RISK MANAGEMENT EFFECT ON PROFITABILITY OF COMMERCIAL BANKS: EVIDENCE FROM KENYAN COMMERCIAL BANKS

BY

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DECLARATION

I hereby declare that this research study project is my original work, and it has actually not been presented in any institution of higher learning or any other university for the award of a degree.

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This dissertation has been submitted for examination with my approval as the university supervisor

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DEDICATION

This research is dedicated to my family; Mercy Njoki, Paul Gakiavi, Jacinta Kinyua, Jane Wanjiku Njoroge, Kenvie Karume, Regina Karume, Wilfred Murungi, Maureen Kinyua and Irene Njoroge for the support and encouraging words they have given me throughout my journey. That support has made this achievement a reality.

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

ERM   Enterprise Risk Management

CBK   Central Bank of Kenya

CMA   Capital Markets Authority

GDP   Gross Domestic Product

IFRS   International Financial Reporting Standard

MPT   Modern Portfolio Theory

NPLs   Non-Performing Loans

ROA   Return on Assets

ROE   Return on Equity

SPSS   Software Package of Social Sciences

CR   Credit Risk

IR   Interest Risk

FER   Foreign Exchange Risk

LR   Liquidity Risk

CMR   Capital Management Risk

OR   Operational Risk

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

The study aimed at establishing whether risk management in Kenyan commercial banks affects the profitability of those banks. The study also strived to find out whether management of various risks had the same effect on the bank's profitability. In this study, we used financial information from financial reports of all Kenyan banks covering the years 2014 to 2018. The researcher computed various ratios from these financial statements and checked whether banks' profitability was impacted by risk management. Multiple regression analysis revealed that credit risk and profitability were negatively and insignificantly related (β =-0.0288653p=0.084). The test between interest risk and profitability indicated a significant and positive relationship (β =0.3086844, p=0.0001). In addition, it was revealed that foreign exchange risk influences the profitability of Kenyan banks positively and insignificantly (β =0.0405662, p=0.0954). Further, the findings showed a strongly inverse relationship between liquidity risk and profitability (β =-0.0575109, p=0.001). There was a positive and significant relationship (β =0.0980943, p=0.0070) between capital management risk and profitability. The test between bank deposits and profitability revealed a negative and significant relationship between the variables (β =-0.0739159, p=0.0090). In addition, the results show a significantly positive relationship between bank size and profitability (β =0.0045187, p=0.0480). Finally, the panel regression revealed a significantly positive relationship between operational risk and profitability (β =0. 0.0579156, p=0.00460). The study concluded that proper risk management is necessary for the profitability of banks in Kenya. Therefore, it is recommended that the managements of banks in Kenya invest in risk management to enhance profitability. The study also recommended that bank management properly manages its liquidity levels because it has adverse effects to the profitability of banks.

CHAPTER 1

INTRODUCTION

1.1 Background of the study

Risk is defined as situation involving danger or exposure. Management on the other hand is the process of dealing with a situation, thing or people. Risk management is the measures taken by a company to deal with various vulnerabilities. (Bikker and Metzmakers, 2005) once indicated that risk identification, assessment, monitoring and control are the stages of risk management. Management of risk is a crucial function in every organization and the management is constantly looking for ways to manage risks which emerge. An exploratory study was done on US firms and other international organizations to determine level of Risk Management implementation. Data was collected from 123 institutions and the finding was implementation of risk management was tagged to support by the top management, independence of the board, an institution having internal audit department and engaging independent external auditors. An effective ERM can therefore give a company a competitive advantage against the other companies in the same industry or sector.

Profitability is the degree of a company to use the resources and capital at its disposal to generate benefits which exceed the costs incurred. A study was carried out in Turkey between 2002 and 2010 to check determinants of profits in banks. Profitability was quantified by the ratio of Return on Assets (ROA) and how they were affected by various factors. The findings were that bank's profits are determined by the bank's size, non-interest income, loan/asset ratio and interest rate (Adem Anbar, Deger Alper, 2011). Other determinants of profitability of a bank are; competition, productivity and

efficiency. However, to best measure profitability of a bank, a researcher should use a balanced scorecard.

Banks have a very important contribution to the economy of any country. They provide a platform where people with excess finances can save and where people with the need of finances can borrow from. Depositors trust that the bank will manage their deposits well and that they will ensure that their deposits which will be issued out to borrowers as loans will be recovered. Hence it is very important for banks to come up with stringent management of risk policies to safeguard the depositors, support economy and ultimately increase wealth of the shareholders or investors in form of generation of profits. Studies previously done on this field have given contradictory results depending on the variables used. According to a study done by (Awoke, 2014), there was a great association between management of risk and profitability in 12 banks from Europe, Australia and North America. However, another study was done by (Gitau, 2017) and the conclusion was a negative association between management of risk and profitability. Banks in Kenya are governed by Companies, Banking and CBK Acts. The sector boasts of 43 banks according to Central Bank Supervision report, (2015). There are 40 privately owned banks in Kenya and Government has a major ownership in 3 banks. Dubai, Imperial and Chase banks have collapsed in the past five years. According to a research done by (Gathaiya, 2017) which was analyzing the issues that affected the collapsed banks, he attributed the collapse of these three banks to poor management or risk.

1.1.1 Risk Management

Management of risks is an important aspect in every organization, and this is mainly due to the risks which are emerging. These risks arise as a result of various reasons such

as advancement in technology giving room for cybercrime, tough economic conditions leading to high default rates by debtors/borrowers and also increased competition in the market which can create risk loopholes as the organization pursues to catch up with emerging trends. The discipline of risk management has also become very important and various regulators are demanding for risk management structures especially after the great recession of 2008 and international scandals that have happened in the recent past i.e. the Enron case, WorldCom case and the Lehman brothers' scandal. According to Pavodani and Tugnoli (2005), in addition to protecting organizations from vulnerabilities, risk management also helps them to see new opportunities.

Wadesango et al. (2018), did a research to test whether financial performance is affected by management of risk in public sector. Findings of his research revealed that management of risk is directly related to an organization's profits and this is so because it increases customer satisfaction, loyalty and reduces fraud risk. However, these positive effects of risk management can be sometimes watered down by some barriers such as lack of proper employee training, unsupportive leadership and non-existence of independent audit committee in the case of large organizations. In conclusion, the researcher was optimistic that the results of his research would motivate managements of various companies to put in place effective risk management system.

1.1.2 Profitability of Banks

Primarily, any organization's goal is to be profitable. This is achievable by using available resources optimally and seeking risks whose benefit outweighs the risk. In the same manner, as much as banks exist to provide a platform where savers and seekers of finances meet, they have an ultimate goal of making profit and hence maximizing the shareholder's wealth. Every business operates in an environment of uncertainty

about the future, it is how best a company can predict the eventualities in the future that determines the profitability of that business. According to Nikitta Dutta, (2017), profits are only made by entrepreneurs who can make correct estimate about the future or whose prediction prove to be true. On the other hand, entrepreneurs who cannot make correct future estimates or whose prediction prove to be wrong, suffer losses in the long run.

Studies have been previously done in this area of profitability of firms by various scholars. One of such scholars is (Zimmerman, 1996) who was studying the influencers of profits in banks. The research concluded that the main factors affecting profitability in banks is the loan portfolio structure, and the willingness and ability of senior management to control the risks facing the bank. Another study done by (Wall, 1985) on reason some banks make more profits than others, reveals that a bank's profitability is anchored on the management's capability to manage the balance sheet i.e. the assets, liabilities and funding in terms of equity, and its ability to minimize costs. Cost cutting is an important feature of any organization which wants to maximize its profits. Assuming two organizations whose all other factors are constant, an organization which is able to cut its cost through e.g. automation of processes or cheap source of raw materials and other factors of production will definitely make more profit because it will be having a competitive advantage than an organization which has no automation or does not have cheap source of factors of production.

1.1.3 Relationship between risk management and profitability

Risks facing different organizations have increased in the current day than they were sometimes back. This can be attributed to emerging trends such as advancement in technology leading to threats such as phishing, cybercrime and identity theft. The

increase of risk can also be attributed to other factors other than technology such as increased competition which makes organizations to sometimes jump into new operations and ventures without first carrying out due diligence. The financial services industry is more prone to these risks than other industries in the market, this is because of the greed for quick money and riches by the current day generation. The effects of mismanagement of risk in the financial industry especially banks have dire consequences on the economy as it can lead to bank rush, then to bank crisis, collapse of banks and general recession of the economy. Therefore, other than the efforts that the management puts in to reduce risk and maximize profits, it should put equal efforts in risk management as this can either make or break a bank's future. According to (Shahbaz, et.al., 2012), almost all banks have taken stringent measures to upgrade their structures of managing risk.

A study was done by (Lasisi *et. al.*, 2018*)* involving a target population of 14 listed banks in Nigeria in 2017 and covering 2011- 2016 to analyze whether profits made by the banks are linked to management of financial risk. In the research, profitability was quantified using the ratio of Return on Asset and management of financial risk using various risk ratios. The research found that the bond between liquidity risk and the bank's profitability was positive but immaterial, that between credit risk and profitability was significant but on the opposite direction while the capital adequacy risk had a strong bond. The recommendations of the research were that banks should regulate the issuance of loan facilities as this was found to affect the bank's profitability negatively.

1.1.4 Commercial Banks in Kenya

These are institutions offering deposit, loans and intermediary services between depositors and borrowers. Commercial banks are profit making organizations which expect to earn profit after offering the services indicated above. Commercial banks in Kenya have evolved from a few international banks in the early years after independence to many banks in the current day, some of which are locally owned and which have grown from saving societies to tier I banks. In the 1980s, the financial system and especially the banking sector was strictly controlled by CBK. However, in the early 1990s, the banking sector controls were loosened including the exchange controls. It is then that the effects of management of risk started being felt on the banks' profitability. Due to weak surveillance and lack of capacity by CBK to monitor the activities of banks and due to inappropriate government policies, there was accumulation of NPLs and hence the collapse of banks in the late 1990s which can be attributed to poor risk management.

