk, as well as establishing connections between risk and anticipated returns. A limitation of the asset-by-asset method lies in its challenge to accurately detect and quantify concentration. Concentration risk pertains to the augmented portfolio risk that arises from heightened exposure to a borrower or a cluster of borrowers that exhibit correlation. The conventional portfolio methodology employs two distinct techniques, specifically the expert method and credit scoring models. In the expert system, the branch lending officer is responsible for making the credit decision. The choice to approve loans is mostly influenced by the individual's skill, judgment, and careful consideration of specific factors. The traditional approach to assessing the creditworthiness of debtors is to rely on the intuition or heuristics of the loan officer. While heuristic decision making does not possess an intrinsic quality of arbitrariness or unreasonableness, it is susceptible to the impact of individuals' vast experience, which enables them to promptly identify solutions without undertaking a rigorous analytical procedure (Muya, 2017).

The 5Cs (Character, Capacity, Capital, Collateral and Conditions) of credit are consistently utilized by financial institutions to assess the credit worthiness of potential consumers. Adan, (2013) posits that the 5Cs of credit comprise the following elements: capital, capacity, conditions, character, and collateral. The purpose of character evaluation is to determine the propensity and drive of consumers to fulfill their debt repayment obligations. The borrower's ability to both acquire and repay is referred to as their capacity. The ability of the borrower to repay the loan will also be contingent upon prevailing economic conditions.

Typically, a bank will want collateral as a kind of security for the loan. The capital requirement of a firm serves as an indicator of the borrower's financial net worth. The loan officer has the ability to assess numerous factors, but it is necessary to consider these five Cs in addition to the interest rate. Statistical and mathematical methods are employed in credit scoring models to estimate the chance of default (Bachmair, 2016).

2.3 Conceptual Review

2.3.1 Credit Risk Stress Testing

Credit risk stress testing is a method used to assess the impact of a modification to a portfolio resulting from very plausible and extreme events. This is achieved by considering the anticipated loan loss, the likelihood of default, the loss incurred due to default, and the probability of default. Credit risk assessment in the banking industry relies on factors such as anticipated loan loss, default profitability, default exposure, and loss incurred due to default. These factors are crucial in determining the severity of insolvency issues for microfinance institutions (Buncic & Melecky, 2013).

According to Ong (2014), credit risk stress testing is a “what if” exercise. It measures the sensitivity of a portfolio, an institution, or a financial system to exceptional but plausible shocks. The answer involves identifying relevant risk drivers; selecting the appropriate method or model; using that particular method or model to calculate the effects of large shocks; and interpreting the results correctly. Stress testing methods and models can be categorized into three main approaches, which are accounting-based, market priced-based, and macro-financial approach. Most stress test methods

aim to estimate the amount of extra capital needed or “hole” in a bank or banking system in the event of an adverse shock.

According to Goldstein and Sapra (2014), revealing the results of credit risk stress tests has the ability to strengthen market discipline, increase trust in the supervision process, and facilitate price formation by providing pertinent information to decision-makers. Nevertheless, if the credit stress test programs are inadequately designed or if the information presented lacks clarity, they could lead to subjective interpretations and exacerbate information asymmetry (Gaballo, 2016). Moreover, the information crowding-out effect refers to the situation when the revelation of credit stress test outcomes displaces other types of private information, including the information produced by the institutions undergoing the tests. The displacement can influence the price procedure (Goldstein & Leitner, 2022).

Previous research has predominantly focused on analyzing indirect measures, such as atypical stock returns and credit default swap spreads, in order to evaluate the informative nature of credit stress testing outcomes. The aforementioned research have primarily examined the time period in close proximity to the date of disclosure (Fernandes *et al.*, 2020). The views of market participants with different positions and interests in the information provided by credit stress testing may differ. Examining the overall market reaction may hide different reactions and does not allow for a precise assessment of whether such disclosure results in enhanced transparency.

The study facilitates the determination of the enhanced influence of publishing the credit stress test results on information asymmetry, notwithstanding the potential displacement of information. Among all the areas where transparency is important, we have a specific interest in obtaining information regarding banks' credit risk. The

study aligns with the primary literature (Abad *et al.*, 2020) in examining the information opacity resulting from variations among credit rating agencies in assigning credit ratings that share the same reference. These disparities arise when the agencies have different assessments of the credit risk of banks, which is a result of the inherent lack of transparency in the banking system (Kladakis *et al.*, 2020).

Dala *et al.* (2020) look at how the credit stress testing disclosure changed the discrepancy scores for Moody's and S&P in a study that is similar to credit stress testing. The study examined the credit stress testing conducted by banks between 2009 and 2015. It focused on the bond level and assessed the first bond ratings of bonds issued by the tested banks. The analysis was done over the 127 days following the publication of the credit stress testing results. The present study is comprehensive in various aspects. This study examines the impact of credit risk stress testing on the performance of commercial banks in Kenya.

Morgan *et al.* (2014) looked at 24 US banks (17 of which had been through at least one credit stress test program and 7 of which had never been tested) and 39 EU banks (24 of which had been through at least one credit stress test program and 15 of which had never been tested). Their results are interesting. The primary findings indicate that the release of credit stress testing data provides valuable information and impacts the transparency of the banking industry, with the most significant effect observed in the United States. This finding provides a rationale for the influence on the US stock market as described in the literature (Sahin *et al.*, 2020). After the credit stress testing results were published, we observed a decrease in the level of information opacity. This means that credit stress testing programs have enhanced the transparency of the US banking system. Although the banks that pass the stress test only exhibit minor changes in their transparency levels upon revealing the

findings of their credit stress testing, the most substantial decrease in transparency occurs in the banks that fail the test.

In contrast to the EU financial system, the revelation of credit stress testing results does not appear to reduce the lack of transparency in the evaluated banks. This finding is consistent with the research conducted by Petrella and Resti (2013), which shows that EU credit stress testing has minimal influence on the stock market. Additionally, Candelon and Sy (2015) also observe variations in the effects of credit stress testing programs in the banking sectors of the EU and the US. The various consequences of credit stress testing programs found in the two areas are linked to the significant disparities in the regulatory framework, the nature of the credit stress testing programs, the structural components of the banking systems, and the aims sought by regulators. This discovery is consistent with research that has emphasized the disparities between the European Union (EU) and United States (US) programs and their consequences for the impact of regulation (Niepmann & Stebunovs, 2018).

Bank opacity, as highlighted by Acharya and Ryan (2016) and Flannery et al. (2013), poses a threat to financial stability. This is because it obstructs the comprehension of banks' risk profile, financial well-being, and the possibility of crisis contagion for investors, regulators, and other stakeholders. Credit stress testing programs monitor the soundness of the banking system to increase investor trust, facilitate accurate risk evaluation, and encourage the dissemination of information to improve resilience and mitigate credit risk (Kok *et al.*, 2023).

Goldstein and Sapra (2014) examine the advantages and disadvantages of revealing credit stress testing results and its impact on stress testing. While credit stress testing can provide valuable insights that enhance transparency and responsibility, the

revelation of these results may incur additional expenses due to market and operational difficulties. Since the introduction of credit stress testing programs, there has been a noticeable need to evaluate their effects on the tested institutions, the banking system, and the financial markets (Acharya *et al.*, 2018).

Research on the informational value of credit stress tests primarily examines the impact of announcing credit stress testing programs and publishing credit stress testing results by analyzing abnormal returns in stock and credit default swap markets. While the primary results indicate that credit stress testing has informative content, they remain equivocal. Fernandes *et al.* (2020) and Morgan *et al.* (2014) in the United States, Alves *et al.* (2015), and Georgescu *et al.* (2017) in Europe have discovered that credit stress testing outcomes offer significant and pertinent information. Nevertheless, Sahin *et al.* (2020) and Petrella and Resti (2013) discover significantly less significant impacts, whereas Sahin and Haan (2016) and Lazzari *et al.* (2017) ascertain that credit stress testing outcomes do not yield any innovative insights.

Morgan *et al.* (2014) demonstrate that the 2009 tests conducted in the United States yield crucial insights, revealing that banks with larger capital gaps experience a more pronounced decrease in returns. Fernandes *et al.* (2020) observe favorable financial outcomes in 2009, whereas they observe unfavorable financial outcomes from 2011 to 2013. Financial institutions that successfully pass the tests get unusually high returns, whilst those that fail encounter negative returns. They observe a substantial rise in trading activity following the release of credit stress testing findings for the latter. Flannery *et al.* (2017) and Bird *et al.* (2020) have also discovered a substantial correlation between credit stress testing announcements and changes in prices and volumes. Flannery *et al.* (2017) examine the fluctuations in returns and discover that

the outcomes of credit stress testing offer pertinent information for institutions that have not undergone testing as well. In their study, Sahin et al. (2020) analyze the relationship between systematic risk and returns in the stock and credit default swap markets from 2009 to 2015. They discover aberrant behavior exclusively in the credit default swap market, while observing a decrease in systematic risk in the years following credit stress testing. In times of heightened uncertainty, the impact of the credit stress test is more pronounced compared to periods of macroeconomic stability.

Ahnert et al. (2020) examined and contrasted the market reaction to credit stress testing programs in the United States and the European Union. The study examines the contrasting effects of the CCAR-2009 and EBA-2011 initiatives in the two regions. Ahnert et al. (2020) examine the credit stress testing carried out from 2012 to 2017 and discover that both the European Union (EU) and United States (US) credit stress testing initiatives have a favorable effect on banks that successfully pass the test. Conversely, banks that fail the test experience negative abnormal returns. Dala *et al.* (2020) discover varied impacts on split ratings for credit stress testing carried out from 2009 to 2015.

Aktar Kamal and Mohsin (2012) conducted a stress test case study on ten commercial banks in Bangladesh. The study revealed that 80% of the examined banks demonstrated resilience to liquidity shocks, while only 50% of the banks were able to absorb equity shocks. The study conducted stress tests for credit, equity, and liquidity risk, following the guidelines established by Bangladesh Bank (Bangladesh Bank, 2010).

In their study, Hidayat *et al.* (2018) conducted a stress test specifically targeting the Indonesian Islamic banking industry. According to their research, Islamic banks in

Indonesia are not affected by losses as long as the Non-Performing Loan (NPL) rate remains below 8.5%. Additionally, it was discovered that if the industry maintains a constant Loss Given Default (LGD) rate of 40%, it will not face financial ruin as long as the Probability of Default (PD) remains below 9%. The report also determines that Islamic banks in Indonesia did not face any liquidity risk. The stress tests were categorized into three domains: profitability stress test, capital stress test, and liquidity stress test.

An organization is able to broaden the intellectual potential of unfolding events and fine-tune responses by conducting stress testing on timely applications. Omondi (2016) conducted a study on the impact of credit risk management on the performance of commercial enterprises in Kenya. The findings of the study indicated that effective credit risk management has a significant and beneficial effect on the performance of commercial banks.

2.3.1.1 Expected loan loss

This refers to the total value of the loan at the time a borrower defaults. It is a calculation used by the lending institutions to help them understand losses they may incur as a result of lending to a borrower that may default. This is operational through loan loss provision to total risk weighted assets as well as loan loss provision to total capital. Expected loan loss provision is the most significant accrual for the banking sector (Muya, 2017). Usually, the median ratio of LLP (Loan Loss Provision) to earnings range between 15% and 20% and the median ratio of LLP to stockholders' equity is around 10%. Under some estimation, LLP reflects changes in expected future loan losses (Non-Performing Loans), a process that allows for discretion in LLP estimation (Omondi, 2016). The CBK report (2022) Measures expected loan

loss by Loan loss provision to TRWA and Loan loss provision to total capital which will be the measure under the study.

2.3.1.2 Probability of Default

The work makes valuable contributions to multiple areas of research. The text discusses the statistical methods used to forecast the chance of default, specifically referencing the works of Blochlinger and Leippold (2018) and Jones et al. (2016), along with their respective references. In order to conduct model-based credit risk stress tests, it is essential to have models that can convert firm-level or macroeconomic predictor variables into forecasts for the chance of default.

There is hardly any publicly available help review the assessment of the specific methodologies used for the estimation of the credit risk for the Kenyan market. A number of the top banks have adopted the internal rating scale for corporate clients on a rating scale as proposed in the internal ratings-based approach by Basel (2018) and then superimpose the probability of defaults from the global default rates published by rating agencies.

The Basel II accord regulates risk and capital management requirements to ensure that a bank holds enough capital proportional to the exposed risk of its lending practices. Under the advanced internal ratings based (IRB) approach, Basel II allows banks to develop their own empirical models based on historical data for probability of default (PD), loss given default (LGD) and exposure at default (EAD). This thesis looks at some examples of modelling LGD and PD Basel (2018).

The study is relevant to the current collection of literature on credit risk. Some notable examples include the study conducted by Danielsson *et al.* (2016), which evaluates the credit risk models used for predicting systemic and market risk.

Another study by Hamerle and Rösch (2006) examines the model risk associated with credit portfolio models. Additionally, Hayden et al. (2014) evaluate the impact of different variable selection methods on model-based default probability predictions. Surprisingly, there is a lack of research that combines credit risk stress tests and the concept of model risk. Hale et al. (2015) is notable for its unique focus on investigating the impact of different levels of aggregation on the results of macroeconomic credit risk stress testing. Canals-Cerdá and Kerr (2015) published a study that empirically investigates issues related to model definition, sample selection, and stress scenario selection for credit card portfolios. Model risk is focused on the interaction between macroeconomic forces and variables at the account level.

The concept of probability of default pertains to the likelihood about the failure of a borrower to repay a specific obligation. In the logit model, the Probability of Default follows a logistic distribution. Discriminant analysis is used to categorize borrowers into classes based on their risk of default, either high or low. Based on existing scholarly literature, it is evident that there is no universally optimal approach for estimating credit scoring models, and ongoing advancements in this field persist. Logit models and neural networks have been widely utilized in prior scholarly investigations. This research aims to assess the likelihood of default by examining the relationship between loans and deposits, as well as deposits and liabilities (CBK, 2022).

2.3.1.3 Exposure of Default

Cucinelli (2015) discovered that levels of nonperforming loan portfolio is increasing which will lead to credit losses. Bashir and Hassan (2017) discovered strong bond

between financing cost and loan default. Majority of the huge loan defaulters do so mostly in the course of servicing their debts, hence loan defaulting is an inevitable element in commercial banking. Early identification of the underlying factors that determine credit losses in financial institution is a key step in the estimation of the expected losses given a particular loan portfolio.

Financial institutions are authorized and supervised in accordance with the requirements of the Banking Act and the accompanying Regulations and Prudential Guidelines. They hold a prominent position in the Kenyan Banking system and receive careful scrutiny during both off-site and on-site surveillance to ensure compliance with rules and regulations. The banking industry has been identified as a crucial foundation for the realization of vision 2030 (Nasieku & Ngugi, 2016). The increase of inactive loan rates in banks marks, poor credit process, unexpected challenges in the loan granting processes, lack of enough credit collaterals and others things that are related to poor loan risk control that have negative impact on banks profitability (Mokaya, Jagongo, James & Ouma, 2018).

The activities of the banking industry are critical given that more than 85% of their liabilities are customer's deposits (Musau, Muathe & Mwangi, 2018). The expansion in credit transaction and customer loans has made credit increase inevitable. The trend indicates an increasing bank deposit-loan ratio as the economy grows, however, this is also associated with increase in default risk leading to worsening asset quality and capital adequacy. At the same time, growth in default risk increase the marginal cost of debt and equity, this in turn increases the cost of funds for the bank (Ebenezer & Omar, 2016).

The concept of exposure at default pertains to the actualized value of potential losses that a bank may incur in the event that one of its borrowers fails to meet their debt

obligations. Loan failures can be attributed to various circumstances, such as borrowers' lack of willingness to repay loans, diversion of cash, deliberate negligence, and inadequate evaluation by credit officers. The operational aspect of this is demonstrated by the inclusion of non-performing loans in the operating income and the provision for loan losses in the operating income (CBK, 2022).

2.3.1.4 Loss given default

Leymarie *et al.* (2018) define LGD as potential loss occurring if the loan would default. In CRR, loss given default is defined as ratio of the loss on an exposure due to the default of a counterparty to the amount outstanding at default (Regulation (EU) No 575/2013, art. 4 point 55). Definition of LGD is illustrated in Equation (1). In other words, LGD is the estimated loss ratio expressed as percentage of outstanding amount of debt at the moment of default. The amount of debt at default should not be confused to exposure at default (EAD) which is a different component in IRB minimum capital requirement formula. For convenience, in this thesis EAD is used to reference the risk parameter in the IRB risk-weight estimation. Term outstanding amount at default is used for the LGD context's obligation amount in the moment of default. Denominator of Equation should include all capitalized interests, fees, and principal up to the moment of default.

Loss given default refers to the amount of money a financial institution loses when a borrower defaults on a loan, after taking into consideration any recovery. Loss given default is the economic loss occurring when an obligatory defaults. It is expressed in percentage of the defaulted amount. The defaulted amount is equal to the principal amount and overdue interest payments.

An efficient and well functioning sector is essential for the development of an economy and the achievement of high and sustainable growth of any country

(Katircioglu, & altinay , 2018). one of the indicators of financial sector health is Loan loss default. Most unsound financial sector shows high level of loan default within a country (Mburu, Mwngi & Muathe, 2020). The causes of loan default vary in different countries and there are so many reasons as to why loans fail to perform and thus affecting performance of commercial banks.

Commercial banks have been experiencing performance issues. Majority of banks despite showing that they made profits, majority have been experiencing reduction in the profitability levels (World bank, 2020). The theoretical show that the performance issue of the bank can be as a result of loan default. This creates the need to research on the relationship between performance of commercial banks and loan loss default within the institution.

The estimation of LGD is preferably conducted by using historical loss data, but for certain portfolios and counter parties, there is a shortage of such data due to the high quality of the assets and the low number of historical defaults. Portfolios of this kind are often referred to as Low Default Portfolios (LDPs). LDPs include portfolios with exposures to banks. Loss given default will be operational through non performing loans to total loans as well as loan loss provision to net loan and advance (CBK, 2022).

2.3.2 Bank size

The classification of banks into large peer, medium peer, and small groups has a direct impact on their financial performance by reducing the cost of capital. Market share is a crucial factor that impacts a bank's ability to benefit from economies of scale and attract low-cost deposits, as well as the expenses associated with reaching their customer base. According to Tariq (2014), the market share of banks has a

direct impact on the marginal cost of financial obligations and, as a result, the operational cost per client decreases as the market share increases. The research conducted by Saboo (2014) supports the establishment of large banks with significant market share in order for them to achieve competitive advantages and economies of scale. The study findings also confirmed that banks with higher bank size benefitted from a diverse range of enhanced technology. Unlike smaller banks, larger banks benefit from having access to a broader customer base and reducing the risks associated with relying too much on a single client. The large number of clients resulted in the launch of new goods and various product differentials, leading to a significant increase in revenues.

Large firms can utilize their superior management and skill in product development, marketing, commercialization, financial resources, specialty, enhanced negotiation power, stronger competitive edge, and wider market presence to their benefit. Furthermore, those who possess greater financial resources have enhanced opportunities to participate in industries that need substantial capital investment. This favorable situation enables them to operate in highly profitable industries with less competition (Dogan, 2013). According to Velnampy (2013), larger firms possess benefits stemming from their market dominance and enhanced access to financial markets. Moreover, the magnitude of a corporation is directly proportional to its impact on stakeholders.

Banks in Kenya are the main source of debt financing for both commercial and non-business enterprises. Therefore, the stability of the banking sector is essential for the proper running of the financial system, since it plays a critical role in the operation of an economy. (Arif, Khan, & Iqbal, 2013). Hence, it is crucial to understand the factors that influence the profitability of banks in order to uphold economic stability.

Previous empirical investigations have consistently demonstrated a positive association between size and profitability. The positive correlation stems from the adoption of more unique and specialized methodologies, which should consequently lead to enhanced efficiency. Size is a variable that is regarded as a characteristic of a firm (Kigen, 2014).

According to Sritharan (2015), the most dependable indicator of a company's scale is either the size of its management team or the value of its assets compared to other firms in the same industry. Firm size pertains to the most advantageous rate and extent of growth for a specific business. Bank size is commonly used to assess the effectiveness or ineffectiveness of scale in the banking sector. A prominent financial firm accomplishes cost reduction by leveraging economies of scale and breadth.

Size is commonly evaluated using indicators such as gross revenue, gross value of assets, logarithm of total assets, number of workers, and sales turnover. The growth of a corporation can be assessed by its augmentation in revenue, earnings, assets, or workforce, all of which contribute to enhanced financial health and profitability. Omondi and Muturi (2013) conducted a study suggesting that firms should carefully and strategically expand in order to achieve an ideal size. This would allow them to take advantage of economies of scale and ultimately increase their profitability. Multiple studies have investigated the correlation between the size of a bank and the financial success of businesses. These studies have determined that the influence of size on financial success can be either positive or negative. Onounga (2014) found a good correlation between the two criteria. It is advisable for the Kenyan Government to introduce policies that provide incentives for commercial banks to expand their assets (indicating size) and capital base. This will ultimately enhance the overall

efficiency of the banking system. The study conducted by Mule, Mukras, and Nzioka (2015) reveals a substantial and favorable statistical relationship between the size of a corporation and its profitability, specifically in terms of return on equity. As the firm's size grows, its return on equity also increases.

2.3.3 Financial Performance

Financial performance is defined as the measure of how an organization achieves its maximum profit output from the use of its scarce resources (Baraskaite & streimikiene.2021). it solely aims at achieving the organization's mission through sound management, strong governance characteristics and reduction to achieving results (Wang, Cho & Denton, 2017).

Financial performance further refers to the metric of a company's ability to effectively utilize its assets in order to earn income. According to Ali (2015), the return on assets is considered a key statistic for assessing profitability, in addition to income on equity and operational profit margin. The achievement of performance is a crucial objective for banks worldwide, as it serves as an indicator of the banks' ability to effectively manage and distribute resources (Ofori *et al.*, 2016). Academics have historically employed financial measures as a means of evaluating the FP of banks. Financial institutions employ CAMELS ratings to assess their fiscal well-being and operational effectiveness (Ali & Dhiman, 2019). The operational analysis of the study will be conducted using the ratios of total income to total assets and total income to total equity.

Performance of any commercial banks is said to be its ability of that firm to make/innovate or produce predetermined results or outcome against a specific targets or targets. This can be expressed in terms of profit and losses for a given period (Ozcan et al, 2017). Performance helps firms to review how well they are using assets to

generate revenue and it measures the financial soundness of the firms for a given period. Firms can compare their financial performance from one period to another or they can compare performance with other firms (Olukemi, 2017). A firm that is financial performing well, makes efficient and effective use of resources, grows, survives for a long period and achieves its goals and objectives (Warsame, 2016).

Financial performance for manufacturing firms can be measured using several indicators and Measures either in a span of one or more years. Some of these measures are firm profitability (Kayoyire & Shukla, 2016), ratio of return on assets, (Kung'u, 2015), contribution to growth in GDP, (KAM, 2017), total sales and return on sales (Memba & Nyanuba, 2013) and employment rate (Osore & Ogeto, 2014). The overall performance of manufacturing companies is very important to investors since they have entrusted their money and other resources to the management of firms with expectation to increase its value (Njeru, 2015).

2.4 Empirical Literature Review

2.4.1 Expected Loan Loss and Financial Performance of Commercial Banks

Globally, the impact of expected loan loss on the FP of firms has been studied in several countries with varied results. In their study on delayed expected loss recognition and the risk profile of banks, Bushman and Williams (2015) concluded that banks' vulnerability to stock market liquidity risk, individual bank downside tail risk, and code-pendency of downside tail risk are all positively associated with delayed expected loan loss recognition. The study was conducted in North America among commercial banks in the United States of America which has a different regulatory and economic capacity as compared to the present study. In Addition, the

study collected data from 1993 to 2009 while the present study will collect data from 2013 to 2022 is more current and will be a reflection of current trends.

Elleuch & Taktak, (2015) argue that in the last two decades research in accounting has focused on earnings management practices. Some literature examines related earnings management and LLP in the banking industry. The decrease in LLP can affect the capital adequacy ratio and have an impact on decreasing income (Ab userdaneh, 2018). Othman & Mersni, (2014) research that shows that minimize income volatility over time.

Aristei & Gallo (2019) investigating the formation of loan loss provision of banks in Italy During the period 2006 - 2013, the empirical results of this study revealed that the formation of loan loss provision in banks in Italy was supported by non-discretionary factors related to credit risk expectations. They also revealed that local credit banks have lower loan loss provision levels, on the other hand, that regional banks have higher loan loss provision levels with higher loan concentrations and lower competition. Other evidence generated in this study is that banks facing increased risk are not only characterized by an increase in loan loss provision but also have a higher tendency in earnings management practices to stabilize their income streams

Bryce *et al.* (2015) investigated the behavior of loan loss provision by Vietnamese banks from the period 2006-2012, this study examined capital, income smoothing, and management cycle hypotheses. This study also examined the effect of X-efficiency variables and used risk as a control variable in providing behavior. This study proves that incorporating X-efficiency and risk control variables into the research model shows counter-cycle manipulation or capital management and earnings management.

Krüger, Rösch and Scheule, (2018) examine policies relating to the formation of LLP in the United States that are revised based on International Financial Reporting Standards (IFRS) and US General Acceptable Accounting Principles (GAAP) which have an impact on the capital level 1 reduction. They found the results of counterfactual analysis that regulatory changes can have adverse consequences during economic downturns, for low-quality credit portfolios, for banks that do not tighten capital standards during economic downturns, under a comprehensive definition about Significant Credit Risk (SICR) in IFRS. The study also concluded that the rule for the formation of loan loss provision was to increase the practicality of bank capital requirement

Similarly, Giner and Mora (2019) in their study on the contracting effects of bank loan loss accounting observed that expected loan loss is highly influenced by the models for loan loss accounting. The study was conducted in Spain where expected loan loss models were dictated by FASB and IASB. The study was conducted in Europe with different loan loss models and different regulators to the present study which is will be conducted in Kenya which is regulated by the CBK.

In another study, Domikowsky, Bornemann, Duellmann and Pfingsten (2014) observed that models for loan loss provisioning that account for expected losses can help to improve financial stability in a study conducted in German banks. Germany uses different loan loss provisions and is controlled by different regulators compared to Kenya. In addition, Germany is in the first world and hence exposed to different financial systems to Kenya hence the research will conduct the present study in Kenya to fill the knowledge gap.

Regionally, Ofori, Pickson and Opare (2016) in their study conducted in Ghana using one commercial bank as a case study found that it was imperative for banks to reduce

expected loan loss in order to boost the performance of loans. The study used one bank which was limiting in terms of scope as compared to the current study which will collect data from several banks in Kenya.

Ali (2015) conducted a study to investigate if Nigerian banks employ loan loss provisions to manage earnings. The findings indicated that they do. The study was conducted in a different context with different regulations as compared to the banks that will be targeted in the present study. Furthermore, the study employed a two-point filter design while the present study will employ a mixed research design to fill the methodological knowledge gap.

Nsambu, (2014) in a study on the factors that affect the performance of Ugandan commercial banks concluded that loan loss provision to the total loan has a statistically significant negative effect and the earnings ability of a bank. The study did not concentrate on expected loan loss which is a different concept from the loan loss provision. The present study will establish the effect of expected loan loss on the performance of commercial banks in Kenya. This study will fill the knowledge gaps that have been observed in the regional studies.

Katherine and Kajirwa (2019) examined the correlation between financial performance and credit risk in the context of Kenyan banks listed on the Nairobi Securities Exchange. This study investigated the Capital Asset Pricing Model, Portfolio Theory, theory on risk and leverage, and credit risk theory, among other theories and models. Positivism was the research philosophy that guided this investigation. In this investigation, a longitudinal research design was utilized. The research was centered on a cohort of eleven commercial banks that were publicly traded on the Nairobi Securities Exchange. The analysis of the data was conducted using Statistical Package for Social Studies, Version 20. The data were analyzed

utilizing an inferential statistical technique known as Karl Pearson correlation and regression. The results of the study revealed a strong and statistically significant correlation ($r = -0.601^{**}$, $p = .003$) between FP (as measured by Return on Equity (ROE)) and credit risk, specifically Loan Loss. The examination unveiled a significant influence of credit risk on return on equity ($\beta = -0.601$, $p = .007$, α). The adjusted r-squared value for the model was calculated to be 0.323, suggesting that credit risk accounts for around 32.3% of the total variability observed in the FP of commercial banks.

Issackow (2022) examined how credit risk ratings affected the market value of publicly traded Kenyan commercial banks. This study used a descriptive research design and a census approach to look at eleven retail banks that are publicly listed. The information utilized for this study was sourced from publicly accessible financial reports and the CBK for a cohort of eleven retail banks spanning the years 2009 to 2020. An examination of the collected data was conducted utilizing a multivariate panel regression model. The regression tests were generated using SPSS Version 23.0. The data findings were presented utilizing charts and frequency tables to facilitate comprehension. The research findings indicate that there is a slight positive relationship between Loan Loss and the firm value of commercial banks in Kenya. Additionally, the study reveals that the earning ability of these banks has a statistically negligible beneficial impact on firm value.

According to a study done in Kenya by Otieno, Nyagol, and Onditi (2016), FP is improved by reduced loan loss provision coverage ratios (LLPCR). The data collection for their study was conducted in microfinance banks, whereas the current study will gather data from commercial banks in Kenya. This will close the knowledge gap that exists across the many enterprises.

Muriithi, Waweru and Muturi, (2016) also conducted a study in Kenya on how credit risk impacts the performance of commercial banks in Kenya and found out that capital can be reduced by an increase of loan loss provision which in turn will affect the profitability of a bank. The study used loan loss provision among other measures to measure credit risk. This is conceptually different from the effect of expected loan loss on FP that the present study will embark on studying.

Gakure, Ngugi, Ndwiga, and Waithaka (2012) examined the impact of credit risk management on the performance of unsecured bank loans in a separate study. The research revealed that risk identification has an impact on the operational effectiveness of commercial banks. Nevertheless, the influence of anticipated loan loss on the performance of commercial banks in Kenya was not explicitly examined. This is the void that this research will attempt to bridge. The researcher will initiate an effort to address the aforementioned voids in knowledge.

2.4.2 Probability of Default and Financial Performance of Commercial Banks

Globally, Sariev and Germano (2020) conducted a study on estimation of Probability of Default with regard to the Bayesian regularized artificial neural networks. The results showed that Bayesian approach performs better when a comparison is done with the classical regularization approach for neural networks. The study used East European data to conduct the study while the current study will use data from Kenya to fill the geographical gap. Furthermore, the current study will concentrate on impact of the Probability of Default on performance and not the role of networks in the estimation of Probability of Default.

Similarly, Gurný and Gurný (2013) in their study on Probability of Default as a vital parameter in the risk management and comparison of credit scoring in the United States banks and concluded that estimation of Probability of Default is imperative in

its usage for estimation of creditworthiness of borrowers, estimation of bank's capital adequacy, risk management and valuation of credit derivatives. The present study is conducted in Kenya to fill the geographical knowledge gap since the two countries have different regulations and level of advancement in financial systems.

Many research have been conducted to forecast defaults in practice. However, the majority of default prediction research focus on publicly-owned corporations in industrialized nations because to the abundance of available data. Research on the prediction of default likelihood is typically constrained (Karas & Reznakova, 2021). Moreover, the availability of such studies specifically focused on predicting default in commercial banks in underdeveloped nations is even more scarce. Matenda *et al.* (2021) argued that financial institutions in poor nations often struggle to establish and operate formal credit evaluation procedures, which are commonly seen in industrialized countries. This can be linked to insufficient technical capabilities, limited and imperfect financial markets, and a lack of widespread involvement by foreign and local rating agencies (Ozili, 2019).

While commercial banks are not yet fully developed, recent study by professionals and scholars has focused on the likelihood of default. The focus on loan loss in commercial banks was revived with the introduction of the Basel II Capital Accord in 2004. The Basel II Capital Accord incentivizes banks to determine their capital needs based on the ratings assigned to their borrowers, such as commercial banks, using their internal rating systems (Ciampi *et al.*, 2021). Therefore, financial institutions worldwide have now established dedicated desks and divisions just for business banking. Furthermore, considering that commercial banks' loan balances make up a substantial part of total bank loans, the prediction of defaults by

commercial banks is currently being studied as a distinct and separate research field within the banking industry.

Karminsky and Kostrov (2014) also conducted a study on the probability of default in the Russian banking sector. The results showed that there existed a quadratic U-shaped relationship between capital adequacy ratio of a bank and its Probability of Default. This study was also conducted in a different context in the developed country of Russia. The present study will be conducted in Kenya which is a developing country with different challenges regarding credit risks. The present study will fill the noted knowledge gaps.

In respect to the regional perspective a case study was conducted in the Zimbabwe Stock Exchange listed counters by Matanda and Mhizha (2021) on the corporate Probability of Default modeling for banks in emerging economies. The results showed that the Probability of Default model adjusted for transaction costs was appropriate, more realistic and healthier for adoption and application in emerging economies like Zimbabwe, where most transactions are done manually, leading to huge transaction costs that had a substantial impact on the value of the firm. The study was conducted in Zimbabwe with different regulators and financial challenges that are unique to them. The present study will be conducted in Kenya to fill the contextual knowledge gap.

Setargie (2013) in a study in Ethiopia found out that credit diversion and loan size significantly increased the chances of loan default. The study did not however go further to investigate the effect of the default on the FP of the banks. Furthermore, the study was conducted in the micro-finance industry, unlike the current study which targeted commercial banks.

Akpan and Udo (2014) did a study analyzing loan defaults in Nigeria among agricultural credit guarantee scheme (ACGS) loan beneficiaries. Their results showed that factors such as total farm cost, age of the beneficiaries, farm income, family dependency level, government policies, years of experience, other loan schemes, visits by credit officers, time interval between loan application and disbursement, loan size, loan duration, and average interest rate charged were significant in determining Probability of Default of a loan. The present study will delve into the effect of Probability of Default to the performance of banks which is gap in the initial study. Furthermore, the present study will study commercial banks which are different from credit guarantee schemes and are controlled by different regulations. This study will strive to fill the gaps highlighted in the other studies.

In Kenya, Adem, Gichuhi and Otieno (2012) in their study researching on a parametric model on the Probability of Default of bank loans in Kenya found out that the Probability of Default was affected by risk factors such as age, gender, marital status, terms of loan and occupation. The study did not however delve into the impact of the default on the performance of the banks a knowledge gap that the present study will seek to fill.

Kimutai and Ambrose (2013) in a study conducted in Kenya indicated that credit rationing was crucial in minimizing the probability of loan default. The study employed a descriptive research design while the present study will employ an explanatory research design to fill the methodological gap. In addition, the present study will have FP as the dependent variable, unlike their study which had credit rationing as the dependent variable.

Yegon, Kipkemboi, Kemboi and Chelimo (2014) in a study on determinants of seasonal loan defaults noted that personal and facility factors influenced the

Probability of Default of loans. The study did not however research the effect of the Probability of Default on the financial performance of commercial banks, a conceptual gap that this study seeks fill.

2.4.3 Exposure at Default and Financial Performance of Commercial Banks

Globally, Gibilaro and Mattarocci (2018) conducted a study in the Italian market on banking relationships and Exposure at Default. The study concluded that multiple lending has an influence on Exposure at Default, and the effect is stronger in the case of short-term past dues. This study was conducted in Italy a developed nation with different regulations and a higher economic status. The researcher will embark on the present study to fill the geographical knowledge gap by conducting the study in Kenya a developing country.

Similarly, Tong, Mues, Brown and Thomas (2016) in their study conducted in the United Kingdom found out that Exposure at Default models without the credit conversion factor formulation (CCF) can be employed as an alternative to the credit conversion factor-based models or that the two can be combined together. The datasets in the study were from UK banks while the current study will fill the gap by using datasets from banks in the developing world that are exposed to different regulations and financial challenges. Furthermore, the data sets were from 2001 to 2004 which is outdated compared to the data sets for the present study which is from 2013 to 2022 which is current.

Bachmair (2016) in a study conducted through data sets collected from Turkey, Sweden, Colombia and Indonesia showed that expected losses are measured as an estimate of EAD, PD and LGD. The present study will be conducted in Kenya which

is in Africa hence it will fill the continental knowledge gap since the four countries used in the previous study were not in Africa.

Matanda and Mhizha (2021) in their study conducted in Zimbabwe showed that banks engaged in lending activities in emerging economies should adopt and deploy financial econometric Exposure at Default models which can be easily applied, realistic, practical, and market friction-adjusted. The study was conducted in Zimbabwe which creates a contextual gap since the economic situation in the country is different from Kenya where the present study is conducted.

Zik and Ilu (2018) conducted a study in Nigeria and concluded that an increase or decrease in the Exposure at Default does not significantly relate to an increase or decrease in the liquidity position of the selected banks. The present study will be conducted in Kenya to fill the geographical gaps that exist between the two countries due to the difference in regulations between the two countries. In addition, the study employed ex post factor research design while the current study used an explanatory research design to fill the methodological gaps.

Similarly, Matenda, (2021) also conducted another study in Zimbabwe and the results indicated that macroeconomic factors are crucial in enabling stress testing and thus providing a way of modeling Exposure at Default in downturn conditions. The study employed a scoping review technique while the present study will employ an explanatory research design to fill the methodological gap.

Ouma (2016) conducted a survey in Kenya and the results indicated that there was a significant relationship between credit risk testing levels and Exposure at Default in Kenya's Commercial Banks. The study employed a cross-sectional survey research

design while the current study will employ an explanatory research design to fill the methodological knowledge gap.