A study was done by Kamau (2010) focusing on whether Kenyan banks have adopted risk management. The research revealed that most banks used various parameters to measure risk and among all the measures used, scenario analysis was found to be the most commonly used. The study also identified the challenges hampering the management of risk in banks and they include high costs and complexity in the structures. It concluded that there was immense improvement in the way of managing risk in Kenyan banks as majority of the banks had risk management systems. The study further revealed that the improved risk management in Kenyan commercial banks has also seen the bank's profitability grow over the period. The most critical risk in a bank according to the researcher is the credit risk. As per Basel II accord, credit risk forms

up to 75% of the risks facing commercial banks. Management of credit risk by carrying out due diligence on a potential borrower before issuing a loan and the recent adoption of IFRS 9 – expected credit loss model- by banks has lowered the amount of NPLs and in effect increased the profitability of most banks.

1.2 Research Problem

It is description of issues which will be addressed by a research. The type of risk management structures in a commercial bank can be influenced by issues such as the ownership structure, the regulatory requirements, the geographical location where the bank is located, the inherent risks in the country where the bank operates and also the caliber of the bank's management. However, banks operating in the same jurisdiction may have risk management structures that are close to each other than the structures for banks in other jurisdiction or economy. This is so because different economies have different inherent risks that exist in them. As earlier discussed, banks are increasingly finding the need to manage the risk that they face for continuity purpose. However, despite the emphasis that has been placed in risk management, there have been no enough studies done on it (Githinji, 2013).

Studies that have been carried out in the past to investigate the causes of collapse of banks and failure of the banking system globally, have all pinpointed to inadequate management of risk as the main cause of collapse of the banking systems. This has sent an alarm call to the current day banks management to come up with stringent risk management measures to cushion themselves from repeat of history. Commercial banks have embarked on installing sophisticated technology to mitigate various types of risk and conducting stress tests to check whether they can survive in the case of adverse conditions. Stress test is a hypothetical analysis by banks whereby they put themselves

under unfavorable economic conditions to determine whether the bank has enough shock absorbers to withstand those harsh conditions (Kieran, et. al, 2016).

According to a study done by CBK in 2005 to examine the effect of managing risks by banks, they found that 90% of the banks had reduced their loses and the management of these banks mainly attributed this reduction in the losses to the increased risk awareness in the management and the establishment of controls to prevent and detect these risks. Previously, studies done to examine on the subject matter have concentrated on credit risk. Although Basel II accord says that credit risk constitutes the biggest risk facing financial institutions, we would also want to find out using this study the influence of other risks on profitability. Therefore, this study addresses research questions below; first, are profits in banks influenced by management of risk? Secondly, what types of risks significantly affect banks' profit?

1.3 Objective of the Study

The main purpose of this research study was to assess the effects of risk management on the profitability of commercial banks: Evidence from Kenyan commercial banks.

1.3.1 Specific Objectives

The specific objectives will be to assess the effect of the following variables on profitability of commercial banks in Kenya:

   i.   To determine credit risk effect on profitability

  ii.   To establish interest risk effect on profitability

 iii.   To assess foreign exchange risk effect on profitability

 iv.   To evaluate liquidity risk effect on profitability

  v.   To establish capital management risk effect on profitability

 vi.   To determine bank deposits effect on profitability

vii.   To determine impact of bank size on profitability

viii.   To assess operational risk impact on the profitability

1.4 Value of the study

Findings herein can help other researchers pursuing this area further and provide them with literature review materials on the subject. Further, it will enhance the knowledge in theory of management of risk as study results can be used to support or negate the existing theories.

It is also intended to add insight to bank management on whether it is worth investing heavily in risk management in their banks and what benefit this investment in controls and other risk mitigating measures will have on the bank. It will also assist the management to know which types of risks significantly affect the profitability of banks to focus more energy on these significant risks. The study can also be used by regulators such as CBK and Capital Markets Authority (CMA) to come up with risk regulatory requirements that will be implemented by all banks.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter, the study is focusing on the theoretical and empirical reviews, the various profitability determinants and conclude on how the research will fill the gap in the knowledge that exists.

2.2 Theoretical Review

This study covers common risk management theories, particularly; moral hazard theory, modern portfolio theory and Merton's default risk theory. Finally, concludes on the theory that we adopted in our study.

2.2.1 Modern Portfolio Theory

It originates from Harry Markowitz in his paper (Markowitz, 1952). It indicates how risk-averse investors can create a portfolio that can maximize return bearing risk at a certain level. According to it, for an investor to gain high return on any investment, they must be ready to face or incur some risks. It goes ahead to argue that an investor should not assess the risk and return on each investment individually but rather the investor should evaluate impact of each investment on portfolio's risk and return. MPT argues that an investor can maximize the returns of a portfolio composed of many assets by accepting a certain risk. Likewise, investors may choose the expected return of portfolio desired and minimize the risk involved. It is anchored on the belief that investors prefer less risk i.e. they want return on investment while incurring the lowest risk possible.

In summary, the Modern Portfolio Theory suggests that it is possible for an investor or any organization to minimize the risk they face by increasing the portfolio or rather diversifying the areas of investment. The theory argues that an investor can increase the portfolio's expected return by minimizing the risk through increase in portfolio. It states that the risk of every investment has two components, i.e. the systematic risk component and unsystematic risk component. Systematic risks are the risks that are not under the control of the investor or the organization, i.e. they cannot be diversified away. These risks can include natural calamities, weather conditions, war, economic recessions, and political instability. Unsystematic risks are those that the investor can control, i.e. risks that can be diversified away. MTP therefore focus more on the unsystematic risks which can be diversified away by investors in the form of diversification of their portfolios.

2.2.2 Moral Hazard Theory

It states that sometimes the party which is covered against a particular risk or peril may intentionally get involved in the risk knowing very well that another party will incur the cost associated with the risk. This theory was developed by Economist Paul Krugman (Krugman, 2009). This theory states that moral hazard only occurs when there is asymmetry of information on either or both parties. This theory applies in the day to day activities and it mostly affects institutions in the financial industry, i.e. insurance companies and banks. For example, a borrower may engage in activities that are against the covenant in the loan agreement without the knowledge of the lender. This exposes the lender to the risk because in the event of the borrower defaulting, the lender will not be able to recover its funds back hence a loss will be incurred. In the case of an insurance company, a driver may drive carelessly just because he or she is protected by

the insurance cover and incase of any accident he or she will be compensated. This will eventually lead to a loss on the side of the insurance company.

Due to moral hazard, financial institutions have every reason to design, implement and monitor the operating effectiveness of risk management structures to cushion themselves from such losses which arise as a result of negligence. The risk management structures vary for businesses in various sectors and industries. Financial institutions are however prone to more risk especially arising from default by borrowers. To this effect, banks must come up with stringent risk management measures which in effect reduce the probabilities of default thus reducing loses and by extension improving the bank's performance i.e. profitability.

2.2.3 Merton's Default Risk Model

This theory originates from Robert C Merton (Merton, 1974) and it measures default risk. Actuaries and other credit evaluation personnel in banks use this model to assess a borrower's capability to repay a debt and the probability of default by a borrower. The Merton's default model was advanced to Black-Scholes model for options which became a Nobel-Prize winning model. This model is used to calculate the pricing of European derivative options without considering the dividends paid out during the life of the option. The Merton default theory is also used by investors to understand the credit ratings and spread of a company and comprehend the capital structure of an organization.

This helps them to minimize on the risk of investing in a company that will run into liquidity problems soon after making an investment. Banks also use this theory before extending credit facilities to borrowers. This is crucial as it assists the banks to cushion

itself from risk of default by borrowers which forms the biggest risk affecting commercial banks according to Basel II. The Merton default theory has triggered most banks to come up with risk management measures especially before lending money to borrowers such as obtaining the history of the borrower's account, obtaining security for the amount to be awarded so that in case of default the bank can recover the amount and also coming up with stringent loan covenants to cover the bank from potential losses.

2.3 Determinants of commercial banks profitability

Increasing wealth of shareholders is the main goal of every business. Banks being businesses like others, also have the responsibility and objective of maximizing the shareholders wealth. This is achieved by ensuring that the business is making profits and increasing this profit over time. In addition to maximizing the wealth of shareholders, banks also have a very crucial task in the economy of every country hence their stability and progress also means prosperity of the whole economy. However, in the pursuit of the objective to make profits and growing the economy, commercial banks are encountered with several factors which affect their profitability. These factors can be bank specific (i.e. the obstacles specific to a bank) and they can be other micro and macro-economic factors. In this study we are only focusing on the main factors affecting the profits of banks. They include; economic conditions, corporate governance, ownership structure and risk management.

2.3.1 Economic Condition

This refers to the current state of an economy in a country. The economic environment and associated economic conditions that a bank operates in affect its profits. These economic conditions include GDP rate of growth, rates of inflation in the economy,

stability of the local currency, lending rates and the level of government interference in the running of the economy. According to (Ntim, 2009) these factors have a significant influence on an organization's ability to generate benefits using the available resources. A bank which operates in an environment where the currency is stable is likely to generate more profits than a bank operating in an economy whose currency is very volatile. This can only be so if all other factors are held constant. In Kenya for example, there was capping of interest rates from 2016 to 2019, i.e. the banks could not charge interest on loans beyond a certain percentage. This gave mixed effects in the economy, i.e. from the point of view of a borrower, it benefited them as they were able to obtain finances at a cheaper rate and they were cushioned against extreme volatility in interest rates. From the side of the commercial banks however, this had negatively affected their profitability as it had reduced the income, they were earning in terms of interest income.

2.3.2 Corporate Governance

It is the system of structures through which firms are directed. The task of corporate governance is normally undertaken by independent board of directors who oversee the company from an oversight point. It is important as it ensures an effective way of running a business and is normally anchored on the pillars of transparency, accountability, and security. One of the pillars of Basel II accord is that a supervisory review should be conducted for all commercial banks. This is normally carried out by the board of directors through corporate governance. In Kenya, CBK requires all banks to have an independent supervisory board of directors. Brooks, (2017), argued that a company's performance can be attributed to good corporate governance, this reduces the agency conflicts in a firm. Agency conflicts arise whenever the management of a company (agents) make decisions which do not protect the wellbeing of the shareholders (principals). The board of any company is mainly constituted of

representative of shareholders and hence they oversee the operations of the company to ensure that shareholder's interests are safeguarded. Therefore, a good corporate governance system impacts on the profits of a bank positively.