Keitany (2013) in a study conducted in Kenya concluded that there is a strong negative relationship between the loan default of a loanee and the profits that Savings and Credit Cooperative Societies (SACCOs) make. The study was conducted in SACCOs while the current study will be conducted on commercial banks to fill the industrial gap. Kathambi (2020) conducted a study in Kenya on how mobile-based lending affects loan defaults in commercial banks. The results showed that the mobile-based lending exposed banks to defaults. The study only concentrated on mobile-based lending while the present study will look into lending in general.

2.4.4 Loss Given Default and Financial Performance of Commercial Banks

De Moraes (2018) conducted a study in Brazil and the results showed that information on collection actions existing in models are imperative in estimating Loss Given Default of financial institutions. The study did not dwell on the effect of LGD on performance which is a gap that the present study will attempt to fill. Furthermore, the present study will fill the existing geographical gap that exists since the other study was conducted in Brazil.

Similarly, Tanoue, Kawada and Yamashita (2017) in a study conducted in Japan concluded that loan size, collateral and guarantees influence LGD. The present study will be conducted in Kenya to fill the existing geographical gap since Japan is a first world country and Kenya is a developing country.

Tobback, Martens, Van Gestel and Baesens (2014) conducted a study in the United States (US) on forecasting LGD models. The results showed that banks should

access the impact of stressed macroeconomic situations which can help in identifying the macroeconomic variables that drive LGD evolutions. The study focused on forecasting of LGD model which is a different concept to effect of LGD on the performance of banks which the present study will research on to fill the conceptual knowledge gap.

Regionally, Abu, Domanban and Issahaku (2017) conducted a study in Ghana and the results indicated that interest rate loan duration level of profit, enterprise size, and the loan amount determine the rate of default of loans. The present study will investigate the effect LGD on the performance of banks to fill the geographical gap since the financial regulations of Ghana maybe different to the Kenyan context.

Adan (2013) in a study in Uganda found out that there was a significant relationship between the extent of loan terms and the level of loan default as observed in Orient Bank in Uganda. The study did not however investigate the effect of the loan default on FP. In addition, the study employed a descriptive correlational research design while the current study employed an explanatory research design. The current study will fill those knowledge gaps highlighted.

Matenda (2021) performed an analysis in Uganda, situated in the East African region, which examined the effect of financial distress on the FP of Ugandan retail banks. The study utilized data obtained from these banks, as well as financial statements released by the Central Bank of Uganda. The period being examined spanned from 2011 to 2015. The study revealed that the inclusion of credit risk stress testing as a variable had a statistically significant favorable impact on the performance of banks.

An empirical investigation carried out in Nigeria by Offiong and Egbuka (2017) revealed a noteworthy inverse correlation between LGD and the performance of banks. The current investigation will be undertaken in Kenya with the aim of addressing the contextual information deficit pertaining to variations in geographical location, as each nation is subject to distinct financial legislation.

Ouma (2016) surveyed commercial banks in Kenya and found that the amount of credit risk assessment and the amount of loss due to default were significantly related. The preceding investigation employed a cross-sectional survey research methodology, however the present study will adopt an explanatory research design to address the current methodological deficiency.

Kanyare and Mungai (2017) also conducted a study in Kenya on access to microcredit by small and medium retailing enterprises. The results indicated that a higher deposit reduced LGD hence a low LGD meant that the lender will write off a lower amount of loans. The study targeted small and medium retailing enterprises while the present study will target commercial banks to bridge the gap in the different segments of the banking industry.

Muya (2017) conducted a study in Kenya on the comparison of financial distress prediction models. The results showed that LGD was used to detect financial distress in Kenya non-financial sector. The present study will concentrate on the effect of LGD in the performance of banks which are in the financial sector hence filling the sectoral knowledge gap.

2.4.5 Bank Size moderation on Credit Risk Stress Testing and Financial Performance

Sritharan (2015) defines bank size as the sum of a bank's net assets, customer cash deposits, and capital holdings. Ramezani and Alan (2014) provided a definition of bank size as the sum of total revenues, which encompasses both interest and non-interest revenues, earned by a bank. The text discusses the correlation between production costs and the utilization of economies of scale. The regulator of the Kenyan banking sector provides a more specific definition of bank size and use a weighted composite formula to ascertain their market dominance. Banks are then categorized as large, medium, or small based on this classification. According to the Central Bank of Kenya (CBK, 2019), major banks have a composite weight of 5% or above, medium banks have a composite weight between 1% and 5%, and small banks have a composite weight of less than 1%.

Aladwan's (2015) research report on commercial banks in Jordan indicated a rise in global profitability following the financial crises of 2007-2008. The study concluded that banks with greater bank assets outperformed their counterparts in the near term. The analysis discovered a rise in worldwide structural events such as mergers, acquisitions, and receiverships. The increased adoption of technology resulted in enhanced risk management measures, leading to the development of new prudential norms.

The research conducted by Kwaka (2014) in Sub-Saharan African- Ghana examined the factors that influence a bank's performance, with a particular focus on bank size. The research discovered a correlation between the factors of bank performance and return on equity (ROE) in the emerging Ghanaian economy, however this relationship was determined to be rather minor.

Akbas and Karaduman (2015) show that larger firms outperformed smaller institutions in competition due to their ability to procure resources at lower prices and sell goods in big quantities. According to a research study conducted by Levine and Robert (2011), the size of a company has an impact on its economies of scale and the return on investment for the financial institution. The study concluded that the size of a bank directly influences the degree of service quality and the range of products offered. Their findings determined that there is a favorable association between the size of banks and their profitability.

Shehzad *et al.* (2013) investigated the influence of bank size and growth on the levels of earnings or profitability in commercial banks. A dynamic panel consisting of over 15,000 banks from 148 countries was utilized. One of the findings was that the size of a bank has an influence on the unpredictability of its profitability growth. This was consistent with the findings of Aladwan (2015) and Dahmash (2015), but contradicted the findings of Mwangi (2018) and Abe and Le Roux (2016). The study also found that in high-income nations belonging to the Organization for Economic Cooperation and Development (OECD), larger banks have slower growth compared to smaller banks, while being more profitable. Countries belonging to the Organization for Economic Cooperation and Development (OECD) possess greater economic resources in comparison to developing ones. Conducting a study in a low-income country such as Kenya would provide an opportunity to examine the consequences in diverse environments.

Research indicates that the size of a bank may be determined using many criteria. For example, a study conducted by Chinoda in 2014 indicated that bank size can be measured by factors such as client deposits, the bank's capital, its assets, and the extent of its branch network. Onuonga (2014) assessed the magnitude of banks by

utilizing measures such as asset capital and market share. Abebe (2014) proposed use capital, customer deposits, and operational costs as metrics for assessing the magnitude of a bank. This study employed customer deposits, total net assets, and the bank's capital as indicators to quantify the size of the bank. Kaaya and Pastory (2013) investigated the correlation between credit risk and the financial performance of banks in Tanzania. Data was obtained from eleven banks and a descriptive study methodology was employed. Regression analysis was employed to evaluate the correlation between variables, with Return on Assets (ROA) serving as the dependent variable for performance measurement. Credit risk was assessed by the utilization of metrics such as loan loss to gross loan, non-performing loans (NPLs), loan loss to net loan, and impaired loans to gross loan. Two independent variables, namely client deposits and bank size, were introduced. The analysis revealed a notable inverse correlation between credit risk and FP. It is clear from the reviewed literature that most prior research supports (Saleh & Afifa, 2020).

Mwangi (2018) looked at how the size of a Kenyan bank affected its financial performance. Using panel data collected over a period of ten years and doing an analysis using ordinary least squares, it was found that there is a positive association between the size of a company and its financial performance. The fundamental variables were operationalized utilizing the methodology employed by Aladwan (2015) and Dahmash (2015). Bank size was evaluated based on the total value of assets, while financial success was determined by calculating the return on assets (ROA). The findings were in line with the studies carried out by Abel and Le Roux (2016) and Sufian and Kamarudin (2012). Nevertheless Dahmash (2015) expressed conflicting perspectives. The analysis could be improved by integrating other factors.

For instance, Mamatzakis *et al.* (2017) discovered that banks held by the government demonstrated lower levels of profitability in comparison to banks controlled by private entities.

Onuonga (2014) did a study to analyze the impact of internal factors on the profitability of the leading six commercial banks in Kenya between 2008 and 2013. This study utilized the generalized least squares method to gauge the impact of bank assets, capital, loans, deposits, and asset quality on the profitability of banks. He utilized return on assets (ROA) as a measure to evaluate profitability. The findings suggest that the profitability of the six major commercial banks is significantly influenced by factors such as the bank's size, capital adequacy, ownership structure, operational costs, and diversity. The findings suggest that the Kenyan Government should implement policies that provide incentives for commercial banks to augment their assets and capital base, as this will enhance the overall performance of the industry. A further outcome of the study is that commercial banks should invest in technology and management expertise to decrease operational costs, since this will positively impact their growth and sustainability.

Kiptanui, Chenuos, and Biwott (2014) conducted a study to determine the influence of profitability, bank size, and liquidity on the capital structure. The study included panel data from 34 firms registered on the Nairobi Securities Exchange. The dataset encompasses the time period from 2006 to 2012, excluding data from commercial banks. The Pearson Correlation was employed to assess the linear relationship between the variables, while the multiple regression model was performed to evaluate the hypothesis. The results indicated a significant inverse correlation between profitability and liquidity in regard to capital structure. However, there is a

positive relationship between the size of a bank and its capital structure, albeit this relationship does not have statistical significance.

In a study undertaken by Mule, Mukras, and Nzioka (2015), the researchers investigated how the size of corporations listed on the Nairobi Securities Exchange in Kenya affects their profitability and market value. This study employed data from groups that were active between 2010 and 2014. The empirical estimations included panel correlation and multiple regression methodologies. The results indicate a robust and significant relationship between the magnitude of a financial institution and its financial success, particularly in respect to the return on equity. An expansion in the scale of a bank leads to a proportional rise in the return on equity for companies listed at the Nairobi Securities Exchange. Moreover, the results suggest that the magnitude of a company's size does not have a statistically significant impact on the market worth of the organization when taking into account random factors.

2.5 Research Gap

Table 2.1: Research Gap

Author	Study	Methodology	Findings	Gap
Giner and Mora (2019)	Bank loan loss and financial performance of banks in Spain	The study used descriptive study design, Population of listed banks in Spain	The results were that expected loan loss accounting had a negative effect on performance of banks. The study was conducted in Spain where expected loan loss models were dictated by FASB and IASB.	The study based on loan loss and not credit testing as a whole, it used descriptive study design and not mixed design that was used in the current study.
Ali (2015)	Influence of loan loss provisions on earnings	Population commercial banks in Nigeria Panel data	The study found that Nigerian banks employ loan loss provisions to manage earnings	The study was conducted in a different context with different regulations as compared to the banks that were targeted in the present study. Furthermore, the study employed a two-point filter design while the present study employed an mixed research design to fill the methodological knowledge gap.
Issackow (2022)	The effect of credit risk rating on firm value of listed Commercial banks in Kenya.	A descriptive research strategy was utilized to analyze a population sample consisting of eleven publicly listed retail banks, by employing a census methodology.	The research findings indicate that there is a slight positive relationship between capital adequacy and firm value in Kenyan commercial banks. However, the study also indicated that the earning ability of these banks has a statistically negligible positive	The study used longitudinal design this study used mixed research design to breach the gap This study was for 10 year period and not 5 years for previous study Loss given default was part of

			Secondary data was collected from CBK period from 2009 to 2020 variables: expected loan loss, exposure of default and probability of default	effect on firm value.	study variables
Sariev and Germano (2020)	Probability of Default and performance of Bayesian regularized artificial neural networks	Population regularized artificial neural networks Variable: Probability of Default and performance	The results showed that Bayesian approach on default was better when a comparison is done with the classical regularization approach for neural networks.	The study used East European data to conduct the study while the current study used data from Kenya to fill the geographical gap. Furthermore, the current study concentrated on impact of the Probability of Default on performance and not the role of networks in the estimation of Probability of Default.	
Setargie (2013)	Probability of default, loan size and performance of banks in Ethiopia	Population: Ethiopian commercial banks Variable: Probability of Default and performance	The study in Ethiopia found out that probability of default and loan size significantly increased the chances of loan default	The study did not however go further to investigate the effect of the default on the financial performance of the banks. Furthermore, the study was conducted in the microfinance industry, unlike the current study which targeted commercial banks.	
Gibilaro and Mattarocci (2018)	Exposure at Default on banks in Italy	Population: Italian market Causal research design	The study concluded that multiple lending has an influence on Exposure at Default, and the effect is stronger in the case of short-term past dues.	This study was conducted in Italy a developed nation with different regulations and a higher economic status. The researcher embarked on the present study to fill the geographical knowledge gap by conducting the study in Kenya a developing country.	
Matenda, (2021)	Macroeconomic factors and enabling stress	Descriptive research design Target population;	There exists a notable and robust association between credit risk and financial	Secondary data was introduced in the current study and used mixed	

	testing in Zimbabwe	commercial banks in Zimbabwe Primary data Secondary data Longitudinal research design. A target population of 11 Commercial banks	performance in regard to exposure at default.	research design to breach the gap
Kajirwa & Katherine (2019)	Credit risk and financial performance of Banks Listed at the Nairobi Securities Exchange, Kenya	Theories: Capital Asset Pricing Model, Portfolio Theory, theory on risk and leverage and credit risk theory Variables: expected loan loss and probability of default	The findings indicated a statistically significant and robust association between default exposure and financial performance, as measured by return on equity (ROE) ($r = -.601^{**}$, $p = .003$). The analysis revealed a substantial impact of credit risk on return on equity (ROE) ($\beta = -.601$, $p = .007$, α). The adjusted r square value of the model was determined to be 0.323, indicating that approximately 32.3% of the overall variability in the financial performance of commercial banks may be accounted for by credit risk.	The study used longitudinal design this study used mixed research design to breach the gap The study added information asymmetry theory More variables exposure of default and loss given default was investigated
Tanoue, Kawada and Yamashita (2017)	Influence of loan loss on performance of firms in Japan	Population: Japan Manufacturing firms Descriptive design	Loan loss has a significant effect on performance of firms in Japan	The present study was conducted in Kenya to fill the existing geographical gap since Japan is a first world country and Kenya is a developing country.

Abu, Domanban and Issahaku (2017)	Effect of loan loss on performance of insurance firms in Ghana	Insurance firms Longitudinal research design	The results indicated that interest rate loan duration level of profit, enterprise size, and the loan amount determine the rate of default of loans	The present study investigated the effect LGD on the performance of banks to fill the geographical gap since the financial regulations of Ghana maybe different to the Kenyan context.
Muriithi, Waweru & Muturi, (2016)	Effect of credit risk loan loss on performance of commercial banks in Kenya	Descriptive research Primary data Sampling method; purposive Variables: bank size, credit appraisal, credit monitoring Theories: trade off and wreckers theory Variables: expected loan loss, exposure of default and loss given default	The study found out that capital can be reduced by an increase of loan loss provision which in turn will affect the profitability of a bank.	Current study used primary data Variables were on credit risk testing The theories guiding the study are: Portfolio Theory, Information Asymmetry Theory, Capital Asset Pricing Model Theory and Arbitrage Pricing Model Theory and not trade off and wreckers' theory. Probability of default was part of study variables
Offiong & Egbuka (2017)	Loan given defaults and bank performance of commercial banks in Kenya	Explanatory design Multiple regression and t-statistic analysis. Variables: Loan given defaults and bank performance Theories: modern portfolio theory and	There existed a insignificant negative relationship between Loan given defaults and bank performance	The current study used mixed research design which filled the existing methodological gap and credit risk testing fill the existing conceptual gap

		agency theory		
Njoroge, (2016)	Investigated Firm size determinant on Kenya commercial banks profitability	Descriptive survey design Random sampling technique Agency theory	Established that bank size has a negative insignificant relation to profitability which is a measure of performance	The current study assessed credit risk testing and not determinants of performance.

2.6 Conceptual framework

The study is conceptualized as follows;

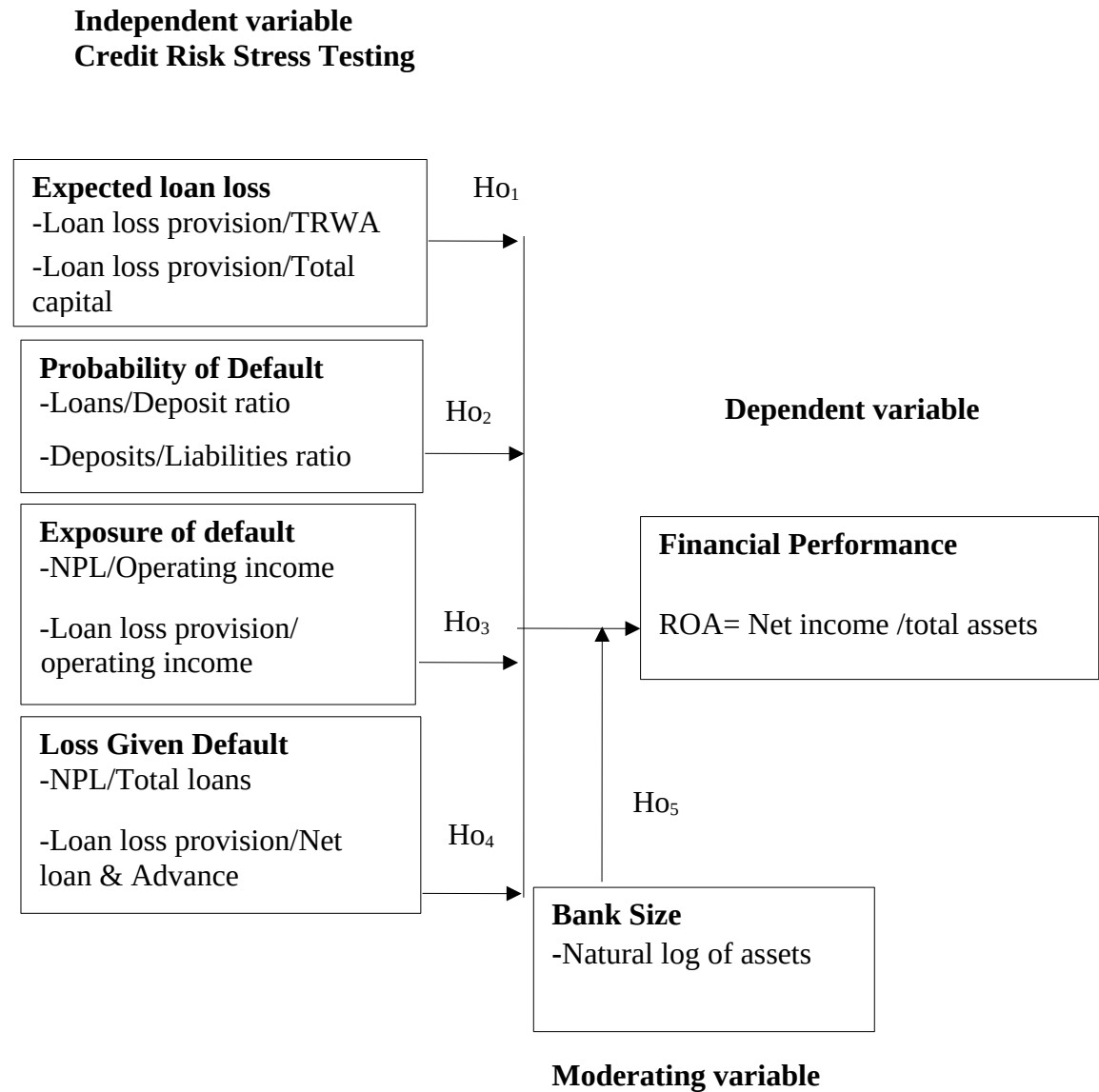


Figure 2.1: Conceptual framework

Source: Researcher (2024)

The conceptual framework shows the relationship between credit risk stress testing and financial performance of public commercial banks in Kenya. The independent variable are expected loan loss, probability of default, exposure at default and loss

given default while the dependent variable was the financial performance. The moderator variable was the bank size.