2.3.3 Ownership structure

This is the composition of the owners of a company, it can either be institutional investors versus individual investors, government owned versus private owned or a mixture of all. The ownership structure influences company's profitability because it determines the amount of capital injected into the company and the management style of the company. (Berle and Means, 2000), broadly classified the ownership structure of companies into two group. The first category is whereby a company is controlled by its owners and the second category is a management-controlled company. The ownership structure of a company also determines the level of agency problem in that company. In the first category, there will be no agency conflict because the agent will also be the principal hence no agency-principal conflict. However, in the second category, the agency conflict is inherent, and this can only be mitigated by placing some controls. This also applies for commercial banks and the ownership structure plays a big role in a bank's performance. Commercial banks owned by government or those which have large portion of its shares being owned by government, may encounter the problem of political interference, hence affecting its profitability.

2.3.4 Risk Management

It is the evaluation of risks and laying down procedures to mitigate them. Management of risk can influence a company's performance and more so banks which are prone to so many risks. 'Banking business is a very risky venture and the relationship between such a business and returns from it ought to be efficient to reward risk seekers investors'

(Forbes, 2002). Banks with strong internal controls and other measures put in place to mitigate risks are more likely to be profitable than banks which have weak internal controls to mitigate risks. Commercial banks can manage their risks by performing thorough due diligence and credit assessment before issuing credit facilities, hedging against currency fluctuations, diversifying portfolios and products so that in case one product is not doing well, they can benefit from the others and also by automating processes and putting in place measures to protect themselves from cybercrime.

2.4 Empirical Literature Review

This is a review of past research done in the same field and analysis of findings from such studies. Many studies on this area have been done both at the local and international level. A study conducted to analyze execution of management of risks by banks in Malaysia, (Mohd and Salina, 2010). It was done for the period between 2006 and 2008 and it used five independent variables i.e. environment, policies and procedures, mitigation and monitoring as per the guidelines of Basel committee on supervision practices. These independent variables were then assessed on how they affected the profits measured by ROE. Results were that banks with better risk management practices reported higher ROE.

Another study was done by (Oluwafeni and Obawale, 2010) covering ten Banks in Nigeria between year 2006 – 2009 on the same subject. The dependent variable was measured using the ratio of ROA and the independent variables included capital, liquidity and credit risks. Results were that there was a strong relationship in the variables.

A study was done by (Hansen, 2009) on the Danish companies on the management of foreign risk exchange to the companies'performance. Hansen concluded that foreign exchange risk management is both a financial and operational strategy and the two complement each other. He further found that the operating and financial hedges on the foreign exchange risk exposure had a positive impact to the performance of a company financially.

A study on credit risk management impact on the success of industrial financial institutions in Nigeria was done by (Kargi, 2011). Kargi utilized the non-performing car loans as an action of credit rating threat in the financial institutions. He discovered that high degree of non-performing lendings brought about monetary distress in the financial industry. The scientist utilized second information through in between 2004 as well as 2008 and used success ratios to determine the financial efficiency of financial institutions. He concluded that credit scores threat management had a substantial impact to the financial performance of commercial banks in Nigeria.

(Ahmed, Akhtar & Usman, 2011), had a study on how Pakistan Islamic banks manage their risks. The main objective of the study was to asses the factors that lead Islamic banks to manage their risks. The study found that some of the factors that influence banks to establish risk management mechanisms is the bank size. It found that a bank's size is positively and strongly correlated to financial risk, but it is negatively correlated to operational risk. On the other hand, the study found that asset management had a positive and strong correlation to liquidity and operational risks. Another finding from this study was that NPLs have a negative and significant relationship to the liquidity and operational risk.

Locally, a research was done by (Kithinji, 2010) to analyze the link between credit risk management risk and profitability of Kenyan banks. It involved all the listed banks and it used data between 2004 and 2008. The study used ROA and measures of credit risk as its independent and dependent variables respectively. The research got a weak bond. The research advocated that banks should not invest heavily in management of credit risk as it didn't have much benefit in terms of the company's profitability. Rather it suggested that banks should consider other factors affecting its profitability and not credit risk management.

Another study by (Wanjohi, 2013) to examine the relationship between financial risk management and financial performance of Kenyan commercial banks was done. Same population as that of Kithinji above but for the period 2008 to 2012 and risk management components as independent variables. A strong relationship was discovered.

A study was done by (Muteti, 2014) to determine connection between economic risk administration and performance of banks financially. Information was gathered from 43 banks and assessed utilizing SPSS and also using several regression version. The independent variables were credit report risk, passion danger, liquidity threat, foreign exchange risk whereas the reliant variable was monetary efficiency gauged making use of ROA. The research wrapped up that the independent variables along with a bank's size positively and considerably affected performance of financial institutions in Kenya financially.

Kamau (2010 assessed the level of danger administration by industrial banks in Kenya. Primary information was gathered in kind of studies on all the financial institutions. Findings were that the major risks affecting banks in Kenya were credit, operational, reputation and compliance risks. It was also found that most banks did not face liquidity risk, and this can be attributed to the strict regulation by CBK that banks must maintain a certain level of float with it so as to cushion the banks from liquidity risks. It was also found that banks used both qualitative and quantitative measures to manage their risks.

Njeri (2010), also did a study to access the extent at which large commercial banks in Kenya apply strategic risk management measures. In addition to finding the strategic risk management measures applied by banks, it also assessed the difficulties banks face in applying these strategies. A survey was done on 13 banks and after analyzing using SPSS, the conclusion was that majority of banks have adopted management of risk measures and main steps in risk management by the banks include risk assessment, monitoring, controlling and reporting.

2.5 Conceptual Framework

This represents how the person doing research wants to arrange concepts in order to explain a phenomenon. It is basically the arrangements of thoughts and the logic of how these thoughts will arrive to a conclusion. The ultimate goal is to assist the researcher to bring out a clearer and complete picture of what he or she wants to bring about by linking the dependent variables to the independent variables (Tobin, J. et. al. (1968). below is a graphical representation of our framework

Independent Variables   **Dependent Variable**

| Credit Risk (CR) |

| Interest risk (IR) |

| Foreign exchange risk (FER) |

| Liquidity Risk (LR) |

| Profitability |

| Capital management risk (CMR) |

| Operational risk (OR) |

| Deposit level |

| Bank size |
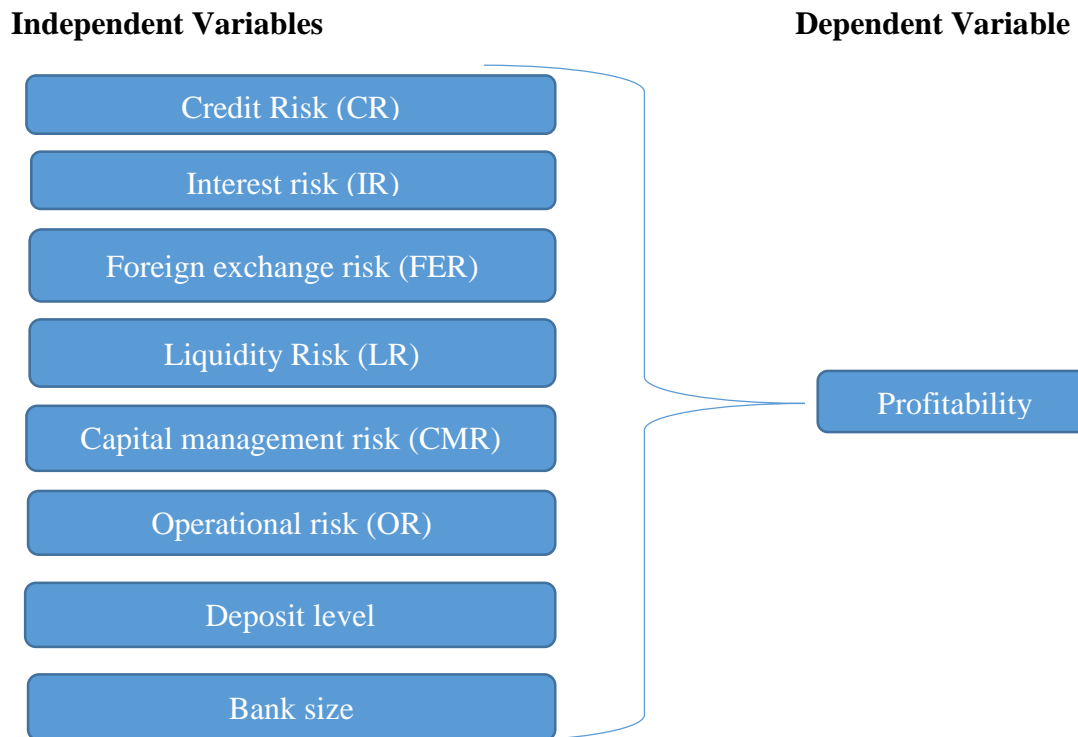
Figure 2.1: Conceptual Framework

2.6 Literature Review Summary

Studies previously conducted touching on this area evidence that the subject cannot be underestimated. If all areas of risk management had been covered, the problems encountered in the past of bank collapse and financial crisis could not have been experienced. To that effect, using this study, we aim to cover the gap identified in this area. All these studies done in the past have limited themselves to one type of risk, either credit risk or financial risk, and they have also limited themselves to the risk management components as their independent variables. To this effect, we have identified a gap in the study and this study is not limited to a specific type of risk but rather all the risks that face commercial banks in Kenya. We also have not limited ourselves to the five components of risk management but rather our independent variables are the various risks that affect the banks. The employment of more independent variables also enables us to reduce the error term.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

First area covers research design employed, second area covers unit of analysis or the target population, and the third section covers data collection and data analysis methods used.

3.2 Research Design

It's a technique employed to explain various issues of the research in a logical manner and handle the research problem appropriately. We have decided to use descriptive research design in this research. Descriptive study uses surveys and fact-finding enquiries so as to describe a phenomenon currently, (Kothari, 2014).

3.3 Target Population

This is a group of items where a sample can be extracted for research purpose. Our research uses all the Kenyan banks. To generalize the results of a research, a target population need to have observable characteristics (Mugenda and Mugenda, 2003). In our case, observable characteristics is that all these banks are regulated by the CBK and they perform the role of a commercial banks as defined by CBK.

3.4 Data Collection

This is gathering and measuring of variable parameters to obtain answers for the research questions. In our study, we use secondary data which obtained from banks financials for period between 2014 and 2018

3.5 Panel Diagnostic test

3.5.1 Normality Test

Evaluating supposition of normality is necessary for a majority of the statistical dealings and parametric statistical evaluation is among the best methods for measuring this supposition; parametric statistical evaluations assume that data is usually normally distributed, however if this normality assumption is not satisfied, interpretation may not be dependable, hence it is crucial that the researcher checks for this assumption before any analysis is undertaken; the most common test of normality tools is the Shapiro-Wilk (SW) test (Razali & Wah, 2011). The assumption of normality ($u_t \sim N(0, \sigma^2)$) is called for to conduct joint or single hypothesis examinations concerning the design criteria (Brooks, 2008). In our research, normality is examined making use of Shapiro-Wilk (SW) test.

3.5.2 Multi-collinearity Testing

Multicollinearity is concerned with the linear relationship among two or more variables; multicollinearity is a major data problem that might significantly lower the reliability of the estimates of the model criteria; a prominent multicollinearity analysis tool is difference variance inflation factor (VIF) (Alin, 2010). VIF tests whether one predicator displays a strong linear relationship with another predicator (Mekonnen, 2015). A large value of VIF indicates some linear dependency between predicators and the norm is that if VIF is more than 10 then multicollinearity is considered high (Alin, 2010).

3.5.3 Autocorrelation

A presumption of straight regression designs is that the errors of the design are independent of each other (not connected), nevertheless, if the assumption is not achieved in time- series research study, after that the errors are deemed non-

independent or auto-correlated; auto-correlation is fundamental since it can; influence the soundness of inferences associated with conventional hypothesis tests and confidence levels, secondly, its existence can force a researcher to select a more suitable statistical analysis methodology and lastly, the accuracy of predictions stipulated from regression models can be made better by using information relating to auto correlation (Hultema & Laraway, 2006). Durbin-Watson test was utilized in this case.

3.5.4 Heteroscedasticity

A crucial assumption of linear regression modelling is homoscedasticity; under this assumption, the errors are assumed to be independently identically distributed; however, if the errors are not independently identically distributed and presumed to have distributions with diverse variances heteroscedasticity is present (Klein et al., 2016). Breusch-Pagan test was made use of in this case.

3.5.5 Tests for Fixed and Random Effects

Researchers in social science are often confronted with difficulties when dealing with grouped quantitative data, one of the most common difficulty arises when the reliant variable can be explained by other factors other than the independent variables only; to address this difficulty and enhance model-fit scholars often fancy the use of fixed or random- effects models (Clark & Linzer, 2015). However, to analyse the usefulness of either of the two models, Hausman test in regularly relied upon (Frondel & Vance, 2010). The Hausman test was employed to take a look at for the presence of endogeneity in the independent variables; Hausman specification test functions by looking at the correlation between error term and panel's independent variables, as well as where it is observed that there is no connection in between the error term and also the panel's independent variables, after that the suitable version relevant is the Arbitrary results

23

and vice-versa (Sheytanova, 2014). STATA is utilized in the calculation of the Hausman statistic to gauge suitability of these models.

3.5.6 Analytical Model

The empirical model for this research was:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \varepsilon$$

Where:

α = constant

$\beta_1, \beta_2 \ldots \beta_8$ = independent variables

Y = Profitability as a measure of ROA

X_1 = is credit risk for the bank, the study uses non-performing loans to total loans ratio.

X_2 = is interest rate risk for the bank this study uses interest sensitivity to total assets ratio.

X_3 = is foreign exchange risk for the banks, the study uses net forex exposure to total assets ratio.

X_4 = is liquidity risk, measured using the bank's liquidity ratio

X_5 = is capital management risk of the bank, the study uses equity to total assets ratio

X_6 = is bank's deposits which uses deposits to total assets ratio

X_7 = is the bank's size which is measured using the natural log of total deposits.

X_8 = is operational risk of the bank which is measured by loans to assets ratio

3.5.7 Test of Significance

The study is testing joint significance and individual significance of independent variables using F-test and t-test respectively. The confidence interval and level of significance are at 95% and 5% respectively.

CHAPTER 4

RESULTS, FINDINGS AND DISCUSSIONS

4.1 Introduction

The chapter is a presentation of patterns of outcomes and analysis of how they explain the subject. Findings were summarised in narratives and tables. It provides detailed analysis, statistics and panel regression evaluation.

4.2 Descriptive Statistics of Raw Data

Table 4.1: Descriptive Statistics of Raw Data

Variable	Mini.	Maxi.	Mean	Std. Dev.
ROA	-.2213849	.1292062	.0127833	.0336537
CR	0.00000	1.335914	.1544142	.1866837
IR	0.00000	.3349966	.0544092	.0288657
FER	-.0028136	.02266	.0046469	.0042497
LR	.1469736	1.877648	.8087112	.2486538
CMR	-.1116714	.4862942	.1752543	.0822006
Bank Deposits	.2525981	.9340418	.6958793	.1211403
Bank Size	8864537	298522451.5	94033174	76147894.23
OR	.1113359	.8794752	.554888	.1397832

The results show that the banking institutions in Kenya have a mean value of .0127833 for the dependent variable which is productivity measured using ROA, highest and lowest values of 0.1292062, -0.2213849. Standard deviation variation is 0.0336537. Results also show that credit risk has a mean of 0.1544142, maximum and minimum value of 1.335914 and 0.00000, respectively. The variation in standard deviation for the variable credit risk was 0.1866837.

The findings show the mean value of interest risk is 0.0544092, highest and lowest values of 0.3349966, 0.00000. Standard deviation variation for foreign exchange risk is 0.0288657. In addition, the results show that the mean value for foreign exchange risk is .0046469, a highest and lowest value of 0.02266 and -0.0028136 respectively. The variation in standard deviation of foreign exchange risk is 0. 0042497. The findings also show the mean value for liquidity risk is 0.8087112 with highest and lowest values of 1.877648 and 0.1469736 respectively. The variation in standard deviation for liquidity risk is 0.2486538.

Further, the results show that the mean value for capital management risk is 0.1752543, highest and lowest values of 0.4862942, -0.1116714. Standard deviation variation in capital management risk is 0. 0822006. According to the descriptive statistics results, the mean value of Bank Deposits is 0.6958793 with highest and lowest values of 0.9340418 and 0.2525981. The variation in standard deviation for Bank Deposits is 0.1211403.

Similarly, the results show that the mean value for Bank Size is 94033174 with highest and lowest values of 298522451.5 and 8864537 respectively. The variation in standard deviation for bank size is 76147894.23. Finally, the results show that the mean value for Operational Risk is 0.554888, a highest and lowest value of 0.8794752 and 0.1113359 respective. The variation in standard deviation for operational risk is found to be 0.1397832. The positive values for the mean of profitability measured in ROA imply that the banking institutions in Kenya are stable.

4.3 Diagnostics Tests

Estimation tests (pre and post) were conducted before running a regression model.

4.3.1 Normality

The normality presumption (ut ~ N (0, σ2)) is needed to perform single or joint hypotheses tests regarding the model criteria (Brooks, 2008). Table 4.2 reveals the results of normality utilizing Shapiro-Wilk test (SW) for the Kenyan banks between 2014 and 2018.

Table 4.2: Normality Test

Shapiro - Wilk Test for Normality					
Variable	**Obs**	**W**	**V**	**z**	**Prob>z**
ROA	190	0.75068	35.573	8.196	0.0670
Credit Risk	190	0.68614	44.781	8.725	0.1059
Interest Risk	190	0.69861	43.002	8.632	0.1274
Foreign Exchange Risk	190	0.86335	19.497	6.816	0.0881
Liquidity Risk	190	0.94814	7.399	4.593	0.1106
Capital Management Risk	190	0.84125	22.650	7.160	0.0971
Bank Deposits	190	0.89694	14.705	6.169	0.1840
Bank Size	190	0.96458	5.054	3.718	0.2799
Operational Risk	190	0.95691	6.148	4.168	0.0670

The results in Table 4.2 reveal P-values of more than the critical 0.05. Therefore, concluding that the data is distributed normally.

4.3.2 Multicollinearity

Multicollinearity is evaluated in this study making use of VIF. According to (Area, & Golubitsky, 2009), VIF values over 10 indicate existence of Multicollinearity in the data.

Table 4.3: Multicollinearity Test Results

Variables	VIF
CR	1.40
IR	1.44
FER	1.26
LR	3.32
CMR	1.48
Bank Deposits	1.99
Bank Size	1.52
OR	2.95

Table 4.3 indicates lack of multicollinearity

4.3.3 Autocorrelation

This research made use of Durbin-Watson test to review for autocorrelation to determine presence of autocorrelation in the details, that is, whether the residual is associated with time.

Table 4.4: Autocorrelation

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
F(1, 8) = 3.983
Prob > F = 0.0771

Results indicate there is no autocorrelation between residuals since $0.0771 < 3.983$ hence abiding by H0.

4.3.4 Heteroscedasticity

Breusch-Pagan examination is made use of to examine heteroskedasticity. H0 in the examination is that terms of error have a continuous variant (must be Homoskedastic) as in Table 4.5.

Table 4.5: Heteroscedasticity Test

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of ROA
chi2(1)   =   49.05
Prob > chi2 =   0.0810

Table 4.5 reveal the error terms are heteroskedastic since the p-value (0.0810) >5% (0.000). Heteroskedasticity was healed using robust standards.