Expected loan loss was measured by loan loss provision to total risk weighted average ratio and loan loss provision to total capital ratio. Probability of default was measured by loans to deposit ratio and deposit loss provision to operating income ratio. Exposure at default was measured by the NPL to operating income ratio. Loss given default was measured by NPL to total loans ratio and loan loss provision to net loan and advance ratio. Bank size was measured by natural log of assets. The financial performance is measured using the ROA ratio, which was calculated by dividing total income by total assets.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The following chapter provides an overview of the research design, target population, sample design, data collection processes, and data analysis.

3.2 Study Area

This study area was Kenya at large on 42 commercial banks under CBK reports (CBK, 2021). Majority of head offices were within Nairobi and CBK was located at Nairobi Central Business District. This provided a central location for gathering all the reports based on the performance and share prices of the organizations. CBK listed banks were sought as they were the benchmarked on credit risk testing and were the drivers of the banking sector due to perceived listing qualifications.

3.3 Research Philosophy

A research philosophy refers to a set of beliefs regarding the appropriate methods for collecting, analyzing, and utilizing data pertaining to various phenomena. The four philosophical perspectives are positivism, pragmatism, interpretivism, and realism. The study used positivism research philosophy. This philosophy adheres to the view that only factual knowledge gained through observation including measurement, is trustworthy (Levin, 2002). This means the data collected was subjected for results and conclusion hence it was not biased to prelude the outcome. In positivism studies the role of the researcher was limited to data collection and interpretation in an objective way (Mugenda & Mugenda, 2018). In other words, the researcher was an objective analyst and he distances himself from personal values in conducting the study. In these types of studies research findings are usually observable and

quantifiable. In this case deductive approach was sought which views that the researcher needs to concentrate on facts (Curwin & Slater, 2008).

3.4 Research Design

The research design refers to the framework employed to address the research inquiries, encompassing both the structure and study design (Mugenda & Mugenda, 2018). The present study employed a mixed research design. The first research strategy employed in this study was a causal association, aiming to establish a cause-and-effect relationship between credit risk stress testing and commercial banks. The aforementioned study was deemed appropriate due to its focus on conducting an in-depth analysis of credit risk stress testing levels and their impact on the financial performance of commercial banks. Furthermore, the study employed a longitudinal research approach, focusing on the period from 2013 to 2022, and examining the performance of commercial banks. Longitudinal research design involves the systematic collection of multiple observations of a population over an extended duration, typically spanning several years. In the context of this study, the duration of observation spans a decade.

3.5 Target Population

A population is defined by Mugenda and Mugenda (2003) as an aggregate of individuals or things that share an observable quality. As both Kothari (2004) and Zikmund et al. (2010) point out, the term "population" encompasses everything within a certain field of study. According to Polit and Beck (2003), a population is all the people who fit a specific description. A researcher's population consists of all the people, places, and things that are relevant to their study (Sekaran and Bougie, 2011). The number of items that make up a population might be finite or infinite, according

to Lavrakas (2008). Kenya has a total of 42 commercial banks, as reported by the Central Bank of Kenya in 2012. These banks collectively hold two-thirds of the financial system's assets. The Central Bank has determined that 64.29% of the banks are owned by local entities, while 35.71% (equivalent to 15 institutions) are owned by foreign entities.

According to Mugenda & Mugenda (2018), the concept of population refers to the complete collection of individuals or objects that a study aims to comprehensively examine in order to get its findings. The study's population consisted of all 42 commercial banks operating under the CBK as of December 2022 (CBK, 2022) and that forms the target population. The financial statements given each bank were used as the unit of study.

3.5.1 Sample

According to Kombo and Tromp (2009), a sample is a small part of a statistical population that is analyzed to gather data that represents the full population. It enables individuals to draw conclusions that are applicable to the entire population of interest (Sekaran & Bougie, 2011). According to Kombo and Tromp (2009), a sample is a collection of representative units that are chosen from the complete population. Sample selection procedures vary in terms of their cost, level of effort, and necessary skills. The quality of the sample depends on its capacity to accurately depict the population in relation to the variables under investigation (Zikmund et al., 2010). This thesis encompasses all 42 commercial banks that have made their financial statements publicly available between the years 2013 and 2022.

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3.6 Data Collection methods

Researchers utilize data collecting as an effective approach to acquire pertinent data for analysis (Creswell, 2003). The present study utilized secondary data obtained from the official website of the CBK. The data source comprised the annual audited financial statements spanning the years 2013 to 2022, pertaining to the commercial banks being examined. The data collection schedule (Appendix II) was utilized for the purpose of gathering secondary data.

Table 3.2: Operationalization

Variable	Name of Variable	Operationalization	Measurement
Dependent variables	Performance	-Return on Assets Return on Equity	Net income /total assets
Independent Variables	Expected loan loss	-Loan loss provision/TRWA Ratio -Loan loss provision/Total capital Ratio	Loan loss provision/TRWA -Loan loss provision/Total capital
	Probability of Default	-Loans/Deposit ratio -Deposits/Liabilities ratio	-Loans/Deposit -Deposits/Liabilities
	Exposure of default	-NPL/Operating income ratio -Loan loss provision/ operating income ratio	-NPL/Operating income -Loan loss provision/ operating income
	Loss Given Default	-NPL/Total loans ratio -Loan loss provision/Net loan & Advance ratio	-NPL/Total loans -Loan loss provision/Net loan & Advance
Moderating variable	Size of the Firm	Total assets	Log of total assets

Source: Research (2024)

3.7 Research Procedures

The procedures were based on secondary data collection whereby research hypotheses identification was addressed. Secondary data was obtained from bank supervisory reports for the 2013-2022 financial years. Ratios were then computed, and data was run through STATA software.

3.8 Data Analysis

Data analysis refers to obtaining information from raw data (Creswell, 2003). The study adopted both descriptive statistics and inferential statistics.

3.8.1 Descriptive statistics

This used mean and standard. Descriptive adds value since it allows researcher to study and describe distribution. It further helps in developing an in depth understanding of research problem (Kothari, 2014).

3.8.2 Inferential statistics

The study used inferential statistics where correlation analysis and regression analysis were attained. STATA software application was useful in obtaining correlation and regression analysis (Kombo & Tromp, 2009). This study used STATA version 15.0. Testing of the significance of each independent variable was done at a confidence level of 95% or significance level of 5%. STATA software was fast, accurate and easy to use (Cooper & Schindler, 2011). Presentation of data was done using tables. Correlation and regression analysis are used to tell the relationship between variables (Kombo & Tromp, 2009).

3.8.2.1 Correlation Analysis

Pearson correlation analysis was used to ascertain variable relationship as it measures magnitude of the relationship (Mugenda & Mugenda, 2018). The values of the correlation coefficient always range from -1 to +1. If close to -1 shows strong negative correlation but if lies towards +1 shows strong positive correlation. If the coefficient is equal to zero then it implies no correlation. Correlation should not go beyond 0.9 so as to avoid multi-collinearity among independent variables (Kombo & Tromp, 2009). A significance less than 0.05 shows variables are related linearly, above 0.5 and above shows insignificant and the two variables are not linearly related.

3.8.2.2 Regression Analysis

A fixed random effect regression analysis model was used to establish the relationship between credit risk stress testing and financial performance. This relationship was determined using the following equation:

Equation 1

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + e$$

Equation 2

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \beta_5 X_{5it}M + \beta_6 X_{6it}M + \beta_7 X_{7it}M + \beta_8 X_{8it}M + e$$

Where

Y is performance which is Return on Assets (ROA)

B Slope or the contribution of stress testing to the performance of the banks.

X₁ is Expected loan loss

X₂ is probability of loan default

X₃ is exposure of default

X_4 is loss given default

X_4 is Size of the firm

X_4 is loss given default

M is bank size

E is the error terms.

3.8.3 Diagnostic Tests

Tests that were conducted included:

3.8.3.1 Normality tests

Jarque bera test is a category of Lagrange multiplier normality test. Jarque bera test is commonly carried out in advance previously one of other tests to approve regularity. It is frequently utilized for huge sets of data for the reason that the other supplementary normality tests are not consistent when the number of items is huge.

Definitely, the Jarque bera test equals the skewness and kurtosis of data to establish whether it resembles that of a distribution. Skewness and Kurtosis: Skewness should be within the range of ± 2 . Kurtosis should be within the range of ± 7 . The prescription which is normally used for the determination of Jarque bera test statistic (ordinarily abbreviated to JB test statistic) is;

$JB = \frac{n(\sqrt{b_1})^2}{6} = \frac{(b_2 - 3)^2}{24}$. Where n is the sample size b_2 is the coefficient of kurtosis of $\sqrt{b_1}$ is the sample skewness coefficient

The negative hypothesis of the Jarque bera test is that the data is typically dispersed; the alternative hypothesis of the test is that data does not originate from a normal distribution

On overall, a huge JB values designates that inaccuracies are not normally spread. For instance, in Matlab an outcome of one denotes that the null hypothesis has been disallowed at the 5% significance level. Additionally, the data does not ordinarily originate from a normal distribution. Jarque bera value of 0 designates that data is distributed normally

3.8.3.2 Multicollinearity test

In the context of multiple regressions, multicollinearity refers to the existence of strong correlations between a group of variables. In this scenario, the coefficient estimates of multiple regressions can exhibit unpredictable variations in response to even slight alterations in the model or the data. Replicating identical variables leads to the occurrence of multi-collinearity, which typically arises when the components are strongly interrelated. This study employed the variance inflation factor (VIF) and tolerance value as analytical tools. Variables having a Variance Inflation Factor (VIF) greater than 10 or a tolerance value more than 1 indicate the presence of multicollinearity. (Myers, 1990).

3.8.3.2 Linearity test

This tested the relationship between credit risk testing, bank size and financial performance to determine whether they are linear. This was done using scatter plots and Pearson correlation analysis (Chatterjee & Hadi, 2015).

3.8.4 Hausman test

Panel data analysis made use of the Hausman test to differentiate between the fixed effects and random effect models. The null hypothesis posited that the dominant model was random effects, while the alternative hypothesis proposed that the model

was fixed effects. The fixed effect model demonstrates that firms exhibit identical features, but the random effect model suggests that enterprises possess distinct traits.

3.8.5 Unit Root Test

Unit root tests was used to check alteration of the estimations over time owing to non- stationery in order to scrutinize or identify non- stationery in absolutely all the variables under study. Failure to think through its existence can lead to an authentic approximation (Brooks, 2014). The following subsequent unit tests were conducted.

An augmented Dickey-Fuller (ADF) test was used. The null hypothesis H_0 is that a unit root was existing in a sample that has a time series. The alternative hypothesis H_1 is dissimilar dependent on the type of the test used, but then is ordinarily trend-stationarity. It is an improved variety of the Dickey-Fuller test for a bigger and further representation of complex set of time series. The test employed the enhanced Dickey-Fuller indicator, which yielded a negative value. As the degree of negativity increases, the amount of confidence in rejecting the premise of a unit root also increases. ADF helps in checking co integration between two stocks and merely attains residues which are later standardized then OLS regression conducted. Other unit root tests conducted were Phillips Perron and ADF. Phillips-Perron (1988): The PP test suggests a non-parametric change of t- statistics from original ADF regressions.

3.8 Ethical Considerations

Ethics is the most vital part of the research (Bryman & Bell, 2014). The data will be confidentially used. The researcher sought a letter from NACOSTI and directorate of post graduate studies at MMUST to authorize the study. Ethically cited work was acknowledged in reference list.

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSIONS

4.1 Introduction

This chapter comprises of the descriptive statistics, the correlation, diagnostic tests which includes both multicollinearity and heteroscedasticity tests, unit root tests for the data and the Hausman Test. A regression analysis and a hypothesis test are also included in this chapter.

4.2 Descriptive statistics and Normality

It was necessary to carry out descriptive analysis so that the nature of the data can be known to detect the outliers. Mean, standard deviation, minima and maxima figures were used to describe the nature of the data. The mean is a measure of central tendency, providing a representative value around which the data points tend to cluster. Standard deviation is a statistical measure, either used to determine the amount of dispersion or variation of values within a set. It quantifies by how much individual data points differ from the mean of the whole data set. A higher standard deviation would indicate more variability or spreading of the data, while a lower standard deviation would suggest that data points are closer to the mean. Descriptive statistics are presented below.

4.2 Expected Loan Loss

Table 4.1 Descriptive statistics-Expected Loan Loss

Stats	Loan loss provision/TRWA	Loan loss provision/Total capital
N	420	420
Min	0	-0.50
Max	18.54	13.80
Mean	0.192	0.59
Sd	1.52	1.25
Cv	2.58	2.09

Source: Field data (2024)

Table 4.1 provides the descriptive statistics on the average expected loan loss, which represents the total value of the loan at the time of borrower failure. The least value observed was 0, while the greatest value was 18.54 with a mean of 0.192. The standard deviation of this measure was calculated to be 1.52. This suggests that the commercial banks in Kenya have not completely utilized the degree of credit stress testing in order to mitigate the anticipated loan loss. This further implies that expected loan loss had a significant effect on commercial banks performance.

Table 4.2 Descriptive statistics- Probability of Default

Stats	Loans/Deposit	Deposits/Liabilities
N	420	420
Min	0	-377
Max	40.96	327.20
Mean	1.94	.59
Sd	3.48	1.25
Cv	1.79	2.098

Source: Field data (2024)

Table 4.2 explains probability of default which is as a measure of likelihood that a borrower will fail to pay back a certain debt had a mean value of 1.94, a minimum value of 0, a maximum value of 40.96 and a standard deviation of 3.48. With

standard deviation above 1.0 it means probability of default had a significant effect on performance of commercial banks in Kenya.

Table 4.3 Descriptive statistics- Exposure at Default

Stats	NPL/Operating income	Loan loss provision/ operating income
N	420	420
Min	-.50	0
Max	13.80	40.9
Mean	1.94	1.94
Sd	3.48	3.45
Cv	2.09	1.79

Source: Field data (2024)

The exposure of default, represents the potential loss that a bank may incur if one of its borrowers fails to meet their debt obligations, table 4.3 indicates that exposure at default exhibited an average value of 1.94. The minimum value recorded was -50, while the maximum value was 13.80. The standard deviation of this exposure was 3.48. This implies that exposure at default has a significant effect on performance of commercial banks. These findings suggest that banks in Kenya face equal levels of default exposure, which could potentially impact the performance of commercial banks in credit risk testing.

Table 4.4 Descriptive statistics-Loss Given Default

Stats	NPL/Total loans	Loan loss provision/Net loan & Advance
N	420	420
Min	-37	0
Max	327.2	16.67
Mean	7.07	0.27
Sd	40.35	0.98
Cv	5.7	3.70

Source: Field data (2024)

Loan given default refers to a situation where a borrower fails to repay a loan according to the agreed terms and conditions. Table 4.4 indicates that loan given default exhibited an average value of 7.07. The minimum value recorded was -37, while the maximum value was 327.2. The standard deviation of this loan given default was 40.35. This implies that loan given default has a significant effect on performance of commercial banks.

Table 4.5 Descriptive statistics-Bank Size

Stats	Ln Assets
N	420
Min	0
Max	5096823
Mean	1.94
Sd	291264.3
Cv	2.42

Source: Field data (2024)

Size of bank explains the capacity of a bank on basis of asset composition. Table 4.5 indicates that size of bank exhibited an average value of 1.94. The minimum value recorded was 0, while the maximum value was 5096823. The standard deviation of size of bank was 291264.3. This implies that size of bank has a significant effect on performance of commercial banks. These findings suggest that banks in Kenya face asset strength challenges as it was significant on credit stress testing and performance,

Table 4.6 Descriptive statistics-Financial performance

Stats	ROE
N	420
Min	-0.19
Max	307.66
Mean	20.47
Sd	52.96
Cv	2.59

Source: Field data (2024)

Table 4.6 examines descriptive on financial performance as measure of how well a firm can use assets to generate revenues. Financial performance had an average value 20.47, a minimum value of -0.19, a maximum value of 307.66 and standard deviation of 52.96. This implies that financial performance of commercial banks was on growth trajectory.

4.3 Panel Unit Root Tests

Unit root testing was required among the time variant variables once the nature of the data had been determined. The following tables display the outcomes of the investigation conducted on the unit root utilizing the Im-Pesaran and Augmented DickieFuller. The findings of the unit root analysis can be seen in tables 4.7 The use of atleast two methods enhances power for observation.

Table 4.7 Panel Unit Root Tests

Variable	Augmented DickieFuller	Phillips Perron
Expected loan loss	26.495** (0.0000)	113.65** (0.0173)
Probability of default	155.395** (0.0000)	26.491** (0.0000)
Exposure at default	106.089** (0.0000)	155.395** (0.0000)
Loan loss default	142.444** (0.0001)	106.089** (0.0021)
Bank size	221.717** (0.0000)	142.364 (0.001)
Financial performance	128.898** (0.0012)	3.458** (0.003)

Source: Field data (2024)

For Philps Perron and ADF test the existence of unit roots is indicated by a p value that is more than 0.05 while the absence of unit root is shown by a p value that is less than 0.05. According to the findings there was no evidence of a unit root for any of the variables under investigation. This conclusion is drawn from the fact that the p-values associated with these tests are below the significance level of 0.05.

Consequently, the null hypothesis, which posits the presence of a unit root in all the panels, is rejected in favor of the alternative hypothesis, which suggests that all the panels are stationary.

4.4 Diagnostic Tests

In order to tell whether the research model was appropriate for the study, diagnostic tests were conducted. The normality, multicollinearity, autocorrelation, heteroskedasticity and linearity were conducted.