4.3.5 Testing for Random and Fixed Effect using Hausman

When doing panel information evaluation, one has to establish whether to run an arbitrary effect version or a set effects layout (Baltagi, 2005). So as to select the most appropriate design to use, both random and set impacts approximate coefficients are obtained. Hausman as well as Taylor (1981) was used in this study to pick between set as well as approximate result styles. The table below gives results of Hausman test.

Table 4.6: Random and Fixed Effect Testing

Variable	(b) fixed	(B) Random	(b-B) Difference
Credit Risk	-.0655532	-.030411	-.0351422
Interest Risk	.3155599	.3079977	.0075623
Foreign Exchange Risk	.1547001	-.0474211	.2021212
Liquidity Risk	-.0732542	-.0548766	-.0183776
Capital Management Risk	.2147946	.1101309	.1046637
Bank Deposits	-.0943212	-.0765771	-.0177441
Bank Size	.207782	.2224411	-.0146591
Operational Risk	.030662	.0552717	-.0246097
chi2(8)	11.95		
Prob > chi 2	0.1533		

Table 4.6 reflect p-value is 0.1533 that is greater than 0.05. In conclusion, random effect model is preferable to fixed effect model.

4.4 Descriptive Statistics of Cured Data

From the results only bank size is cured, the rest of the variables remain the same. The variable bank size is cured by logging it. Logging of bank size is necessary because it was highly skewed and so it is logged with the intention of making it less skewed. Additionally, this is necessary to make patterns in the data more interpretable and for helping to meet the assumption of normality. The rest of the variables are not cured because curing is not necessary since they were already normalized.

Table 4.7: Descriptive Statistics of Cured Data

Variable	Minimum	Maximum	Mean	Std. Deviation
ROA	-.2213849	.1292062	.0127833	.0336537
CR	0.00000	1.335914	.1544142	.1866837
IR	0.00000	.3349966	.0544092	.0288657
FER	-.0028136	.02266	.0046469	.0042497
LR	.1469736	1.877648	.8087112	.2486538
CMR	-.1116714	.4862942	.1752543	.0822006
Bank Deposits	.2525981	.9340418	.6958793	.1211403
Log of Bank Size	11.97799	20.46144	17.16182	1.534302
OR	.1113359	.8794752	.554888	.1397832

Table 4.7 gives the descriptive statistics of variables after the raw data is cured. From the results only bank size is cured, the rest of the variables remained the same. Table 4.7 show that banking institutions in Kenya have a mean value of .0127833 for the dependent variable which is productivity measured using ROA capital with highest and lowest values of 0.1292062, -0.2213849. Standard deviation variation is 0.0336537.

Results also show that credit risk has a mean of 0.1544142 with a highest and lowest value of 1.335914 and 0.00000. Variation in standard deviation for the variable credit risk is 0.1866837.

The results also indicated that the mean value of interest risk is 0.0544092 with highest and lowest values of 0.3349966, 0.00000. Standard deviation variation in interest risk is 0.0288657. In addition, results show that the mean value for foreign exchange risk is .0046469 with a highest and lowest value of 0.02266 and -0.0028136 respectively. Variation in standard deviation of foreign exchange risk is 0. 0042497. The findings show the mean value for liquidity risk is 0.8087112 with highest and lowest values of 1.877648 and 0.1469736 respectively. Variation in standard deviation for liquidity risk is 0.2486538.

Further, the results show that the mean value for capital management risk is 0.1752543 with highest and lowest values of 0.4862942, -0.1116714. Standard deviation variation in capital management risk is 0. 0822006. According to the descriptive statistics results, mean value for Bank Deposits is 0.6958793 with highest and lowest values of 0.9340418, 0.2525981. Variation in standard deviation for Bank Deposits is 0.1211403.

Similarly, the results show that the mean value for Bank Size after curing is 17.16182 with highest and lowest values of 20.46144, 11.97799. The variation in standard deviation for bank size is 1.534302 after curing. Finally, the results show that the mean value for Operational Risk is 0.554888, highest and lowest values of 0.8794752, 0.1113359. Standard deviation variation for operational risk is found to be 0.1397832.

The positive values for the mean of profitability measured in ROA imply that the banking institutions in Kenya are stable.

4.5 Correlation Analysis

This study conducts correlation analysis for the banks to show how risk management is associated with profitability of the banks which is measured using ROA. Table 4.8 gives the correlation matrix of all variables and how they are influencing profitability.

Table 4.8 Correlation Matrix

		ROA	CR	IR	FER	LR	CMR	Bank Deposits	Bank Size	OR
ROA	Pearson Correlation	1.0000								
Credit Risk	Pearson Correlation	-0.2926*	1.0000							
Interest Risk	Pearson Correlation	0.2385*	-0.1938*	1.0000						
Foreign Exchange Risk	Pearson Correlation	0.1320	-0.1568*	0.1048	1.0000					
Liquidity Risk	Pearson Correlation	-0.0452	-0.0772	0.3278*	-0.1348	1.0000				
Capital Management Risk	Pearson Correlation	0.1640*	-0.3792*	0.0179	0.0144	0.0200	1.0000			
Bank Deposits	Pearson Correlation	0.0327	-0.1233	0.2751*	-0.0138	-0.2808*	-0.2065*	1.0000		
Log Bank Size	Pearson Correlation	0.2544*	-0.1959*	0.2070*	0.3010*	-0.1126*	-0.2859*	0.3786*	1.0000	
Operational Risk	Pearson Correlation	0.0322	-0.1161	0.3088*	-0.2289*	0.6783*	-0.1617*	0.2012*	0.1253 *	1.0000

Table 4.8 indicates Credit Risk and profitability in ROA are negatively and significantly associated (-0.2926), Interest Risk has a significant and positive relation to profitability (0.2385), results also show also that Foreign Exchange Risk and profitability are positively and insignificantly associated (0.1320), Liquidity Risk is found to be negatively and insignificantly associated with profitability of the Kenyan banks (-0.0452). In addition, the correlation results show that there is significant and positive association between Capital Management Risk and profitability (0.1640), Bank Deposits is found to be positively and insignificantly associated with profitability (0.0327).

Concerning the bank size, the study results show a significant and positive association between log of bank size and profitability (0.2544). Finally, the correlation show an insignificant but positive relation between Operational Risk and profitability (0.0322). The correlation results agree with the conclusion made by (Wadesango et al., 2018) that management of risk is directly related to an organization's profits and this is so because it increases customer satisfaction, loyalty and reduces fraud risk. However, these positive effects of risk management can be sometimes watered down by some barriers such as lack of proper employee training, senior management failure and non-existence of independent audit committee in the case of large organizations. In conclusion, the researcher is optimistic that the results of this research will motivate managements of various companies to put in place effective risk management system.

4.6 Testing the Relationship between Variables
4.6.1 Credit Risk and ROA

Table 4.9 show the relationship between credit risk and ROA.

Table 4.9: Credit Risk and ROA

Dep Var: ROA	Coef. Std.	Err.	z	P>|z|
Credit Risk	-.0550677	.0159788	-3.45	0.001
Constant	.0212865			
R Squared	0.1474			
F statistic	11.88			
P-value	0.0006			

$Y = .0212865 - .0550677 X_1$

Y= Profitability as measured by ROA

X_i= credit risk for the bank

Table 4.9 indicates the coefficient of determination (R^2) is 0.1474 implying that credit risk explains 14.74% of the variation in profitability. Further, it indicates that credit risk and profitability are negatively and significantly related (β =-.0550677, p=0.001). The model is found to be significant in explaining the relationship.

4.6.2 Interest Risk and ROA

Table 4.10 shows relationship between interest risk and profitability

Table 4.10: Interest Risk and ROA

Dep Var: ROA	Coef. Std.	Err.	z	P>|z|
Interest Risk	.2289201	.0827809	2.77	0.006
Constant	.0003279			
R Squared	0.1116			
F statistic	7.65			
P-value	0.0057			

$Y = .0003279 + .2289201 X_2$

Y= Profitability as measured by ROA

X_2= Interest Risk for the bank

Table 4.10 shows that R^2 is 0.1116 indicating that interest risk explain 11.16% of the variation in profitability. Further, it indicates that interest risk and profitability are positively and significantly related (β = .2289201, p=0.006). The model is found to be significant in explaining the relationship.

4.6.3 Foreign Exchange Risk and ROA

The results in Table 4.11 show the connection between profitability of Kenyan commercial banks and foreign exchange risk.

Table 4.11: Foreign Exchange Risk and ROA

Dep Var: ROA	Coef. Std.	Err.	z	P>|z|
Foreign Exchange Risk	.7751793	.7331233	1.06	0.290
Constant	.0091811			
R Squared	0.0458			
F statistic	1.12			
P-value	0.2903			

$Y = .0091811 + .7751793\ X_3$

Y= Profitability as measured by ROA

X_3= Foreign Exchange Risk for the bank

Table 4.11 shows that R^2 is 0.0458 indicating that foreign exchange risk explain 4.58% of the variation in profitability. Further, it indicates that foreign exchange risk and profitability are positively and significantly related (β = .7751793, p=0.290).

4.6.4 Liquidity Risk and ROA

The results in Table 4.12 show the connection between LR and profitability.

Table 4.12: Relationship between Liquidity Risk and ROA

Dep Var: ROA	Coef. Std.	Err.	z	P>|z|
Liquidity Risk	-.0043392	.0109121	-0.40	0.691
Constant	.0162924			
R Squared	0.0530			
F statistic	0.16			
P-value	0.6909			

$Y = .0162924 - .0043392 X_4$

Y= Profitability as measured by ROA

X_4= Liquidity Risk

Table 4.12 shows R^2 0.0530 implying that liquidity risk explains 5.30% of the variation in profitability. Further, it indicates that liquidity risk and profitability are negatively and insignificantly related (β = -.0043392, p=0.691).

4.6.5 Capital Management Risk and ROA

Table 4.13 shows the relation between capital management risk and profitability.