4.4.1 Normality Test

Assessment of skewness, kurtosis and jargue bera test helped determine whether or not the data was normal. Skewness value of less than 2 and Kurtosis value less than 6 is regarded normal (Tabor, 2011). For jargue bera if the p-value is greater than or equal to 0.05, we fail to reject the null hypothesis, indicating that the data can be reasonably considered as normally distributed.

Table 4.8: Normality Test

Variable	Skewness	Kurtosis	adj chi2(2)	Probability
Expected loan loss	1.868	2.911	916.5	0.199
Probability of default	1.822	2.189	57.67	0.130
Exposure of default	1.363	4.254	111.8	0.250
Loan loss default	1.037	5.230	227.6	0.500
Bank size	1.363	4.254	376.2	0.820
Financial performance	1.781	1.142	74.69	0.170

Source: Research Survey Data, 2024

Table 4.8 shows that none of the variables had skewness greater than 2 hence indicates that are regularly distributed and that were sufficient and fulfilled the assumption of normality. Kurtosis values were less than 6 hence corroborate skewness values. Normalcy was further attested by jargue bera whose value probability was above 0.05 indicating that data was normally distributed.

4.4.2 Multicollinearity

Multicollinearity is a situation whereby there exist high correlations among variables that are understudied which can be either two predictor variables or many predictor variables. Predictor variables are variables that can be used to predict another variable. Variance Inflation Factor was employed to measure multicollinearity. According to Laurens (2018), multicollinearity is considered to be present when the variance inflation factor surpasses a value of 10. If the average VIF score is less than 10, it indicates the absence of multicollinearity. There was no multicollinearity as VIF were less than 10 and tolerance value lee than 1.

Table 4.9: Test for Multicollinearity

Variable	Tolerance	VIF
Expected loan loss	.783	1.277
Probability of default	.824	1.213
Exposure of default	.843	1.186
Loan loss default	.779	1.283
Bank size	.702	1.423

Source: Research Survey Data, 2024

4.4.3 Auto Correlation Test

The presence of serial correlation in linear panel data models introduces bias in standard errors and reduces the efficiency of findings. Consequently it is important for researchers to detect and identify serial correlation in the idiosyncratic error component inside a panel data model.

Table 4.10 Auto Correlation Test

Wooldridge test for autocorrelation in panel data	
H0: no first order autocorrelation	
F(1, 41) =	12.626
Prob > F =	0.0533

Source: Research Survey Data, (2024)

The wooldridge test for autocorrelation was used to confirm this assumption. The study aimed to test the credibility of the alternative hypothesis, which states that a first order serial correlation does exist. Based on the results provided in table 4.10 it emerged that no first order serial correlation existed. The study failed to reject the null hypothesis since the p value (p value $0.0533 > 0.05$). According to findings, the data confirmed the validity of hypothesis that residuals do not share a correlation with respect to time, making them suitable for panel regression analysis.

4.4.4 Test of heteroskedasticity

Heteroscedasticity happens when the error term of variance, which is ideally taken to be common, fluctuates. This implies that the ordinary least square model will be infective since it will underestimate the variance of standard errors thus resulting in misleading results. Heteroscedasticity was tested using the Wald test in this research. Here, the null hypothesis was; H_0 = Homoscedasticity, and Heteroscedasticity otherwise. The findings are demonstrated in table 4.11.

Table 4.11: Breuch Pagan Test for Heteroscedasticity

Modified Wald test for group wise heteroskedasticity in fixed effect regression model

H0: $\sigma(i)^2 = \sigma^2$ for all i

Wald Test	Wald test Statistic
chi2 (42)	14.37
Prob>chi2	0.066

Source: Field data (2024)

Heteroscedasticity is a situation whereby there is equal variability across range of values of the second factor predicting it (Vinod, 2018). If the value is greater than 0.05 then it is evident that homoscedasticity does not exist. Table 4.11 Heteroscedasticity test results indicate that the Wald test result exceeded chosen threshold of significance (0.05), Chi-square = 14.37, p-values = 0.066 >0.05. The study rejected the null hypothesis and indicated that there was no heteroskedasticity problem.

4.4.5 Test for Linearity

This refers to the extent to which the variation in the dependent variable is associated with the variation in the independent variable. The linearity of the data was assessed by analyzing P-P plots, as shown in figure 4.12. The graphic illustrates that the points are predominantly situated along a straight diagonal line, running from the bottom left to the top right. This suggests a linear correlation between the independent and dependent variables.

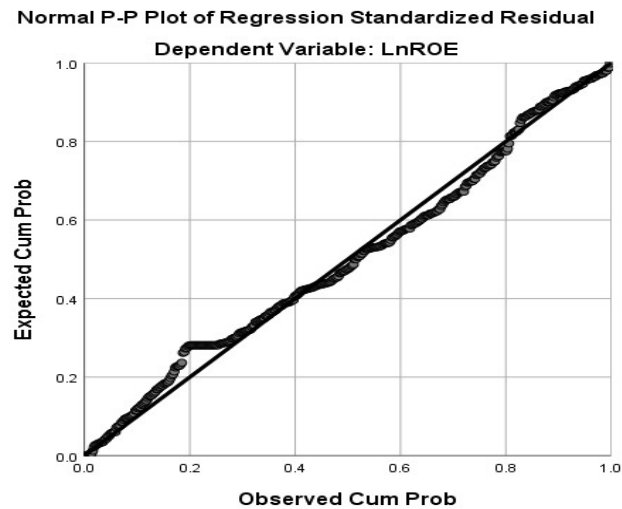


Figure 4.12: Test for Linearity

4.5 Correlation Matrix

The study conducted pair wise correlation analysis to ascertain the type and direction of the relationship between variables. The findings are presented in table 4.13.

Table 4.13: Correlation Analysis

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) Expected loan loss	1.000					
(2) Probability of default	0.150* (0.003)	1.000				
(3) Exposure at default	0.103* (0.041)	0.215* (0.000)	1.000			
(4) Loss Given Default	0.024* (0.042)	0.035* (0.048)	-0.112* (0.027)	1.000		
(5) Bank size	-0.074* (0.045)	0.048* (0.043)	-0.048* (0.049)	-0.138* (0.006)	1.000	
(6) Performance	-0.258* (0.000)	-0.029* (0.036)	-0.118* (0.020)	-0.004* (0.032)	0.027* (0.041)	1.000

Note. Values in parentheses () indicate p-values and * shows significance at 5% level of significance i.e. $p\text{-value} < 0.05$

Research Survey Data, (2024)

According to the correlation research in Table 4.13, there is a positive and statistically significant relationship between the expected loan loss and the financial

performance of commercial banks in Kenya. The results are statistically significant at the 0.05 level, indicated by a p-value of 0.000 and a correlation coefficient of -0.258*. This indicates that the expected loan loss does indeed affect performance, but it has a detrimental effect on the performance of commercial banks. Commercial banks bear the responsibility of monitoring loan losses that have a negative impact on performance.

The performance of commercial banks in Kenya is inversely associated to the likelihood of default, with a p-value of $(0.036) < 0.05$, indicating a statistically significant correlation (-0.029*). The probability of default has a significant and adverse impact on the performance of commercial banks.

The study revealed a significant negative association of -0.118* ($p < 0.020$) between the financial performance of Kenyan commercial banks and their susceptibility to default. There is no significant statistical relationship between loss given default and the financial performance of Kenyan commercial banks. This is indicated by a p-value of 0.032, which is higher than the threshold of 0.05. Additionally, the correlation coefficient is -0.004*. There is a strong and positive correlation between the size of commercial banks in Kenya and their financial success. The p-value is 0.041 and the value is 0.027*, both of which are below than the significance criterion of 0.05. No variables had a correlation coefficient larger than 0.9. Therefore, multicollinearity did not emerge due to the absence of a statistically significant link between the variables.

4.5 Hausman Test

In panel data analysis it is necessary to carry out both random and fixed effect model then Hausman test is lastly carried out to determine the type of the model to use between the two. The Hausman test is conducted to ascertain the appropriateness of adopting either the fixed effect or random effects model, utilizing the Hausman test statistic. Based on the Hausman test, the null hypothesis (H0) states that there is no systematic difference in coefficients, indicating that a random effect is acceptable. The p-value of 0.000 supports this conclusion. Therefore, the null hypothesis is rejected, and it is decided that the fixed effect model is appropriate. Therefore, it is preferable to use the fixed effect standard rather than the random effect specification. Hence, it is imperative to interpret the fixed effects model for the long-term specification.

Table 4.14 Hausman Test

Hausman fixed Random, sigma more				
Coefficients				
Variable	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b- V_B)) S.E.
Expected loan loss	0.054	0.043	0.012	0.005
Probability of default	1.516	1.469	0.0470	0.025
Exposure at default	-0.863	-0.515	-0.347	0.05
Loss Given Default	1.017	0.671	0.346	0.04
b = consistent under Ho and Ha; obtained from xtreg				
B = inconsistent under Ha, efficient under Ho; obtained from xtreg				
Test: Ho: difference in coefficients not systematic				
chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)				
= 98.66				
Prob>chi2 = 0.0000				

Source: Research Survey data 2024

The findings shown in Table 4.14 suggested a Prob>chi2 = 0.0000, which lower than the essential p value at the 0.05 level of significance. This suggests that the null

hypothesis that a random effect model is the most appropriate one was not supported. As a result, the research used a fixed effect regression.

4.6: Discussions of Regression Results Based on the Fixed effects Model

4.6.1 Regression Fixed Effect of Expected Loan Loss on Performance of Commercial Banks (ROA)

Table 4.15 Regression Fixed Effect of Expected Loan Loss on Performance of Commercial Banks (ROA)

Fixed-effects (within) regression				Number of obs	=	420
Group variable: BankID				Number of groups	=	42
R-sq:				Obs per group:		
within = 0.1278				min =	10	
between = 0.0000				avg =	10.0	
overall = 0.1150				max =	10	
				F(1,377)	=	55.25
				Prob > F	=	0.0000
LnROE	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
LnELL1	-.318	-.0428	7.43	0.000	.235	.404
LnELL2	-.321	-.0408	7.13	0.000	.234	.402
_cons	-.019	-.147	0.13	0.893	-.269	.308

Source: Field data (2024)

The study found that commercial banks in Kenya had a statistically significant correlation between ELL and credit risk stress testing. The effects of the global financial crisis of 2008–2009 and the current oil crisis on the banking industry, especially in regard to dollar-currency swings, have led Kenyan commercial banks to

implement credit risk stress testing. As a result, these financial institutions have shown a firm resolve to conduct Credit Risk Stress Testing, continuing all the way until 2014/2022. According to the results of the fixed effect model, 11.5% (Overall R square=0.1105) of the variance in Commercial Bank Performance could be explained by predicted loan loss. A p-value of 0.0000, which is less than 0.05, corresponds to this. With values of -.318 and -.321, respectively, for expected loan loss, we can see that performance drops by -.318 and -.321 percent as a result of a 1% rise in projected loan loss. The p-value for projected loan loss was 0.000, which was lower than the adopted significance level of 0.05, further indicating that this link was statistically significant. The regression model is as shown below.

$$ROA = -0.019 - 0.318 \text{ Loan loss P/TRWA}$$

$$ROA = -0.019 + -0.321 \text{ Loan loss P/TC}$$

Consequently, the study found that predicted loan loss does have a statistically significant, albeit negative, effect on commercial banks' performance, rejecting the null hypothesis that it has no correlation. The relationship between anticipated loan loss and bank performance has been the subject of multiple studies. Consistent with previous research, this study confirms that expected loan loss provisioning significantly affects the cyclicity and volatility of bank earnings and that the informational features of financial reports reflect changes in the risk attributes of loan portfolios. Nevertheless, the study fails to offer a comprehensive examination of how anticipated loan loss affects the financial performance of banks.

4.6.2 Regression Fixed Effect of Probability of Default on Performance of Commercial Banks

Table 4.13 Regression Fixed Effect of Probability of Default on Performance of Commercial Banks

Fixed-effects (within) regression				Number of obs	=	420
Group variable: BankID				Number of groups	=	42
R-sq:				Obs per group:		
within = 0.4273				min =		10
between = 0.0004				avg =		10.0
overall = 0.3693				max =		10
				F(1,377)	=	281.24
				Prob > F	=	0.0000
LnROE	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
LnPD1	-1.565	-.093	16.77	0.000	1.381	1.748
LnPD2	-1.301	-.088	17.13	0.000	1.234	1.412
_cons	-0.728	.0956	-7.62	0.000	-.916	-.541

Source: Field data (2024)

Based on the results of the fixed effect model, the probability of default explained 36.93% (R square=0.3693) of the variance in commercial banks' performance. A p-value of 0.0000 was found in the results. The figures for Probability of Default were -1.565 and -1.301, respectively, indicating that performance increases by -1.565 and -1.301 percent in response to a given percentage decrease in Probability of Default. The p-value for the chance of default was 0.000, which was lower than the established significance level of 0.05, further indicating that this link was statistically significant. Here is the regression model:

$$ROA = -0.728 - 1.565 \text{ Loans/Deposit ratio}$$

$$ROA = -0.728 - 1.301 \text{ Deposits/Liabilities ratio}$$

Researchers found a statistically significant, negative effect of probability of default on commercial bank performance, rejecting the null hypothesis that the variable had no effect. This suggests that commercial banks' performance would improve if the probability of default were to reduce. Higher amounts of regulatory capital are generally required of banks to prevent possible losses caused by the possibility of defaults. Financial stability relies on having enough capital reserves, but if such reserves are too big, the bank may not be able to manage their capital efficiently. This would limit the bank's ability to pay dividends to shareholders or pursue growth opportunities, both of which would reduce profitability. The chances of asset recovery would be improved if Kenyan banks made a concerted effort to decrease the probability of client defaults. Credit risk stress should continue to be an integral part of Kenyan commercial banks' day-to-day operations in order to successfully reduce fractional losses caused by business or individual failures. As a result, commercial banks in Kenya are better able to evaluate credit risk. These results are in line with those of Wruck (1990), who demonstrated that banks' financial performance is affected by the likelihood of default. Economic downturn, performance drops, and insufficient risk management are the causes of this effect.

4.6.3 Regression Fixed Effect of Exposure of Default on Performance of Commercial Banks (ROA)

Table 4.14 Regression Fixed Effect of Exposure of Default on Performance of Commercial Banks (ROA)

Fixed-effects (within) regression	Number of obs	=	420
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Group variable: BankID				Number of groups = 42		
R-sq:				Obs per group:		
within = 0.2796				min = 10		
between = 0.2973				avg = 10.0		
overall = 0.2000				max = 10		
				F(1,377) = 32.59		
				Prob > F = 0.000		
LnROE	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
LnED1	-.557	-.098	-5.71	0.000	-.749	-.365
LnED2	-.199	-.184	-2.05	0.000	-.169	.555
_cons	-.177	.145	-1.22	0.000	-.461	.108

Source: Field data (2024)

Results from the fixed model indicated that default exposure accounted for 20% (Overall R sq=0.2000) of the variance in Commercial Banks' performance. A p-value of 0.000 was found in the results. As a percentage, an increase in exposure of default causes performance to increase by -0.557 percent, and -0.199 percent, respectively, according to the values for exposure of default. A p-value of 0.000, which was lower than the established significance level of 0.05, further confirmed the statistical importance of this link. The regression model is as shown below

$$ROA = -0.177 - 0.557 \text{NPL/Operating Inc}$$

$$ROA = -0.177 - 0.199 \text{Loan LP/Op Income}$$

According to the model shown in Table 4.14, the coefficient of exposure to default has an increasing effect on the performance of Kenyan commercial banks. While holding all other variables constant, the model's inflation index coefficient implies that. As a result, we can say that the null hypothesis, which states that commercial

banks in Kenya's performance is unrelated to their exposure at default, is not true. The aforementioned results were expected since commercial banks could be at risk from default exposure. The potential for loan defaults, which would cause the bank to lose money due to unpaid interest and principle, is what this risk is all about. If the bank experiences too many loan losses, its profitability and net income could take a hit.

If this indication is negative, it could mean that the bank's assets aren't as good as they once were, which would hurt their return on equity and their profitability. Past studies by Gibilaro and Mattarocci show that default exposure has a negative effect on profitability (2018). According to their research, banks' bottom lines would take a hit if they set aside more money to protect themselves against potential loan defaults. To reduce the reserve ratio and increase profitability, prudent credit management is essential for mitigating expected loan loss.

4.6.4 Regression Fixed Effect of Loss Given Default on Performance of Commercial Banks

Table 4.15 Regression Fixed Effect of Loss Given Default on Performance of Commercial Banks

Fixed-effects (within) regression	Number of obs = 420
Group variable: BankID	Number of groups = 42
R-sq:	Obs per group:

within = 0.2381	min = 10
between = 0.2014	avg = 10.0
overall = 0.2292	max = 10
	F(1,377) = 14.92
	Prob > F = 0.0001

LnROE	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
LnLGD1	-.471	-.122	3.86	0.000	.231	.711
LnLGD2	-.194	-.186	4.01	0.000	-.182	.655
_cons	-.236	-.256	0.92	0.036	-.267	.739

Source: Field data (2024)

The results obtained from the fixed effect model indicate that Loss Given Default accounts for 22.92% of the variation in Commercial Bank Performance, as evidenced by an overall R square value of 0.2292. The calculated p-value of 0.0001 is statistically significant, as it is lower than the predetermined significance level of 0.05. The Loss Given Default values were -0.471 and -0.194, respectively, showing that performance decreases by -0.471 and -0.194 percent for every 1% increase in Loss Given Default. Given that the p-value for Loss Given Default was 0.0001, which is below the predetermined significance level of 0.05, it can be concluded that this relationship is statistically significant. The regression model is displayed below.

$$ROA = -0.236 - 0.471 \text{ NPL/Total loans}$$

$$ROA = -0.236 - 0.194 \text{ Loan loss provision/Net loan \& Advance}$$

A substantial effect of the Loss Given Default coefficient on the Performance of Kenyan Commercial Banks was noted in the offered regression analysis. According to the model's Loss Given Default coefficient, if all other variables remain constant, the Performance of Commercial Banks in Kenya will fall by an amount equal to one unit higher in Loss Given Default. Findings from this study are likely to have

statistical significance according to the p-value of 0.0001, which is lower than the previously established significance criterion of 0.05. Therefore, we can say that the loss given default does correlate with the performance of Kenyan commercial banks, contrary to the null hypothesis.

The fixed effect regression analysis shows that the sample of commercial banks' financial performance is negatively and significantly affected by loan defaults. Return on assets is an important measure of a commercial bank's financial health, and this suggests that loan defaults significantly lower it. Theoretically, performance suffers when loans go into default since fewer money are available for lending. In principle, banks' bottom lines could take a hit when loan defaults happen since less money is available to lend and interest income drops. Successfully managing loan defaults is critical for commercial banks to enhance financial performance ratios. Since interest income is the principal source of revenue for financial institutions, this would lead to an increase in both the amount of funds that may be loaned and the amount that can be earned in this way. The results show that loan defaults have a positive effect on financial performance, which is in line with what Kabui (2020) and Nyarko-Baasi (2018) found. Consistent with their own findings, óollaku and Aliu (2021) found a statistically significant impact. The results of this study are at odds with those of Nyarko-Baasi (2018), which found that loan defaults hurt commercial banks' bottom lines. A statistically significant negative effect was noted by Gabriel, Victor, and Innocent (2019) in their investigation.

4.6.5 Multiple Regression

Table 4.16 Multiple Regression

Fixed-effects (within) regression	Number of obs	=	420
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Group variable: BankID			Number of groups = 42			
R-sq:			Obs per group:			
within = 0.6413			min = 10			
between = 0.1595			avg = 10.0			
overall = 0.4834			max = 10			
corr(u_i, Xb) = -0.3527			F(4,374) = 167.15			
			Prob > F = 0.000			
LnROE	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
Expected Loan Loss	-.0548	-.0304	1.80	0.073	-.0050	.115
Probability of default	-1.516	-.0806	18.81	0.000	1.358	1.675
Exposure of default	-.862	-.0685	-12.57	0.000	-.996	-.727
Loss given default	-1.017	-.086	11.87	0.000	.849	1.185
_cons	1.956	.202	9.67	0.000	1.558	2.353

Source: Field data (2024)

Commercial bank performance was significantly impacted by combined credit risk stress, according to the results of the fixed effect model. Of the total variance in Commercial Bank Performance, 48.34% (Overall R square=0.4834) was explained by credit risk stress. The equivalent p-value was less than 0.05, coming in at 0.000. The regression model is as shown below.

$$Y_{it} = 1.956 - 0.0548 X_{1it} - 1.516 X_{2it} - 0.862 X_{3it} - 1.017 X_{4it}$$

The offered regression analysis revealed that the credit risk stress coefficient significantly affected the performance of Kenyan commercial banks. The credit risk stress coefficient in the model indicates that, everything else being equal, the Performance of Commercial Banks in Kenya will fall by an amount equal to one unit higher credit risk stress. The results produced in this investigation are statistically significant, as the obtained p-value of 0.000 is less than the preset significance level of 0.05. As a result, we can say that the credit risk stress and Performance of Commercial Banks in Kenya connection is statistically significant, as opposed to the null hypothesis. These findings are in line with those of Wruck (1990), who also discovered a substantial impact of credit risk stress testing on banks' bottom lines.

4.6.6 The Moderating Effect of Size of the firm on the Relationship between Credit Risk Stress Testing and Financial Performance of Commercial banks in Kenya.

Dharma (2018) defines a moderating variable as one that influences the link between explanatory variables and dependent variables. The researcher was able to determine the true degree of correlation between the independent variables (Expected loan loss, Probability of Default, Exposure of default, and Loss given default) and the dependent variable (Performance of Commercial Banks) by comprehending the impact of the moderating variable. The impact of the moderating variable was assessed by examining variations in the values of R^2 . The model specification was as follows $Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \beta_5 X_{5it} M + \beta_6 X_{6it} M + \beta_7 X_{7it} M + \beta_8 X_{8it} M + e$

Table 4.17: Model 1-Independent and Dependent Variables

Source	SS	Df	MS	Number of obs = 420		
				F(4, 415)	=	108.17
Model	1334.47	4	333.62	Prob > F	=	0.0000
Residual	1279.88	415	3.08	R-squared	=	0.5104
Total	2614.35	419	6.24	AdjR-squared	=	0.5057
				Root MSE	=	1.7561
LnROA	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
Expected Loan Loss	.043	.034	1.26	0.007	-.024	.110
Probability of default	1.47	.088	16.76	0.000	1.29	1.64
Exposure of default	-.51	.56	-9.14	0.000	-.613	-.404
Loss given default	.67	.083	8.02	0.000	.507	0.836

_cons	1.02	.19	5.33	0.000	.64	1.39
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Source: Field data (2024)

Model one involves the examination of parameters related to financial performance and credit risk stress testing. The regression model involving the independent and dependent variables yielded an R-squared value of 0.5104, indicating that 51.04% of the variance in the financial performance of commercial banks is strongly influenced by credit risk stress testing. This contribution is highly significant, as evidenced by the P value of 0.000. This indicates that credit risk stress testing is a strong predictor of the financial performance of commercial banks. From this model it was found that Expected Loan Loss was found significant (p=0.007), Probability of default was significant (p=0.000), Exposure at default significant (p=0.000) and lastly Loss given default significant (p=0.000).

$$\text{LnROA} = 1.02 + .043 X_1 + 1.47X_2 - 0.51X_3 + 0.67X_4$$

Table 4.18: Model 2-Independent, Moderating and Dependent Variables

Source	SS	df	MS	Number of obs = 420
				F(4, 415) = 90.72
Model	1366.86	5	273.37	Prob > F = 0.0000
Residual	1247.49	414	3.013	R-squared = 0.5228
Total	2614.35	419	6.24	AdjR-squared = 0.5171

					Root MSE	= 1.7359
LnROE	Coef.	Std. Err.	T	P>t	[95% Conf.	Interval]
Expected Loan Loss	.055	.034	1.61	0.007	-.012	.121
Probability of default	1.47	.087	16.91	0.000	1.29	1.64
Exposure of default	-.53	.056	-9.52	0.000	-.64	-.423
Loss given default	.78	.089	8.75	0.000	.60	.955
Bank size	.108	.033	3.28	0.001	.043	.173
_cons	.15	.32	2.63	0.000	-.48	.79

R-Square Diff. Model 2 - Model 1 = 0.012 F(1,414) = 10.749 p = 0.001

Source: Field data (2024)

Model two entails LnROA (Dependent variable), the credit risk stress testing (Independent Variables) and bank size (Moderating variable). The model of independent, moderating and dependent variable produced an R^2 square of 0.5228 implying that 52.28% of the variation in financial performance of Kenyan Commercial Banks is significantly affected by credit risk stress testing. The introduction of additive bank size moved R^2 from 0.5171 to 0.5228. Though bank size had a significant effect the increase was small as indicated by $P=0.001$.

$$Y_{it}=0.15+0.055 X_{1it}+1.47 X_{2it}-0.53 X_{3it}+0.78 X_{4it}+0.108M$$

Table 4.19: Model 3-Independent, Moderating, Interaction and Dependent Variables

Source	SS	df	MS	Number of obs = 420		
				F(9, 410)	=	55.95
Model	1441.07	9	160.12	Prob > F	=	0.0000
Residual	1173.28	410	2.86	R-squared	=	0.5512
Total	2614.35	419	6.24	AdjR-squared	=	0.5414
				Root MSE	=	1.6916
LnROE	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
Expected Loan Loss	.208	.267	2.31	0.757	.44	.61

Probability of default	2.05	.68	2.55	0.123	2.40	.29
Exposure at default	.49	.376	2.30	1.94	.25	1.23
Loss given default	.33	.41	2.81	0.420	1.13	.47
Bank size	.17	.039	4.47	0.000	.097	.25
Expected loan loss*Bank size	.204	.025	2.15	0.885	.052	.045
Probability of default*Bank size	.23	.062	3.74	0.000	.111	.356
Exposure at default*Bank size	.11	.038	2.86	0.004	.185	.03
Loss given default*Bank size	.11	.039	2.80	0.005	.033	.189
_cons	-.29	.35	-0.86	0.039	-.98	.382

R-Square Diff. Model 3 - Model 2 = 0.028 F(4,410) = 6.483 p = 0.000

Model	R ²	F(df)	p	R ² change	F(df) change	
1:	0.510	108.175(4,415)	0.000			
2:	0.523	90.723(5,414)	0.000	0.012	10.749(1,414)	0.001
3:	0.551	55.953(9,410)	0.000	0.028	6.483(4,410)	0.000

Source: Field data (2024)

Model three entails LnROA, the credit risk stress testing, bank size and the association between credit risk stress testing and bank size. The third regression model is as shown below.

$$\text{LnROA} = -0.29 + 0.208 X_{1it} + 2.05 X_{2it} + 0.49 X_{3it} + 0.33 X_{4it} + 0.17 X_{5it} + 0.204 X_{6it} + 0.23 X_{7it} + 0.11 X_{8it} + 0.11 X_{9it} + M$$

This model produced an R₂ of 0.5512 implying that 55.12% of the variation in performance of Kenyan Commercial Banks is significantly affected by credit risk stress testing. The incorporation of (IV*MV) thus interaction terms moved R₂ squared from 0.523 to 0.5512. The change was of 0.028 and significant as indicated by p 0.00 which less than 0.05 hence significant. This increase further implied that bank size interaction had no moderating effect on the relationship between by credit risk stress testing and performance of Kenyan Commercial Banks. The study

therefore rejected the null hypothesis that bank size has no significant moderating effect on the relationship between by credit risk stress testing and performance of Kenyan Commercial Banks. This finding agrees with Mwangi (2018) who found the impact of size on financial performance of banks in Kenya significant. Shehzad *et al.* (2013) found bank size significant on profitability of commercial banks.

Table 4.20: Hypothesis Results

Hypothesis	Findings	Decision and basis
HO₁: Expected loan loss does not significantly affect financial performance of Commercial Banks in Kenya	Expected loan loss has a significant negative effect on financial performance of Commercial Banks in Kenya	Reject 0.000<0.05
HO₂: Probability of default does not significantly affect financial performance of Commercial Banks in Kenya.	Probability of default has a significant negative effect on financial performance of Commercial Banks in Kenya	Reject 0.000<0.05

HO₃: Exposure at Default does not significantly affect financial performance of commercial banks in Kenya.	Exposure at default has a significant negative effect on financial performance of Commercial Banks in Kenya	Reject 0.000<0.05
HO₄: Loss given default does not significantly affect financial performance of Commercial Banks in Kenya.	Loss given default has a significant negative effect on financial performance of Commercial Banks in Kenya	Reject 0.000<0.05
HO₅: Firm size does not significantly affect the relationship between credit risk stress testing and financial performance of commercial banks in Kenya	Firm size have a significant positive moderating effect on the relationship between strategic orientation and financial performance of commercial banks in Kenya	Reject 0.000<0.05

Source: Field Data (2024)

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The findings summary from the previous chapter is presented in this chapter. Numerous inferences and suggestions are made in light of the findings. Additional study directions are also recommended.

5.2 Summary of the Findings

The purpose of the study was to examine the effect of credit risk stress testing and financial performance of Commercial Banks in Kenya with key interest on expected loan loss, probability of default, exposure at default and loss given default and bank Size which acted as moderating variable. The study utilized a correlation research design. Descriptive statistical analysis was generated to assess for just any outliers and define basic characteristics of the sample.

The Phillips Peron and ADF confirmed data was stationery. The calculated model underwent post-diagnostic checks. The results of the Jarque-Bera test for normality indicated that the data exhibited a normal distribution. On assessing residual autocorrelation data indicated the absence of autocorrelation. Additionally, the heteroscedasticity test was assessed, while the VIF and tolerance test for multicollinearity also indicated the absence of multicollinearity. Both fixed effect and random effect analyses were performed in order to determine the optimal regression model. After conducting a Hausman test, the probability value ($P(0.000 < 0.05)$) indicated that the fixed effect model was the most suitable. The coefficients and statistical significance of the independent variables in relation to the dependent variable were derived using the Fixed Effect model.

5.2.1 Effects of Expected Loan loss on Performance of Commercial Banks

The first objective of this study was to investigate the influence of Expected loan loss on Performance of Commercial Banks in Kenya. The results revealed that Expected loan loss negatively and significantly correlates with Performance of Commercial Banks. Expected loan loss causes a negative impact on the Performance of Commercial Banks as shown by a negative and significant coefficient of (0.00) in the regression model (Fixed effect model). This finding can be attributed to the fact that

it allows commercial banks to provide more accurate and reliable financial reporting. By estimating and provisioning for potential loan losses based on forward-looking information, banks can present a clearer picture of their financial health and the quality of their loan portfolio to investors, regulators, and other stakeholders. The study rejected the null hypothesis as the variable was significant.

5.2.2 Effects of Probability of Default on Performance of Commercial Banks

The study's second goal was to ascertain the effect of Probability of Default on Performance of Commercial Banks in Kenya. From the findings Probability of default negatively affects the Performance of Commercial Banks in Kenya as indicated by a p value of 0.00 in the fixed effect model. This can be explained as a result of the following possible factors: Loans with higher Probability of default are more likely to become non-performing assets (NPAs) or be classified as doubtful debts. The accumulation of NPAs and doubtful debts deteriorates the bank's asset quality, weakening its balance sheet and potentially affecting its ability to attract deposits and raise funds at favorable rates. Also, a persistent high Probability of default and elevated loan losses can damage the bank's reputation among customers, investors, and regulators. A perception of poor risk management or underwriting standards may lead to a loss of trust and confidence, resulting in customer attrition, investor skepticism, and increased regulatory scrutiny. The study rejected the null hypothesis as the variable was significant.

5.2.3 Effect of Exposure at Default on Performance of Commercial Banks

The third objective of this study was to determine the effect of Exposure at Default on Performance of Commercial Banks in Kenya. From the findings, Exposure at

Default negatively affects the Performance of Commercial Banks in Kenya as indicated by a p value of (0.00) in the fixed effect regression model. This can be explained by the fact that defaults by borrowers can lead to a deterioration of the bank's asset quality. Non-performing loans (NPLs) increase when borrowers fail to meet their financial obligations, which can weaken the bank's balance sheet. NPLs often require additional provisions for loan losses, which further impacts the bank's profitability and financial health. The study rejected the null hypothesis as the variable was significant.

5.2.4 Effect of Loan Given Default on Performance of Commercial Banks

The Fourth objective of this study was to determine the effect of Loan given default on Performance of Commercial Banks in Kenya. From the findings, Loan given default decreases the Performance of Commercial Banks in Kenya as indicated by a p value of (0.00) in the fixed effect regression model. This can be explained by the fact that Loss Given Default (LGD) as a primary a measure of potential losses, it can have negative effects on the performance of commercial banks by facilitating risk pricing and management, portfolio diversification, capital allocation, loan structuring, regulatory compliance, and stress testing. By incorporating LGD into their risk management frameworks, banks can enhance profitability, strengthen asset quality, and improve overall financial performance. The study rejected the null hypothesis as the variable was significant.

5.2.5 The moderation effect of bank Size on the Relationship between Credit Risk Stress Testing and Performance of Commercial Banks in Kenya

The objective of the study was to assess the influence of company size on the correlation between Credit Risk Stress Testing and the performance of commercial

banks in Kenya. The study found that the size of a bank has a statistically significant impact on the relationship between credit risk stress testing and the performance of commercial banks in Kenya. This was demonstrated by the p-value of 0.00, which is above the standard threshold of 0.05. In addition, the inclusion of interaction terms (IV*MV) increased the R-squared value from 0.523 to 0.5512. The change had a magnitude of 0.028 and was deemed significant based on a p-value of 0.00, which is less than the threshold of 0.05 for significance. The study refuted the null hypothesis due to the positive and significant variable, suggesting that the relationship between credit risk stress testing and the performance of commercial banks in Kenya was influenced by the size of the bank.

5.3 Conclusion

The study revealed that Kenyan Commercial Banks are incorporating credit risk testing into their daily operations, which was unexpected given the absence of prior research. The research conducted revealed that the variables of expected loan loss, Loss Given default, Probability of default and Exposure of default were found to have a negative significant influence on the performance of commercial banks in Kenya. The observed phenomenon could potentially be attributed to the volatility of the Kenyan currency in relation to the global financial crisis, which has impacted several financial sectors. Kenya Commercial Banks are using Expected Loan Loss, Exposure at Default, Probability of Default, and Loss Given Default into their credit risk stress testing. All variables were significant except the moderator.

5.4 Recommendations

Regarding credit risk stress testing, the study suggests that banks implement a robust strategy that raises the threshold for default risk, so allowing only clients who are

confident in their ability to return the borrowed loan. This measure will effectively address the loopholes that frequently contribute to the default. In relation to the likelihood of default, it is recommended that Kenyan commercial banks implement a robust policy enabling them to access all financial and asset accounts belonging to defaulters. This measure aims to mitigate the possibility of borrower default subsequent to loan acquisition.

The study additionally suggests that banks should broaden the range of loans offered to customers in order to mitigate the likelihood of default. This measure is expected to have a substantial impact on the reduction of loan defaults. Regarding the capacity to generate earnings, the study suggests that banks should allocate a significant portion of their profits into internal investments, potentially at the detriment of shareholders, in order to ensure effective and sustainable business operations. Implementing a credit risk stress testing plan can effectively mitigate the likelihood of a bank encountering a financial crisis. The study suggests that it would be advantageous for banks to persist in providing loans to prospective clients as a means to enhance their profitability by means of interest rates. In order to mitigate liquidity risk, it is advisable for banks to augment their liquid holdings.

Additionally, the study suggests that banks should formulate ways to address their immediate financial obligations by intensifying the distribution of loans to their clientele, hence incorporating credit risk stress testing. It is recommended that commercial banks in Kenya implement a policy that permits the establishment of external monitoring and evaluation offices, facilitated by external auditors, to conduct comprehensive analysis of banks' default exposure. This measure aims to address the issue of banks closing as a result of significant default exposure.

5.5 Suggestions for Further Research

This research concentrated on how Kenyan banks' financial performance was impacted by the degree of credit risk stress testing. Further research should be conducted on various types of financial institutions to determine if there is a consistent impact of credit risk stress testing on financial performance. It is recommended that a research investigation be undertaken, specifically focusing on Microfinance Institutions (MFI) and Development Financial Institutions (DFI), utilizing a questionnaire as a means to ascertain the potential impact of credit risk testing on financial performance. Due to the aforementioned constraints, it was not feasible to do thorough research on each component and ascertain the precise extent to which each element contributes to credit risk testing. Therefore, additional investigation can be conducted on these variables. It is important to acknowledge that various banks may employ distinct risk management procedures.

The field of financial risk management in commercial banks is constantly evolving, necessitating management that possesses the ability to think rapidly and adapt flexibly to the latest ideas proposed by both younger and older staff members. This fosters a superior generation of thoughts.