Table 4.13: Capital Management Risk and ROA

Dep Var: ROA	Coef. Std.	Err.	z	P>|z|
Capital Management Risk	.0994363	.0353361	2.81	0.005
Constant	-.0046434			
R Squared	0.0610			
F statistic	7.92			
P-value	0.0049			

$Y = -.0046434 + .0994363 X_5$

Y= Profitability as measured by ROA

X_5= Capital Management Risk for the bank

Results show R^2 is 0.0610 implying that capital management risk explain 6.10% of the variation in profitability. Further, it indicates that capital management risk and profitability are positively and significantly related (β = .0994363, p=0.005).

4.6.6 Bank Deposits and ROA

Table 4.14 show the connection between bank deposits and profitability.

Table 4.14: Bank Deposits and ROA

Dep Var: ROA	Coef. Std.	Err.	z	P>|z|
Bank Deposits	-.0120599	.02486	-0.49	0.628
Constant	.0211755			
R Squared	0.0159			
F statistic	0.24			
P-value	0.6276			

$Y = .0211755 - .0120599 \ X_6$

Y= Profitability as measured by ROA

X_6= Bank Deposits for the bank

Table 4.14 show R^2 is 0.0159 implying that bank deposits explain 1.59% of the variation in profitability. The results further indicate that bank deposits and profitability are negatively and insignificantly related (β = -.0120599, p=0.628).

4.6.7 Bank Size and ROA

Table 4.15: Log of Bank Size and ROA

Dep Var: ROA	Coef. Std.	Err.	z	P>|z|
Log of Bank Size	.2136793	.096251	2.22	0.026
Constant	-.0318241			
R Squared	0.1665			
F statistic	4.93			
P-value	0.0264			

$Y = -.0318241 + .2136793 \ X_7$

Y= Profitability as measured ROA

X$_7$= Log of Bank Size

Table 4.15 show R^2 is 0.1665 implying that the log of bank size explains 16.65% of the variation in profitability. Further, it indicates the log of bank size and profitability are significantly and positively related (β = .2136793, p=0.026).

4.6.8 Operational Risk and ROA

Table 4.16 shows the relationship between operational risk and profitability.

Table 4.16: Operational Risk and ROA

Dep Var: ROA	Coef. Std.	Err.	z	P>|z|
Operational Risk	.0080975	.0207708	0.39	0.697
Constant	.00829			
R Squared	0.0150			
F statistic	0.15			
P-value	0.6966			

Y= .00829+.0080975 X$_8$

Y= Profitability as measured by ROA

X$_8$= Operational Risk

Table 4.16 show R^2 is 0.0150 implying that operational risk explains 1.50% of the variation in profits. Further, it indicates that operational risk and profitability are positively and insignificantly related (β = .0080975, p=0.697).

4.7 Multiple Regression Analysis

The research sought to accomplish multiple regression evaluation to identify joint statistical significance relationship between ROA and the independent variables.

Table 4.17 shows multiple regression evaluation results.

Table 4.17: Panel Regression Analysis

Dep Var: ROA	Coef. Std.	Err.	z	P>|z|
Credit Risk	-.0303785	.0170176	-1.79	0.074
Interest Risk	.3088041	.0927969	3.33	0.001
Foreign Exchange Risk	-.0310055	.7153978	-0.04	0.965
Liquidity Risk	-.0550165	.0173657	-3.17	0.002
Capital Management Risk	.1098593	.0362233	3.03	0.002
Bank Deposits	-.0766814	.0281812	-2.72	0.007
Log of Bank Size	.266074	.1067559	2.49	0.013
Operational Risk	.0554608	.029174	1.90	0.057
Constant	-.0069032	.0299517	-0.23	0.818
R Squared	0.2689			
F statistic	39.78			
P-value	0.0000			

$Y = -0.0069032 - 0.0303785X_1 + 0.3088041X_2 - 0.0310055X_3 - 0.0550165X_4 +$

$0.1098593X_5 - 0.0766814X_6 + 0.266074X_7 + 0.0554608X_8$

Y= Profitability as measured by ROA

X_1= CR

X_2= IR

X_3= FER

X_4= LR

X_5= CMR

X_6= bank deposits

X_7= bank size.

X_8= OR

Table 4.17 shows R^2 is 0.2689 indicating that all variables jointly explain 26.89% of the variation in profitability. This implies that, 26.89% of the variation in profitability is influenced by the independent variables in this research study.

The results further indicate that credit risk and profitability are negatively and insignificantly related (β =-.0303785, p=0.074), regarding the influence of interest risk, significant and positive relationship is established between interest risk and profitability (β =.3088041, p=0.0001). A negative and insignificant relationship is found to exist between foreign exchange risk and profitability (β =-.0310055, p=0.0965). The results further reveal significant and negative relationship between liquidity risk and profitability (β =-.0550165, p=0.002); however, there is positive and significant relationship between capital management risk and profitability of the banks (β =.1098593, p=0.002). The findings concur with the findings of a study by (Zimmerman, 1996) on the influencers of profits in banks which indicated that the main factors affecting profitability in banks is the loan portfolio structure, and the willingness and ability of senior management to control the risks facing the bank.

The study in addition to this test the relationship between bank deposits and profitability and the results reveal that Bank Deposits and profitability are negatively and significantly related (β =-.0766814, p=0.007). The relationship between bank size and profitability indicate that there is positive and significant relationship between Bank Size and profitability (β =.266074, p=0.013). Finally, the link between operational risk and profitability is tested. Results revealed a positive but insignificant relationship between the two variables (β =.0554608, p=0.057). The results contradict with the conclusion by (Lasisi et. Al., 2018) that the bond between liquidity risk and the bank's

profitability is positive but immaterial, that between credit risk and profitability is significant but on the opposite direction.

The model fit is statistically significant as indicated by F= 39.7800 (p=0.000<0.05) implying the model has goodness of fit. Table 4.9 indicates that the overall model is statistically significant. A study by (Nikitta Dutta, 2017) indicates that profits are only made by entrepreneurs who can make correct estimate about the future or whose prediction proves to be true. On the other hand, entrepreneurs who cannot make correct future estimates or whose prediction proves to be wrong, suffer losses in the long run.

Although the Basel Accord II attributes credit risk as the highest risk affecting financial institutions, this study reveals that credit risk has a negative and insignificant relation with profitability. This can be attributed to the increased measures by banks to reduce credit risk such as thorough due diligence on potential borrowers. In anticipation of the adoption of IFRS 9 in 2019, which would mean more provision for doubtful debts, banks started laying down the necessary measures to only issue loans to borrowers with high credit rating, hence reducing the credit risk. In 2016, CBK capped interest rates and this meant that banks had to diversify to other income generating products and move from their traditional overreliance of interest income. The diversification of income and reduction of credit risk as explained above, justifies why in this study we see an insignificant negative relationship between credit risk and profitability of Kenyan banks.

CHAPTER 5

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The chapter presents the summary, conclusions, recommendations and implications of the findings and further areas of study.

5.2 Summary of the Findings

This study seeks to establish the relation between the management of risk and banks' profitability in Kenyan. Based on panel regression analysis results, the study reveals that credit risk and profitability are negatively and insignificantly related. The correlation analysis results reveal that credit risk and profitability which is measured using ROA are negatively and significantly associated. The trend line show that there is a general rise in credit risk level throughout the period indicating that number of defaulters was increasing in the banks at an increasing rate. The results show that a positive and significant relation between interest risk and profitability; implying improvements in interest risk rate leads to a substantial improvement in earnings of the banks in Kenya. It consists of lots of strategies for modelling and evaluating numerous variables when the emphasis gets on the relationship in between a dependent as well as one or more independent variables. Table 4.17 reveal the panel regression analysis outcomes.

In addition, foreign exchange risk and profitability are positively and insignificantly related indicating that any positive change in foreign exchange risk will result into a positive change in profitability, but the effect is not significant. The results further indicate that liquidity risk and profitability are negatively and significantly related. The

findings on panel regression analysis also show a significant and positive relation between capital management risk and profitability.

Additionally, results indicate, bank deposits are significantly but negatively related to profitability. Meanwhile, bank size has a significant and positive effect on profitability. Finally, results established a positive but insignificant relation between operational risk and profitability. Findings concur with conclusions made by (Wadesango et al., 2018) that management of risk is directly related to an organization's profits and this is so because it increases customer satisfaction, loyalty and reduces fraud risk. However, these positive effects of risk management can be sometimes watered down by some barriers such as lack of proper employee training, top management failures and non-existence of independent audit committee in the case of large organizations.

5.3 Conclusions

This study analyses the risk management of banks in Kenya to assess the effect of risk management on the profitability. Secondary data is obtained from banks' annual reports and banking statistics that are derived from banking institutions in Kenya and covering the period of five (5) years (2014-2018). Multiple panel regression analysis is applied to assess the relationship between the study variables.

Based on the findings the study concludes that credit risk negatively and insignificantly influences profits. Therefore, a change in the credit risk does not result into any significant change in the banks' profitability. However, efficient credit history risk management practices such as credit scores evaluations, information gathering and also hostile financial debt collection techniques several be utilized as part of the

management of the quality of assets as well as the reduction of direct exposures from responsibilities.

The study also concludes that, interest risk positively and significantly impacts on profitability of banks in Kenya, meaning that an improvement in interest risk in these banks would lead to better ROA. Further, it concludes that, foreign exchange risk negatively but insignificantly relates to the Kenyan banks' profitability, this imply that the more the foreign exchange risk the more the profitability, but the change is insignificant.

Additionally, the study concludes that, liquidity risk negatively and significantly impacts on profitability implying; an increase in the rate of liquidity risk results into a decrease in profits. Further, it concludes based on the findings there is positive and significant link between capital management risk and profitability. The finding implying that an improvement in capital management risk will result into improvement in profitability of the banks significantly.

The research likewise concludes that, profitability of financial institutions in Kenya depend on several variables consisting of the capacity of a business financial institution to grow its down payments and also the extent to which the financial institution has the ability to transform its deposit responsibilities right into income earning properties. In addition, based upon the findings it is sufficient in conclusion that, a rise in financial institution size results in boosted success by enabling banks to realize economies of scale. This implies that enhancing dimension allows financial institutions to spread out fixed prices over a greater asset base, thus decreasing their typical expenses.

Furthermore, as the range of procedure rises, banks can much better utilize specialized inputs such as financing cop with competence in a certain business line, causing far better efficiency. Finally, the research study finishes based upon the findings that in achieving greater success, small changes in bank-specific and also market-specific aspects quantity big changes in measurement consequently, financial institutions need not enlarge to be effective: company methods and local economic problems are no less important in determining financial institution revenues than dimension.

5.4. Recommendations

Based on findings and conclusions of this research study, a number of recommendations can be made; the managements of financial institutions in Kenya financial institutions need to invest in threat administration to improve their success The research study establishes that improper credit report danger administration minimize the bank earnings, impacts the top quality of its possessions as well as increase funding losses and also non-performing car loan which might eventually cause monetary distress. This study for that reason advises that the banks must focus on handling their credit threats properly to enhance their earnings.

This study found that excessive interest risk can pose a considerable risk to a financial institution's productivity. Changes in rates of interest influence a financial institution's earnings by altering its net passion revenue and the degree of other interest-sensitive earnings and also overhead. It is therefore recommended that the banks in Kenya should manage the levels of their interest risks to be able to improve on their profitability. Based on the findings, excessive liquidity risk can lead to decrease in ROA and hence poor financial profitability. The study therefore recommends proper management of liquidly risk by the banks.

The financial institutions need to focus on purchasing bring in down payments since deposits play a crucial function in bank's funding, as a predominant part of bank's possessions are funded through customer down payment. The research also recommends that banks in Kenya require to check the interest on down payments meticulously. The main cost by the bank is the interest expense and also consequently for the bank in Kenya to be lucrative, they need to be able to increase down payments at sensible rates in order to on lend to the clients.

Finally, this study recommends to the practitioners to pursue deposits, especially more call deposits than time deposits. On loans, banks should aim to obtain as many loan advances as possible if they have deposits to lend to borrowers. Banks in Kenya should use available resources to improve profitability and properly perform their main functions.

5.5 Further Studies' Suggestion

The research seeks to establish risk management impact on profitability of Kenyan banks, thus area for further studies could consider other companies in Kenya. This study adopts eight (8) independent variables and how they affect the profitability which is measured using ROA. Therefore, future research studies can incorporate other variables like capital adequacy, asset quality and income diversification since they are also capable of affecting the profitability of a bank.

Finally, this study does not use a moderating variable such as central bank regulations to check impact of the moderating variable on relationship between these factors and profitability. Therefore, future studies can conduct a similar study by introducing a moderating or an intervening variable such as central bank regulations in their models then compare the findings with those of the current study.

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APPENDICES

Appendix I: Analysis Outputs

Descriptive Statistics Raw Data

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Totalassets	162	-.2213849	.1292062	.0127833	.0336537
ROA	190	0.00000	1.335914	.1544142	.1866837
Credit_Risk	190	0.00000	.3349966	.0544092	.0288657
Interest_Risk	190	-.0028136	.02266	.0046469	.0042497
Foregn_Exchange_Risk	190	.1469736	1.877648	.8087112	.2486538
Liquidity_Risk	190	-.1116714	.4862942	.1752543	.0822006
Capital_Management	190	.2525981	.9340418	.6958793	.1211403
Bank_Deposits	190	8864537	298522451.5	94033174	76147894.23
Bank_Size	190	8864537	298522451.5	94033174	76147894.23
Operational_Risk	190	-.2213849	.1292062	.0127833	.0336537
Valid N (listwise)	162				

Descriptive Statistics cured data

Sum ROA Credit_Risk Interest_Risk Foregn_Exchange_Risk Liquidity_Risk Capital_Management Bank_Deposits logbanksize Operational_Risk

```
    Variable |    Obs     Mean   Std. Dev.    Min       Max
-------------+---------------------------------------------------------
         ROA |    190   .0127833   .0336537  -.2213849   .1292062
 Credit_Risk |    190   .1544142   .1866837        0   1.335914
 Interest_R~k |    190   .0544092   .0288657        0   .3349966
 Foregn_Exc~k |    190   .0046469   .0042497  -.0028136    .02266
 Liquidity_~k |    190   .8087112   .2486538   .1469736  1.877648
-------------+---------------------------------------------------------
 Capital_Ma~t |    190   .1752543   .0822006  -.1116714   .4862942
 Bank_Depos~s |    190   .6958793   .1211403   .2525981   .9340418
  logbanksize |    190   .2087585   .0324835   .0754636   .2707416
 Operationa~k |    190    .554888   .1397832   .1113359   .879475
```

52

DIAGNOSTICS

NORMALITY TEST

. swilk ROA Credit_Risk Interest_Risk Foregn_Exchange_Risk Liquidity_Risk Capital_Management Bank_Deposits logbanksize Operational_Risk

Shapiro-Wilk W test for normal data

Variable	Obs	W	V	z	Prob>z
ROA	190	0.75068	35.573	8.196	0.06700
Credit_Risk	190	0.68614	44.781	8.725	0.10590
Interest_R~k	190	0.69861	43.002	8.632	0.12740
Foregn_Exc~k	190	0.86335	19.497	6.816	0.08801
Liquidity_~k	190	0.94814	7.399	4.593	0.11060
Capital_Ma~t	190	0.84125	22.650	7.160	0.09710
Bank_Depos~s	190	0.89694	14.705	6.169	0.18400
logbanksize	190	0.96458	5.054	3.718	0.27990
Operationa~k	190	0.95691	6.148	4.168	0.06700

MULTICOLLINEARITY TEST RESULTS

. vif

Variable	VIF	1/VIF
Liquidity_~k	3.32	0.300874
Operationa~k	2.95	0.338515
Bank_Depos~s	1.99	0.502830
Bank_Size	1.52	0.657636
Capital_Ma~t	1.48	0.675534
Interest_R~k	1.44	0.692649
Credit_Risk	1.40	0.712377
Foregn_Exc~k	1.26	0.791818
Mean VIF	1.92	

AUTOCORRELATION

xtserial ROA Credit_Risk Interest_Risk Foregn_Exchange_Risk Liquidity_Risk

Capital_Management Bank_Deposits Bank_Size Operational_Risk

Wooldridge test for autocorrelation in panel data

H0: no first-order autocorrelation

   F(1,   8) =   3.983

     Prob > F =   0.0771

HETEROSKEDASTICITY TEST

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of ROA
   chi2(1)   =   49.05
    Prob > chi2 =   0.0810

HAUSMAN TEST

. xtreg ROA Credit_Risk Interest_Risk Foregn_Exchange_Risk Liquidity_Risk Capital_Management Bank_Deposits Bank_Size Operational_Risk,fe

Fixed-effects (within) regression   *Number of obs*   =   *190*
Group variable: bank1   *Number of groups =   38*

R-sq: *Obs per group:*
   within = 0.2047   *min =   5*
   between = 0.1733   *avg =   5.0*
   overall = 0.1489   *max =   5*

                            F(8,144)   =   4.63
corr(u_i, Xb) = -0.6107   *Prob > F   =   0.0000*

--

ROA	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Credit_Risk	-.0655532	.0288115	-2.28	0.024	-.1225012	-.0086052
Interest_Risk	.3155599	.1071678	2.94	0.004	.1037347	.5273852
Foregn_Exchange_Risk	.1547001	1.113867	0.14	0.890	-2.046942	2.356343
Liquidity_Risk	-.0732542	.0212696	-3.44	0.001	-.1152952	-.0312132
Capital_Management	.2147946	.0486276	4.42	0.000	.1186785	.3109106
Bank_Deposits	-.0943212	.0362982	-2.60	0.010	-.1660673	-.0225751
Bank_Size	.207782	.1619939	1.28	0.202	-.1124112	.5279751
Operational_Risk	.030662	.0384865	0.80	0.427	-.0454094	.1067334
_cons	-.1809141	.1988373	-0.91	0.364	-.573931	.2121028

sigma_u	.02758038
sigma_e	.02554249
rho	.53830547 (fraction of variance due to u_i)

F test that all u_i=0: F(37, 144) = 3.08   Prob > F = 0.0000

. estimates store fixed

. hausman fixed random

```
         ---- Coefficients ----
     |    (b)        (B)         (b-B)     sqrt(diag(V_b-V_B))
     |  fixed      random     Difference        S.E.
```

	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
Credit_Risk	-.0655532	-.030411	-.0351422	.0232627
Interest_R~k	.3155599	.3079977	.0075623	.0536672
Foregn_Exc~k	.1547001	-.0474211	.2021212	.8534504
Liquidity_~k	-.0732542	-.0548766	-.0183776	.0122945
Capital_Ma~t	.2147946	.1101309	.1046637	.0324658
Bank_Depos~s	-.0943212	-.0765771	-.0177441	.0229535
Bank_Size	.207782	.2224411	-.0146591	.1360792
Operationa~k	.030662	.0552717	-.0246097	.0251235

----

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

$$chi2(8) = (b-B)'[(V\_b-V\_B)^{\wedge}(-1)](b-B)$$
$$= 11.95$$
$$Prob>chi2 = 0.1533$$

CORRELATION ANALYSIS

Correlate ROA Credit_Risk Interest_Risk Foregn_Exchange_Risk Liquidity_Risk Capital_Management Bank_Deposits logbanksize Operational_Risk

(obs=190)

	ROA	Credit~k	Intere~k	Foregn~k	Liquid~k	Capita~t	Bank_D~s	logban~e	Operat~k
ROA	1.0000								
Credit_Risk	-0.2926	1.0000							
Interest_R~k	0.2385	-0.1938	1.0000						
Foregn_Exc~k	0.1320	-0.1568	0.1048	1.0000					
Liquidity_~k	-0.0452	-0.0772	0.3278	-0.1348	1.0000				
Capital_Ma~t	0.1640	-0.3792	0.0179	0.0144	0.0200	1.0000			
Bank_Depos~s	0.0327	-0.1233	0.2751	-0.0138	-0.2808	-0.2065	1.0000		
logbanksize	0.2544	-0.1959	0.2070	0.3010	-0.1126	-0.2859	0.3786	1.0000	
Operationa~k	0.0322	-0.1161	0.3088	-0.2289	0.6783	-0.1617	0.2012	0.1253	1.0000