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APPENDICES

Appendix I: List of Commercial Banks in Kenya

TIER 1 (Big Banks)

1. Co-operative Bank of Kenya
2. Kenya Commercial Bank(KCB)
3. Equity Bank
4. Barclays Bank
5. Commercial Bank of Africa(CBA)
6. Standard Chartered Bank

TIER 2 (Medium Banks)

7. Family Bank
8. I&M Bank
9. NIC Bank
10. Diamond Trust Bank
11. Bank of Africa
12. Housing Finance
13. Ecobank
14. Prime Bank
15. Bank of Baroda
16. CFC Stanbic Bank
17. Citibank
18. Guaranty Trust Bank
19. National Bank
20. Bank of India

TIER 3 (Small Banks)

21. Jamii Bora Bank
22. ABC Bank
23. Credit Bank
24. Paramount Universal
25. Consolidated and Development Bank

26. Fidelity Bank
27. Equatorial Commercial Bank
28. Giro Bank
29. Guardian Bank
30. Middle East Bank
31. Oriental Commercial Bank
32. Paramount Universal Bank
33. Trans-National Bank
34. Victoria Bank
35. First Community Bank
36. Habib A.G Zurich Bank
37. Habib Bank
38. Gulf Africa
39. Sidian Bank
40. UBA Bank
41. Consolidated Bank
42. Development Bank

Source: Central Bank of Kenya (2023)

Appendix II: Secondary Data Collection Tool

Variable	Measure												
		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Financial Performance	Total income												
	Total assets												
	Total Equity												
Expected loan loss	Loan loss provision												
	Total Risk Weighted Assets (TRWA)												
	Total capital												
Probability of Default	Loans												
	Deposit												
	Liabilities												
Exposure of default	Non Performing loans (NPL)												
	Operating income												
	Loan loss provision												
Loss Given Default	Total loans												
	Net loan & Advance												
Firm size	Total assets												

Appendix IV: NACOSTI

 REPUBLIC OF KENYA Ref No: 144648	 NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION Date of Issue: 11/September/2023
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Appendix V: Raw Data

TOTAL EQUITY	M	M	M	M	(M)	M	M	M	M	M
Banks	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
1. KCB Bank ltd	57805	72165	80886	80989.89	88991	97789	92608	111271	87957222	90200466
2. Equity bank ltd	40733	42351	49311	52341.04	61906	60587	69914	86697	55864207	62770438
3. Absa/Barclays Bank ltd	37980	40733	47440	60045.83	68227	68319	69416	72028	55214858	62561322
4. Cooperative Bank	37462	38111	40914	42094.71	44584	43393	77088	85597	39935899	62469024
5. Standard chartered bank	28944	40450	39716	43904.78	43004	47713	44079	44969	37788041	44555022
6. CFC stanbic Bank ltd	25587	17857	22708	36431.81	43559	45336	47222	50219	35459462	38832488
7. Diamond Trust Bank	22245	26644	29996	27470.17	31571	34591	52001	54032	34201410	37847066
8. I & M Bank ltd	19122	25784	28251	30237.5	33051	33775	47015	52324	33237245	36157351
9. NIC/NCBA Bank ltd	18826	22618	26454	30288.26	35024	38339	38940	41857	28030736	35701874
10. Citibank Kenya	17592	21814	26187	26186.68	28938	31117	22943	2667	25276163	22634933
11. Commercial Bank of Africa	13779	12114	10914	109996.7	17900	20415	24455	24902	20038296	21471831
12. National Bank of Kenya	10343	11066	19407	19628.61	20177	23039	11705	22134	19313389	18596723
13. Family Bank	10184	18359	11927	14224.91	7048	6936	19047	11936	18677814	14813135
14. Bank of Baroda	9324	9867	11273	12618.88	14338	19410	12408	13162	12460848	11244237
15. Prime Bank ltd	6722	7913	8725	9774.97	11608	13191	15532	17853	10706525	7830795
16. Bank of Africa/Commercial B Africa	6105	7735	8496	10833.99	11625	11426	6568	7070	6952209	6579626
17. Bank of India	5902	6276	9090	8417.99	9963	6938	7877	8871	6925770	5827565
18. Ecobank Kenya	5079	7828	7561	9536.34	6439	9165	9152	8247	5663581	5812771
19. Guaranty Trust Bank ltd	4667	6075	7183	7307.24	8468	6408	4276	6745	5627881	5774511
20. Gulf African Bank	3056	7165	7906	8366.45	8609	6736	6356	9189	5074402	5421718
21. Victoria commercial Bank	2615	3147	3877	4375.71	4419	5963	8808	5419	4344181	4262768
22. Sidia/ K rep bank	2337	2623	3837	2996.76	5612	4468	4635	5029	3875451	3698408

23. Giro commercial bank	2330	2876	2837	5060.04	3160	8453	3689	3816	3423941	2875701
24. Jamii Bora/jamii bank	2197	2432	3515	3868.79	3447	3557	4018	4080	2956579	2837260
25. Habib/HFC bank	2179	2422	3163	2964.98	2842	4037	3077	3204	2862779	2649048
26. African Banking	1928	1715	2835	2903.34	2375	3039	3000	3218	2628938	2606842
27. Habib/HFC bank	1846	2764	2844	3077.44	1709	2863	2741	2051	2575020	2523757
28. Transnational/Access bank	1814	3105	1984	3590.08	2665	2557	1462	2257	2420413	2428895
29. Development bank	1745	1155	2069	1577.41	2930	1271	3950	3823	2174218	2241806
30. Standard chartered bank	1729	1518	1613	2214.59	3454	2174	2242	2834	2091915	1660390
31. First commercial bank	1423	1568	1745	1403.07	3028	3065	3043	4121	1640141	1647246
32. oriental commercial bank	1387	2243	2573	1817.22	2132	1929	2000	3071	1574544	1510566
33. paramount universal bank	1314	1915	1615	2453.62	1068	925	1778	1300	1259015	1152391
34. Middle east bank	1217	1942	2147	2459.57	1607	1687	1818	2847	1174336	1086257
35. UBA Kenya	1217	1378	2033	2073.41	1760	1769	2009	1837	1023539	1036015
36. Credit bank ltd	1112	1596	1536	2931.49	1188	1020	1156	1911	1018894	1002344
37. Consolidated Bank of Kenya	1088	1152	2240	1644.21	2162	1945	1040	1274	774637	678505
38. UBA Kenya	1017	1234	1392	2143.39	1162	1158	304	1413	58308	617150
39. Spire/Equitorial bank	934	2179	1119	1192.11	1169	-1030	-552	-1820	0	0
40. Chas Bank	9613	10621	0	0	0	0	0	0	0	0
41. Imperial Bank	6564	7469	0	0	0	0	0	0	0	0
42. Fidelity commercial/BM Bank	1551	1755	1263	0	1269	2871	0	0	0	0

NON PERFORMING LOANS	M	M	M	M	(M)	M	M	M		
Banks	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
1. KCB Bank ltd	12368	13368	19289	28333	34182	30012	34786	66810	56103	72611
2 Equity bank ltd	7369	7469	6832	15038	17621	28953	26185	42825	47659	51925
3 Absa/Barclays Bank ltd	7682	7982	8189	11472	12615	17064	31156	51781	43283	51248
4 Cooperative Bank	9752	10752	5336	272	435	13910	30516	35995	35419	37617
5 Standard chartered bank	4354	4554	3656	3392	2666	11036	13519	17099	33259	35258
6 CFC stanbic Bank ltd	5269	5969	14698	7450	7798	21661	19345	25038	25881	29720
7 Diamond Trust Bank	1099	1199	13195	816	2252	16644	12892	19747	25421	28891
8 I & M Bank ltd	3670	3770	4723	1855	18714	21115	18799	20178	23559	25380
9 NIC/NCBA Bank ltd	1813	1913	5072	11273	27658	15830	20058	22337	21529	24685
10 Citibank Kenya	3270	3370	4858	29987	809	9271	25175	26438	18448	19048
11 Commercial Bank of Africa	7137	7237	11762	856	1724	31461	8244	9391	17099	18480
12 National Bank of Kenya	3096	3196	3515	805	592	13334	4126	6342	11329	13506
13 Family Bank	4063	4163	4097	158	1438	8138	12316	10799	11181	11980
14 Bank of Baroda	2312	2412	989	1193	10571	3903	4555	4838	9784	10033
15 Prime Bank ltd	556	666	9744	10794	2481	2821	14980	16225	9083	9741
16 Bank of Africa/Commercial B Africa	1045	1065	2364	2038	877	819	1116	1120	8351	8574
17 Bank of India	870	881	2444	676	1595	9509	3613	4028	6970	8519
18 Ecobank Kenya	2361	2461	1768	891	10359	3192	1204	1679	6948	6961
19 Guaranty Trust Bank ltd	933	1033	364	7013	3535	1347	4783	4377	5023	5585
20 Gulf African Bank	865	885	1398	2840	13265	2572	8998	8689	3877	5462
21 Victoria commercial Bank	462	472	2677	12650	8287	696	3556.7	3425	3756	4849
22 Sidia/ K rep bank	60	71	1608	196	2349	4232	3258	2337	3342	4239
23 Giro commercial bank	2928	3028	0	0	778	2526	1592	2017	2715	3785
24 Jamii Bora/jamii bank	766	776	570	5359	2106	2942	2747	3269	2495	2954

25 Habib/HFC bank	2711	2811	2777	1322	1421	4940	1212	996	2186	2908
26 African Banking	801	811	778	778	17	2879	4699	5258	2181	2698
27 Habib/HFC bank	707	787	3388	2141	1122	960	6083	6787	2031	2686
28 Transnational/Access bank	1418	1518	1958	994	17669	1113	944	1181	1984	2423
29 Development bank	1222	1322	1604	5072	2310	6344	3341	3420	1928	2368
30 Standard chartered bank	249	250	1029	787	3917	2539	2632	2436	1856	2149
31 First commercial bank	611	602	1870	2594	11901	773	1411	1812	1745	2139
32 oriental commercial bank	581	586	515	5520	0	1850	2196	159	1628	2131
33 paramount universal bank	1021	1063	733	2459	2596	2686	1263	1346	1519	1969
34 Middle east bank	549	552	815	15457	14758	16311	787	836	1450	1738
35 UBA Kenya	331	342	831	7015	9478	1069	870	790	1389	1569
36 Credit bank ltd	2214	2314	116	1617	1962	581	2632	2711	1345	1555
37 Consolidated Bank of Kenya	1106	1116	434	3853	4399	442	50	125	1247	1463
38 UBA Kenya	54	84	1093	69	152	1227	67	129	1107	1173
39 Spire/Equitorial bank	29	52	58	6193	8212	8	883	1295	0	0
40 Chas Bank	2120	2020	0	0	0	0	0	0	0	0
41 Imperial Bank	2120	2020	0	0	0	0	0	0	0	0
42 Fidelity commercial/BM Bank	509	529	185	0	0	0	0	0	0	0

	TOTAL ASSETS	M	M	M	(M)	M	M	M	M	M
	Banks	2014	2015	2016	2017	2018	2019	2020	2021	2022
1	KCB Bank ltd	376969	467741	504778	555630	621722.88	674301.72	758345	768345	788345
2	Equity bank ltd	277116	341329	379749	406402	438508.78	507525.24	496823	499823	5096823
3	Absa/Barclays Bank ltd	222636	339550	349998	382830	408303.62	449616.47	667650	677150	687250
4	Cooperative Bank	282689	241153	250274	271682	284691	302295.9	283569	293560	298569
5	Standard chartered bank	226043	234131	259498	285125	325362.74	254252.17	377936	399132	407936
6	CFC stanbic Bank ltd	137299	147846	244124	270082	281515.7	374109.2	325873	365872	375875
7	Diamond Trust Bank	171347	198578	164116	183953	280953.01	464890.69	491614	501611	511613
8	I & M Bank ltd	141176	190948	210878	229525	229161.13	287250.6	318986	338989	359921
9	NIC/NCBA Bank ltd	137087	156762	204895	98232	232317.12	292705.14	166313	167315	168315
10	Citibank Kenya	175809	198484	103324	192817	195054.63	96570.19	106454	116455	126455
11	Commercial Bank of Africa	79398	88147	161847	239408	85638.69	143311.34	312189	302199	313192
12	National Bank of Kenya	107112	81190	82907	96132	123014.4	62543.24	75129	76131	78130
13	Family Bank	61945	65001	65338	56631	62689.13	108785.53	116204	107204	118205
14	Bank of Baroda	61813	68178	47815	76438	98534.46	78857.13	90591	991332	987113

15	Prime Bank ltd	of B	122865	42163	68085	25985	70647.74	72519.36	79190	80190	81180
16	Bank Africa/Commercial Africa		34918	24714	22403	109942	115143.44	15358.07	37653	38653	39657
17	Bank of India		34370	20020	27156	18708	32336.96	36072.41	31267	31267	31269
18	Ecobank Kenya		15799	29374	29619	62127	66909.84	29082.4	37890	37894	37898
19	Guaranty Trust Bank ltd		32992	19107	69432	31316	21520.67	24823.46	27212	29216	28210
20	Gulf African Bank	commercial	12147	14440	17033	27628	16185.96	21540.74	126842	126908	126998
21	Victoria Bank		17244	10230	16254	15803	17805.42	16386.45	21947	21847	21999
22	Sidia/ K rep bank		19734	15810	12508	17360	25323.37	75377.85	32643	329439	396478
23	Giro commercial bank		9449	22058	14705	24804	33325.58	35122.98	11022	11129	11623
26	Jamii Bora/jamii bank		15082	14609	22422	14465	49080.86	18762.84	33500	33688	33591
27	Habib/HFC bank		14571	10533	115114	10577	15323.11	28680.49	11378	17379	15379
28	African Banking		21439	16943	10465	9541	27212.71	16088.32	16858	16959	16858
29	Habib/HFC bank	Transnational/Access	16515	10526	12202	16320	9887.41	10443.3	18743	18290	18991
30	bank		62212	52427	9427	10295	54463.88	26451.64	12985	12993	12989
31	Development bank		10240	14136	16418	54191	10515.02	12393.78	17222	18231	19302

32	Standard chartered bank	10402	5678	20875	6505	15332.12	8466.28	23145	23946	25245
33	First commercial bank	13118	16782	5601	3548	10235.52	57083.28	94428	97427	99429
34	oriental commercial bank	7858	14613	9920	11745	6856.57	9317.7	30612	31613	33616
35	paramount universal bank	5937	10287	55996	13456	17880.46	8652.48	12886	13887	14888
36	Middle east bank	3502	15025	14962	19302	9223.08	6860.3	12729	15727	14726
37	UBA Kenya	8865	7781	5234	12851	12887.33	11865.61	44917	45918	45918
38	Credit bank ltd	15077	14470	13918	2610	10004.86	8987.92	13263	14267	132976
39	Consolidated Bank of Kenya	4756	69280	15724	69051	57083.28	112028.75	54478	55473	55479
40	UBA Kenya	16589	125295	13802	53456	25329.17	8584.54	51143	50981	59324
41	Spire/Equitorial bank	45934	0	47124	11148	5250.61	43996.12	10147	0	0
42	Chase Bank	56599	0	0	0	0	0	0	0	56599
43	44 Imperial Bank	54918	0	0	0	0	0	0	0	54918
45	46 Fidelity commercial/BM Bank	15278	8496	0	5121	5360.86	0	0	0	15278

TOTAL CAPITAL	M	M	M	M	(M)	KSH 000	KSH 000	M	M	M
Banks	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022

1. KCB Bank ltd	6107 2 5288	71210	61072	85691	78020	95595972	101066966	126674	102218	105218
2. Equity bank ltd	7 6337	47552	52887	72770	61902	55864207	64711979	77446	70566	70581
3. Absa/Barclays Bank ltd	2 4122	38419	63372	55095	81048	109429717	65182117	92118	70268	70291
4. Cooperative Bank	2 4014	55534	41222	42746	43934	45102257	82739024	61233	60707	61807
5. Standard chartered bank	7 3035	36288	40147	42104	42242	42880319	48907303	51543	47561	49562
6. CFC stanbic Bank ltd	1 3029	30529	30351	33904	38790	41776778	46433739	51909	43715	45718
7. Diamond Trust Bank	9 2654	25065	30299	32876	36208	35785032	45275624	49335	42208	43209
8. I & M Bank ltd	4 3035	22863	26544	31883	32227	39656966	43686655	46444	40940	42943
9. NIC/NCBA Bank ltd	7 1910	27340	30357	26934	32964	30856983	43037925	45676	39240	39941
10. Citibank Kenya	1	18057	19101	25800	26130	28732458	22858745	26670	26670	26889
11. Commercial Bank of Africa	2520 1 1388	21705	25201	19196	19763	20200548	22033737	22912	22599	25590
12. National Bank of Kenya	4 1154	11206	13884	13992	16909	20074411	18596724	18515	18091	19191
13. Family Bank	7 1053	10551	11547	14450	11796	18816717	14992969	17322	17145	17189
14. Bank of Baroda	1	9683	10531	10501	13147	12643481	13263038	13363	11344	11589
15. Prime Bank ltd	9904	6722	9904	10765	11069	12725325	7856083	7932	7355	7359
16. Bank of Africa/Commercial B										
	8351	8244	8351	8971	9109	6952209	7734329	7835	6578	6979
17. Bank of India	8651	6037	8651	9580	5995	7610639	6368498	6605	6097	6599

18. Ecobank Kenya	7144	6530	7144	7606	5517	6207062	6371264	7070	5804	5905
19. Guaranty Trust Bank ltd	5172	4682	5172	7637	5354	5737693	6918214	5673	5413	5715
20. Gulf African Bank	3877	3147	3877	5580	6986	5074402	5421718	6055	4640	4689
21. Victoria commercial Bank	3785	2756	3785	4988	4836	6127447	5876860	4052	4052	4098
22. Sidia/ K rep bank	3475	2379	3475	4266	4771	3892295	4927160	4200	3622	3688
23. Giro commercial bank	2835	2422	2835	3817	3354	4959437	2928750	5123	3506	3579
24. Jamii Bora/jamii bank	2573	2273	2573	3077	2887	3073246	3001944	3220	2870	2899
25. Habib/HFC bank	2300	2243	2300	2965	2842	2926564	2952103	2995	2826	2899
26. African Banking	3012	2945	3012	2788	2644	2720978	2705075	2834	2649	2738
27. Habib/HFC bank	2108	1942	2108	2789	2906	2683456	2740810	2654	2546	2945
28. Transnational/Access bank	1984	1915	1984	2468	2375	2557152	3076075	3204	2534	5533
29. Development bank	2033	2010	2033	2969	2349	2174218	2241806	2695	2395	5394
30. Standard chartered bank	2147	1755	2147	2215	2162	3419154	1660390	2259	2259	5258
31. First commercial bank	2018	1423	2018	2454	1898	1793898	181817761	3484	2246	2941
32. oriental commercial bank	2033	1450	2033	2143	1638	1574544	2657425	1747	1747	1847
33. paramount universal bank	2024	1376	2024	2073	2021	1259015	1369437	1663	1620	1190
34. Middle east bank	1532	1227	1532	2019	1269	1175769	1093714	1413	1413	1513
35. UBA Kenya	1700	1139	1700	1895	1169	1112261	1036015	1221	1209	1212
36. Credit bank ltd	1403	1165	1403	1638	1157	1018894	1016015	1026	1026	1035
37. Consolidated Bank of Kenya	1257	1444	1257	1969	1041	1078077	678505	1619	836	838
38. UBA Kenya	1119	1040	1119	1186	1206	116616	1130466	1076	828	928
39. Spire/Equitorial bank	1312	1442	1312	1001	595	-1562	-1331313	-2581	0	0
40. Chase Bank	9376	10376	0	0	0	0	0	0	0	0