REGRESSION ANALYSIS

Credit Risk and ROA

. xtreg ROA Credit_Risk

Random-effects GLS regression   Number of obs   =   190

Group variable: bank1   Number of groups =   38

R-sq: Obs per group:

   within = 0.0364   min =   5

   between = 0.1474   avg =   5.0

   overall = 0.0856   max =   5

                                     Wald chi2(1)   =   11.88

corr(u_i, X) = 0 (assumed)   Prob > chi2   =   0.0006

ROA	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Credit_Risk	-.0550677	.0159788	-3.45	0.001	-.0863854	-.0237499
_cons	.0212865	.0042411	5.02	0.000	.012974	.0295989

-------------+--

  sigma_u | .01742275

  sigma_e | .02745682

    rho | .28706629   (fraction of variance due to u_i)

Interest Risk and ROA

. *xtreg ROA Interest_Risk*

Random-effects GLS regression   Number of obs   =   190

Group variable: bank1   Number of groups =   38

R-sq: Obs per group:

   within = 0.0266   min =   5

   between = 0.1116   avg =   5.0

   overall = 0.0569   max =   5

                           Wald chi2(1)   =   7.65

corr(u_i, X) = 0 (assumed)   Prob > chi2   =   0.0057

ROA	*Coef.*	*Std. Err.*	*z*	*P>|z|*	*[95% Conf. Interval]*	
Interest_Risk	*.2289201*	*.0827809*	*2.77*	*0.006*	*.0666726*	*.3911676*
_cons	*.0003279*	*.0057223*	*0.06*	*0.954*	*-.0108876*	*.0115434*
sigma_u	*.01791928*					
sigma_e	*.02759613*					
rho	*.29658832*	*(fraction of variance due to u_i)*				

Foreign Exchange Risk and ROA

. xtreg ROA Foregn_Exchange_Risk

Random-effects GLS regression   Number of obs =   190

Group variable: bank1   Number of groups =   38

R-sq: Obs per group:

   within = 0.0000   min =   5

   between = 0.0458   avg =   5.0

   overall = 0.0174   max =   5

                         Wald chi2(1)   =   1.12

corr(u_i, X) = 0 (assumed)   Prob > chi2   =   0.2903

          ROA | Coef. Std. Err.   z   P>|z| [95% Conf. Interval]

----------------------+--

Foregn_Exchange_Risk | .7751793 .7331233   1.06 0.290   -.661716   2.212074

        _cons | .0091811   .004996   1.84 0.066   -.0006108   .018973

----------------------+--

       sigma_u | .01876194

       sigma_e | .02797037

          rho | .31031858   (fraction of variance due to u_i)

Liquidity Risk and ROA

. xtreg ROA Liquidity_Risk

Random-effects GLS regression   Number of obs   =   190

Group variable: bank1   Number of groups   =   38

R-sq: Obs per group:

   within = 0.0020   min =   5

   between = 0.0530   avg =   5.0

   overall = 0.0200   max =   5

                    Wald chi2(1)   =   0.16

corr(u_i, X)   = 0 (assumed)   Prob > chi2   =   0.6909

      ROA | Coef.   Std. Err.   z   P>|z| [95% Conf. Interval]

---------------+--

Liquidity_Risk | -.0043392 .0109121   -0.40 0.691   -.0257264 .0170481

      _cons | .0162924 .0095789   1.70 0.089   -.0024819 .0350666

---------------+--

    sigma_u | .01932883

    sigma_e | .02796783

      rho | .32324164   (fraction of variance due to u_i)

Capital Management Risk and ROA

. xtreg ROA Capital_Management

Random-effects GLS regression   Number of obs   =   190

Group variable: bank1   Number of groups =   38

R-sq: Obs per group:

   within = 0.0610   min =   5

   between = 0.0152   avg =   5.0

   overall = 0.0269   max =   5

               Wald chi2(1)   =   7.92

corr(u_i, X) = 0 (assumed)   Prob > chi2   =   0.0049

      ROA | Coef. Std. Err.   z   P>|z| [95% Conf. Interval]

------------------+---

Capital_Management | .0994363 .0353361   2.81 0.005   .0301789 .1686938

     _cons | -.0046434 .0072293 -0.64 0.521   -.0188125 .0095257

------------------+---

   sigma_u | .01943825

   sigma_e | .02710444

    rho | .33963759 (fraction of variance due to u_i)

Bank Deposits and ROA

. xtreg ROA Bank_Deposits

Random-effects GLS regression   Number of obs   =   190

Group variable: bank1   Number of groups   =   38

R-sq: Obs per group:

   within = 0.0138   min =   5

   between = 0.0159   avg =   5.0

   overall = 0.0011   max =   5

                      Wald chi2(1)   =   0.24

corr(u_i, X)   = 0 (assumed)   Prob > chi2   =   0.6276

```
------------------------------------------------------------------------------
      ROA |    Coef.  Std. Err.    z   P>|z|   [95% Conf. Interval]
--------------+---------------------------------------------------------------
Bank_Deposits | -.0120599   .02486   -0.49  0.628   -.0607846   .0366649
       _cons |  .0211755  .017697   1.20  0.231    -.01351   .0558609
--------------+---------------------------------------------------------------
     sigma_u |  .01923863
     sigma_e |  .02777654
        rho |  .3241985  (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Log Bank Size and ROA

. xtreg ROA logbanksize

Random-effects GLS regression   Number of obs   =   190

Group variable: bank1   Number of groups =   38

R-sq: Obs per group:

   within = 0.0001   min =   5

   between = 0.1665   avg =   5.0

   overall = 0.0647   max =   5

                       Wald chi2(1)   =   4.93

corr(u_i, X) = 0 (assumed)   Prob > chi2   =   0.0264

ROA	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]
logbanksize	.2136793	.096251	2.22	0.026	.0250308 .4023278
_cons	-.0318241	.0203839	-1.56	0.118	-.0717759 .0081276

----

   sigma_u | .01696245

   sigma_e | .02796916

     rho | .26890188   (fraction of variance due to u_i)

Operational Risk and ROA

. xtreg ROA Operational_Risk

Random-effects GLS regression   Number of obs =   190

Group variable: bank1   Number of groups =   38

R-sq: Obs per group:

   within = 0.0060   min =   5

   between = 0.0150   avg =   5.0

   overall = 0.0100   max =   5

                    Wald chi2(1)   =   0.15

corr(u_i, X) = 0 (assumed)   Prob > chi2   =   0.6966

       ROA | Coef. Std. Err.   z   P>|z| [95% Conf. Interval]

----------------+---

Operational_Risk | .0080975 .0207708   0.39 0.697   -.0326125 .0488075

      _cons | .00829 .0121146   0.68 0.494   -.0154541 .0320342

----------------+---

    sigma_u | .01938288

    sigma_e | .02796177

       rho | .32455954   (fraction of variance due to u_i)

Multiple Regression Analysis

. *xtreg ROA Credit_Risk Interest_Risk Foregn_Exchange_Risk Liquidity_Risk Capital_Management Bank_Deposits logbanksize Operational_Risk*

Random-effects GLS regression　　　　*Number of obs　=　190*

Group variable: bank1　　　　*Number of groups　=　38*

R-sq:　　　　*Obs per group:*

　within　= 0.1766　　　　*min =　5*

　between = 0.2689　　　　*avg =　5.0*

　overall = 0.2033　　　　*max =　5*

Wald chi2(8)　=　39.78

corr(u_i, X)　= 0 (assumed)　　　*Prob > chi2　=　0.0000*

ROA	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Credit_Risk	-.0303785	.0170176	-1.79	0.074	-.0637323	.0029754
Interest_Risk	.3088041	.0927969	3.33	0.001	.1269256	.4906827
Foregn_Exchange_Risk	-.0310055	.7153978	-0.04	0.965	-1.433159	1.371148
Liquidity_Risk	-.0550165	.0173657	-3.17	0.002	-.0890526	-.0209804
Capital_Management	.1098593	.0362233	3.03	0.002	.0388629	.1808557
Bank_Deposits	-.0766814	.0281812	-2.72	0.007	-.1319156	-.0214472
logbanksize	.266074	.1067559	2.49	0.013	.0568363	.4753116
Operational_Risk	.0554608	.029174	1.90	0.057	-.0017192	.1126408
_cons	-.0069032	.0299517	-0.23	0.818	-.0656074	.0518011
sigma_u	.01745173					
sigma_e	.02554423					
rho	.3182239	*(fraction of variance due to u_i)*				

Appendix II: List of licensed commercial banks in Kenya as at 31.12.2018

1. African banking corporation limited
2. Bank of Africa Kenya limited
3. Bank of Baroda (K) limited
4. Bank of India
5. Barclays bank of Kenya limited
6. Charterhouse bank limited (under statutory management)
7. Chase bank (K) limited (in receivership)
8. Citibank N.A Kenya
9. Commercial bank of Africa limited
10. Consolidated bank of Kenya limited
11. Co-operative bank of Kenya limited
12. Credit bank limited
13. Development bank of Kenya limited
14. Diamond trust bank Kenya limited
15. DIB bank (Kenya) limited
16. Ecobank Kenya limited
17. Spire bank ltd
18. Equity bank Kenya limited
19. Family bank limited
20. Fidelity commercial bank limited
21. First community bank limited
22. Guaranty trust bank (K) ltd
23. Guardian bank limited
24. Gulf African bank limited
25. Habib bank A.G Zurich
26. Habib bank limited
27. Imperial bank limited (in receivership)
28. I&M bank limited
29. Jamii bora bank limited
30. KCB bank Kenya limited
31. Middle East bank (K) limited

32. National bank of Kenya limited

33. NIC bank limited

34. M-Oriental bank limited

35. Paramount bank limited

36. Prime bank limited

37. Sidian bank limited

38. Stanbic bank Kenya limited

39. Standard chartered bank Kenya limited

40. Trans-National bank limited

41. UBA Kenya bank limited

42. Victoria commercial bank limited

Source: CBK (www.centralbank.go.ke).