	5216									
41. Imperial bank	1	6634	0	0	0	0	0	0	0	0
42. Fidelity bank	0	0	0	0	0	0	0	0	0	0

	TOTAL DEPOSIT	M	M	M	M	(M)	M	M	M		
Banks	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	
1 KCB Bank ltd	307805	276750	347702	386611	445398	486613	536830	591067	59103	602218	
2 Equity bank ltd	100733	216174	263709	277274.67	298703	341782	381138	502423	57659	70566	
								39481			
3 Absa/Barclays Bank ltd	307980	202485	236610	259471.75	285990	304593	360305	3	43283	70268	
								37008			
4 Cooperative Bank	307462	164779	172036	178447.78	226051	213033	330113	5	35419	60707	
								25770			
5 Standard chartered bank	208944	154067	165359	186598.23	209254	220784	242375	6	33259	47561	
								25695			
6 CFC stanbic Bank ltd	215587	122044	148537	169599.9	189305	224440	236461	1	25881	43715	
								23504			
7 Diamond Trust Bank	222245	96830	126229	159284.81	186444	212282	221038	8	25421	42208	
								21916			
8 I & M Bank ltd	119122	101594	108130	121989.23	178696	186521	195841	7	23559	40940	
								23349			
9 NIC/NCBA Bank ltd	18826	92791	105194	104160.2	134247	177250	205516	3	21529	39240	
								13840			
10 Citibank Kenya Commercial Bank of	17592	86621	103741	103740.63	142006	145220	119341	6	18448	26670	
11 Africa	13779	104734	110622	96966.52	77694	102007	81345	88594	17099	22599	

12	National Bank of Kenya	10343	79124	62022	62485.52	65461	71467	97079	81190 11267	11329	18091
13	Family Bank	10184	51150	62731	64873.6	100165	105244	65335	2	11181	17145
14	Bank of Baroda	9324	48683	52929	41473.32	58951	57761	58332	70577	9784	11344
15	Prime Bank ltd	6722	41671	50819	38155.86	47627	49256	46755	56912	9083	7355
	Bank of Africa/Commercial B										
16	Africa	6105	44940	47488	49312.8	44825	48806	66321	85021	8351	6578
17	Bank of India	5902	36310	41888	34463.71	36981	51044	50573	57094	6970	6097
18	Ecobank Kenya	5079	32414	34479	26726.39	45856	35445	38004	41196	6948	5804
19	Guaranty Trust Bank ltd	4667	24668	24613	32242.99	33335	47188	33329	28806	5023	5413
20	Gulf African Bank Victoria commercial	3056	17734	15490	16561.68	16601	30181	27350	21316	3877	4640
21	Bank	2615	15795	19024	21754.94	26105	24339	18932	27977	3756	4052
22	Sidia/ K rep bank	2337	16050	13380	16078.45	18886	26689	27818	29972	3342	3622
23	Giro commercial bank	2330	12289	15774	15695.95	20104	16760	22981	28082	2715	3506
24	Jamii Bora/jamii bank	2197	12065	14024	13685.09	14140	21974	18014	23770	2495	2870
25	Habib/HFC bank	2179	12451	10946	11772.94	13808	20525	20532	22082	2186	2826
26	African Banking	1928	13559	12802	5788.51	13120	16390	17347	18149	2181	2649
27	Habib/HFC bank Transnational/Access	1846	8465	9665	12938.39	14783	14392	13078	19038	2031	2546
28	bank	1814	8485	12495	8095.1	11485	13336	16285	15544	1984	2534
29	Development bank	1745	14306	10378	12655.46	7665	15541	6029	8279	1928	2395
30	Standard chartered bank	1729	13339	12350	12313.03	5612	12964	13600	13238	1856	2259
31	First commercial bank	1423	10642	10116	9491.8	7950	7405	9188	8082	1745	2246
32	oriental commercial bank	1387	8948	9996	8542.84	8855	8083	8796	9749	1628	1747
33	paramount universal bank	1314	7666	6861	8215.36	6842	8824	8479	5081	1519	1620
34	Middle east bank	1217	6399	7593	9135.3	7729	8126	7100	10149	1450	1413

35	UBA Kenya	1217	8048	8067	8000	6822	4787	6512	9287	1389	1209
36	Credit bank ltd	1112	6231	6218	6936.72	4194	5615	7138	9265	1345	1026
37	Consolidated Bank of Kenya	1088	7218	7267	7667.9	3908	3198	7293	9605	1247	836
38	UBA Kenya	1017	4127	4137	1947.36	2080	4147	4795	7826	1107	828
39	Spire/Equitorial bank	934	3576	4099	3996.06	1285	7090	4553	4793	1086	0
40	41 Chase Bank	9613	47186	0	0	0	0	0	0	0	0
42	43 Imperial bank	6564	47148	0	0	0	0	0	0	0	0
44	45 Fidelity bank	1551	12643	10403	0	7463	6822	0	0	0	0

TOTAL INCOME		M	M	M	M	(M)	M	M	M	M	M	M
Banks		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	
1.	KCB Bank ltd	21445	22362	23445	28482	27472	31384.94	33183.95	23586	57805	56103	
2.	Equity bank ltd	19388	20112	22388	22778	23086	24382.34	25973.66	16961	40733	47659	
3.	Absa/Barclays Bank ltd	14073	14300	14073	18024	16502	17586.76	20326.06	14207	37980	43283	
4.	Cooperative Bank	12174	12515	12074	12764	10006	11433.57	12691.23	10289	37462	35419	
5.	Standard chartered bank	8979	12294	8974	10440	9510	10250.07	12012.34	8300	28944	33259	
6.	CFC stanbic Bank ltd	8398	7749	8367	8876	8228	9264.77	11857.47	7018	25587	25881	

7. Diamond Trust Bank	7118	7391	7077	8651	7516	8797.96	9289.88	6955	22245	25421
8. I & M Bank ltd	6051	6307	7055	7593	7189	8725.33	9279.31	6237	19122	23559
9. NIC/NCBA Bank ltd	6169	6081	6260	6910	6373	7952.41	8239.66	5791	18826	21529
10. Citibank Kenya	6119	4522	6227	6033	5676	5982.05	5646.51	5480	17592	18448
11. Commercial Bank of Africa	5478	4145	5577	5926	5599	5643.03	5466.2	3942	13779	17099
12. National Bank of Kenya	2891	3302	2883	3876	5053	5159.08	2798.62	2733	10343	11329
13. Family Bank	2589	2695	2593	2336	2675	2447.91	2456.5	1849	10184	11181
14. Bank of Baroda	2287	2618	2486	2185	1977	2088.48	1352.24	1326	9324	9784
15. Prime Bank ltd	1560	2332	1470	1445	849	955.73	1179.98	617	6722	9083
16. Bank of Africa/Commercial B Africa	1193	1284	1093	796	740	587.5	1136.82	559	6105	8351
17. Bank of India	891	729	677	754	409	565.1	668.56	493	5902	6970
18. Ecobank Kenya	581	687	547	659	393	419.88	491.2	480	5079	6948
19. Guaranty Trust Bank ltd	571	643	520	633	254	359.04	385.27	451	4667	5023
20. Gulf African Bank	523	635	510	622	241	348.05	300.07	313	3056	3877
21. Victoria commercial Bank	489	615	485	601	228	332.21	250.55	238	2615	3756

22. Sidia/ K rep bank	439	532	479	493	216	307.08	243.35	147	2337	3342
23. Giro commercial bank	381	472	355	302	203	292.2	218.05	105	2330	2715
24. Jamii Bora/jamii bank	319	378	329	222	179	209.56	185.48	104	2197	2495
25. Habib/HFC bank	281	319	252	162	116	168.81	164.26	97	2179	2186
26. African Banking	178	318	178	160	96	157.6	105.58	77	1928	2181
27. Habib/HFC bank	193	298	169	158	58	150.79	85.64	56	1846	2031
28. Transnational/Access bank	97	204	93	105	54	136.26	64.49	43	1814	1984
29. Development bank	38	191	49	95	35	105.31	64.45	19	1745	1928
30. Standard chartered bank	71	137	43	62	14	23.65	59.63	8	1729	1856
31. First commercial bank	40	96	42	50	-297	-98.46	-23.49	6	1423	1745
32. oriental commercial bank	38	84	36	36	-361	-267.65	-56.23	-124	1387	1628
33. paramount universal bank	15	76	11	-16	-439	-278.41	-365.88	-262	1314	1519
34. Middle east bank	-19	7	-179	-41	-633	-307.4	-453.43	-352	1217	1450
35. UBA Kenya	-201	-90	-277	-101	-762	-351.57	-516.91	-680	1217	1389
36. Credit bank ltd	-313	-274	-304	-277	-839	-383.4	-795.13	-693	1112	1345

37. Consolidated Bank of Kenya	-614	-331	-655	-490	-1371	-395.28	-821.25	-963	1088	1247
38. UBA Kenya	-1401	-461	-1434	-968	-1434	-362.07	-1143.38	-1257	1017	1107
39. Spire/Equitorial bank	-1512	-499	-1684	-2889	-1576	-873.32	-2929.68	-2010	0	0
40 Chase Bank		0	2689	0	0	0	0	0	0	0
41 Imperial Bank		0	2298	0	0	0	0	0	0	0
42. Fidelity commercial/BM Bank		0	102	0	0	-41	0.51	0	0	0

TOTAL LOANS	M	M	M	M	M	M	M	M	M	M
Banks	2013 10221	2014	2015	2016	2017	2018 43436	2019	2020	2021	2022
1. KCB Bank ltd	8	257399	324284	373031	411666	1 25756	468258	544837	545836	554837
2. Equity bank ltd	70566 7026	192973	229394	132497	139406	6 23102	290564	355630 30732	355629	375630
3. Absa/Barclays Bank ltd	8 6070	181370	212711	176349	177224	6	281516	4 25969	307331	337324
4. Cooperative Bank	7 4756	128768	148846	19354	20771	18615 15228	244395	8	259689	269698
5. Standard chartered bank	1 4371	128204	128266	38089	43943	7 13316	205304	229677 17659	229698	279677
6. CFC stanbic Bank ltd	5 4220	97984	122905	105082	107038	6 15549	163859	7 16594	176599	186597
7. Diamond Trust Bank	8	95258	111286	4339	39763	8	155307	8	165973	185948
8. I & M Bank ltd	4094	92667	107683	40170	7232	14443 4	152807	16066	160672	190665

	0							5		
	3924					11778		15271		
9. NIC/NCBA Bank ltd	0	91163	104302	241395	68153	6	144483	1	152733	162711
	2667					11827				
10. Citibank Kenya	0	89797	103535	68616	7741	1	60677	74774	74789	75774
11. Commercial Bank of Africa	2259									
	9	68093	72842	7109	38080	66123	54389	63111	63122	64111
12. National Bank of Kenya	1809									
	1	55837	57975	28242	5680	49215	49335	51151	51157	52151
	1714									
13. Family Bank	5	46260	54624	5361	3242	47023	45822	41836	41837	42836
	1134									
14. Bank of Baroda	4	39236	41617	4015	33589	43439	38932	9248	9249	9348
15. Prime Bank ltd	7355	35060	41075	37480	9882	38188	27226	44531	44547	45531
16. Bank of Africa/Commercial B Africa										
	6578	29002	32263	10317	10171	27255	27068	36760	36789	37760
17. Bank of India	6097	24541	30902	8361	7365	26255	24578	39726	39763	39826
18. Ecobank Kenya	5804	24116	27683	7026	135443	14733	24542	22928	22983	23928
19. Guaranty Trust Bank ltd	5413	14068	17973	118483	16371	19153	24118	25884	25848	26884
20. Gulf African Bank	4640	13513	15864	15022	118459	23616	22546	26884	26835	27884
21. Victoria commercial Bank	4052	12851	15538	112509	21456	22810	20115	21850	21859	23850
22. Sidia/ K rep bank	3622	12438	13317	9287	6867	0	15846	21961	21919	23961
23. Giro commercial bank	3506	11555	13124	27393	6345	13342	15797	17512	17532	18512
24. Jamii Bora/jamii bank	2870	11214	12826	8319	9929	14108	14872	15714	15745	18714
25. Habib/HFC bank	2826	10979	11532	6243	13746	10691	13608	20980	20991	21980
26. African Banking	2649	10766	10767	10497	18887	10031	11833	14572	14598	15572

27. Habib/HFC bank	2546	10467	10400	13418	10710	9715	10766	8907	8973	8897
28. Transnational/Access bank	2534	10295	10155	15293	6680	13440	9892	9248	9283	9448
29. Development bank	2395	9990	10037	9604	156843	9112	9801	10149	10159	12149
30. Standard chartered bank	2259	9332	9926	104302	235	10027	8929	10130	10128	13130
31. First commercial bank	2246	6609	9094	141702	12330	8018	7455	7742	7883	7842
32. oriental commercial bank	1747	6464	7388	14488	221698	7646	7313	3481	3434	3581
33. paramount universal bank	1620	5887	7339	221039	46928	6109	7177	7883	7879	7983
34. Middle east bank	1413	5389	6485	53485	20144	23602	7000	6847	6891	6947
35. UBA Kenya	1209	5078	5582	16686	10995	3917	6153	7639	7696	7739
36. Credit bank ltd	1026	4707	5329	11926	291	778	5114	3827	3839	3927
37. Consolidated Bank of Kenya	836	4208	4271	0	0	592	5067	8789	8796	8889
38. UBA Kenya	828	3719	4009	3127	3309	152	4606	5056	5886	5156
39. Spire/Equitorial bank	201	3443	2790	56786	52630	1438	3841	3178	0	0
40. Chase Bank	3968	1	0	0	0	0	0	0	0	0
41. Imperial Bank	3182	7	0	0	0	0	0	0	0	0
42. Fidelity Bank	7786	10083	9389		0	0	0	0	0	0

TRWA Banks	KSH									
	M	M	M	(M)	KSH 000	000	M	M	M	
	2014	2014	2015	2016	2017	2018	2019	2020	2021	2022

1. KCB Bank ltd	33997 7	397490	430839	483986	537572619	577236270	57723628 2	653393	87957222	90200466
2. Equity bank ltd	26851 8	325484	319615	374209	400288769	410346536	41034659 1	455847	55864207	62770438
3. Absa/Barclays Bank ltd	20580 6	298137	356088	357310	367430410	350879900	35087998 3	56695 9	55214858	62561322
4. Cooperative Bank	25651 1	224121	239299	243728	213677904	476759743	47675975 9	34174 2	39935899	62469024
5. Standard chartered bank	18310 5	189137	201321	228112	261752219	233853549	23385359 8	22936 6	37788041	44555022
6. CFC stanbic Bank ltd	13873 5	162284	183223	204039	214581736	277812947	27781297 4	29731 4	35459462	38832488
7. Diamond Trust Bank	13227 4	171281	179751	206090	199699818	209981453	20998146 7	22397 6	34201410	37847066
8. I & M Bank ltd	12126 0	138179	147419	173455	227294222	238222002	23822201 9	25647 2	33237245	36157351
9. NIC/NCBA Bank ltd	13104 5	148256	148414	165647	165126598	242802511	24280253 9	24725 1	28030736	35701874
10. Citibank Kenya	66136	67435	139840	150898	160962878	69827913	69827939	86842	25276163	22634933
11. Commercial Bank of Africa	12118 0	140604	72808	77348	58280792	53266941	53266981	58365	20038296	21471831
12. National Bank of Kenya	80433	73606	45823	52365	53829261	68493696	68493698	82243	19313389	18596723
13. Family Bank	52067	42539	69534	52478	68086955	30964343	30964329	35693	18677814	14813135
14. Bank of Baroda	40044	75266	88325	66207	28787492	70978185	70978196	74824	12460848	11244237
15. Prime Bank ltd	40100	39685	48576	20508	65186401	33983208	33983281	46180	10706525	7830795
16. Bank of Africa/Commercial B	51781	48318	19615	53576	28664566	67262493	67262497	76037	6952209	6579626
17. Bank of India	15316	52778	54161	37495	48940357	31604573	31604589	35151	6925770	5827565

18. Ecobank Kenya	32967	16889	39119	24265	29424874	44679426	44679463	44549	5663581	5812771
19. Guaranty Trust Bank ltd	18750	18647	47248	19923	34582816	42533091	42533089	20794	5627881	5774511
20. Gulf African Bank	23285	24593	20599	44275	18810854	20643540	20643591	31903	5074402	5421718
21. Victoria commercial Bank	14376	15340	19599	29847	32834897	34347247	34347274	7625	4344181	4262768
22. Sidia/ K rep bank	11572	18004	22788	87998	27021094	27479534	27479587	46280	3875451	3698408
23. Giro commercial bank	10186	11781	16420	20377	30952640	10731752	10731761	31047	3423941	2875701
24. Jamii Bora/jamii bank	8709	9577	11924	8506	19408413	20069349	20069393	22156	2956579	2837260
25. Habib/HFC bank	6036	14151	9179	10505	11880588	9381519	9381595	11255	2862779	2649048
26. African Banking	17096	18304	7207	16679	18756441	7858628	7858687	12030	2628938	2606842
27. Habib/HFC bank	5924	6172	13888	19239	8674913	12345662	12345681	8712	2575020	2523757
28. Transnational/Access bank	8824	11256	10801	11746	11241904	20005291	20005289	21331	2420413	2428895
29. Development bank	6780	9473	18530	12156	6557499	8837363	8837385	12114	2174218	2241806
30. Standard chartered bank	10600	5776	11288	5575	92765531	5517940	5517941	7426	2091915	1660390
31. First commercial bank	12413	7394	5412	8060	9136177	9020366	9020398	21331	1640141	1647246
32. oriental commercial bank	5659	11649	5541	5974	5517940	24545787	24545798	7064	1574544	1510566
33. paramount universal bank	5404	13249	9974	13173	5593083	10125914	10125919	10291	1259015	1152391
34. Middle east bank	3641	6349	8047	1811	3932028	3506605	3506629	6699	1174336	1086257
35. UBA Kenya	1943	10276	11646	1237	2475148	5836904	5836938	4371	1023539	1036015
36. Credit bank ltd	6185	8964	5979	2717	4303343	6839081	6839089	7427	1018894	1002344
37. Consolidated Bank of Kenya	13139	3793	14071	6331	11828591	8147944	8147958	17453	774637	678505
38. UBA Kenya	4768	4704	3749	9537	11107327	13962683	13962698	11740	58308	617150
39. Spire/Equitorial bank	13457	13974	12669	11686	7099	6463765	6463757	4263	-1671	0

40. Chase Bank	67948	0	0	0	0	0	0	0	0	0
41. Imperial Bank	43219	0	0	0	0	0	0	0	0	0
42. Fidelity Bank	10230	0	0	0	0	0	0	0	0	0