INFLUENCE OF FINANCIAL RISK ON FINANCIAL PERFORMANCE OF DEPOSIT TAKING SAVINGS AND CREDIT CO-OPERATIVES SOCIETIES IN KENYA

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Influence of Financial Risk on Financial Performance of Deposit Taking Savings and Credit Co-operatives in Kenya

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DECLARATION

This thesis is my original work and has not been presented for examination in any other university

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DEDICATION

This thesis is dedicated to my parents Mr. Vincent Ochieng and Mrs. Felista Awino for their tireless sacrifice, and my wife Catherine and my Kids Cassidy and Chloe for their love and moral support throughout the entire study

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ACRONYMS AND ABBREVIATIONS

AIC	- Akaike Information Criteria
AMFI	- Association of Micro Finance Institutions
ANOVA	- Analysis of Variance
AROA	- Average Return on Assets
ARDL	- Autoregressive Distributed Lag
BIC	- Bayesian Information Criteria
BOSA	- Back Office Saving Activity
CAR	- Capital Adequacy Ratio
CAMEL	- Capital Adequacy, Assets, Management Capability, Earnings, and Liquidity
CBK	- Central Bank of Kenya
COSO	- Committee of Sponsoring Organizations
CR	- Credit Risk
DTMFI	- Deposit Taking Microfinance
DTMB	- Deposit Taking Microfinance Banks
DTMS	- Deposit Taking Microfinances
D.T. SACCOs	- Deposit Taking Savings and Credit Co-operative Societies
ERM	- Enterprise Risk Management
FOSA	-Front Office Service Activities
FP	- Financial Risk
FLR	- Funding Liquidity Rate

GDP	- Gross Domestic Product
GMM	- Generalized Method of Moments
ICA	- International Co-operative Alliance
IRR	- Internal Rate of Return
JKUAT	- Jomo Kenyatta University of Agriculture and Technology
LCR	- Liquidity Coverage Ratio
LR	- Liquidity Risk
MFBs	- Microfinance Banks
MFI	- Micro Finance Institution
MMR	- Moderated Multiple Regression
MLR	- Market Liquidity Rate
MoCD&M	- Ministry of Co-operative Development and Marketing
MoFED	- Ministry of Finance and Enterprise Development
NLPR	- Non-Performing Loans Ratio
NSFR	- Net Stable Funding Ratio
OLS	- Ordinary Least Squares
OR	- Operational Risk
PEARLs	- Protection, Effective financial structure, Asset quality, Rates of Return and costs, Liquidity and Signs of growth
ROA	- Return on Assets
ROAA	- Return on Average Assets
ROE	- Return on Equity

ROAE	- Return on Average Equity
SACCOS	- Savings and Credit Co-operative Societies
SASRA	- Saccos Societies Regulatory Authority
SPSS	- Statistical Package for Social Science
VIF	- Variance Inflation Factor
WOCCU	-World Council of Co-operatives Credit Union

DEFINITION OF TERMS

Credit Risk: It is the risk of default on a debt that may arise from a borrower failing to make required payments. In the first resort, the risk is that of the lender and includes lost principal and interest, disruption to cash flows, and increased collection costs. According to Chijoriga (2007) credit risk is the most expensive risk in a financial institutions and its effect is more significant as compared to other risk as it directly threatens the solvency of financial institutions.

Deposit Taking Savings and Credit Co-operative: It is a type of a Savings and credit Co-operative Societies which offer bank-like services, like withdraw-able savings, debit cards, advances, deposits, money transfers and they are regulated by Sacco Society Regulatory Authority (SASRA, 2015).

Financial Performance: It is a general measure of a firm's overall financial health over a given period. Financial performance of the Deposit Taking Saccos is viewed under the dimensions of profitability (Leontief, 2011).

Interest Rate Risk: The volatility of lending rates in the commercial banking sector remains an important facet of the performance of the Deposit Taking SACCOs. This is premised on the fact that a good number of Deposit Taking SACCOs rely heavily on external financing to fund a significant portion of their core business activities (Sacco Supervision Report, 2016).

Liquidity Risk: It indicates whether the Deposit Taking SACCO is administering its cash so that it can meet deposit, withdrawal requests and liquidity reserve requirements, while at the same time, minimizing the amount of idle funds that earn no economic returns (Ngwu, 2006).

Operational risk: Operational risk include frauds and forgeries by Sacco staff and outsiders, inability to use information and communication technology well that allow outsiders access to system such as ATM frauds (Owojori, Akintoye & Adidu, 2011).

Financial Risk: This risk concerns the continuous financial position of an enterprise. Any kind of predisposition to activities that could result to possible loss of funds by the Deposit Taking SACCO is a financial risk. (Njogo, 2012).

ABSTRACT

The overall performance of Deposit Taking Sacco in Kenya has been declining drastically as measured by ROE and interest margin to gross income. The Increase in Non- performing loans indicated elevated credit risk. The decline in liquidity poses liquidity risk. The interest spread has not been relatively stable from 2011 to 2016. Increase in Operating Expense to Total Assets Ratio poses operational risk for the DT Saccos. The purpose of this study was to assess the influence of financial risk on financial performance of deposit taking savings and credit co-operatives in Kenya. Specifically the study evaluated the influence of credit risk, liquidity risk, interest rate risk, operational risk and the moderating effect of firm size of the DT Sacco on financial performance of deposit taking savings and credit co-operatives in Kenya. This research is intended to fill the gap of inadequate information and understanding that exists in relation to financial risk and financial performance of deposit taking Saccos in Kenya. As reflected by the presented theoretical and empirical literature there is inadequacy of research findings on whether financial risk leads to the financial performance. The study adopted a descriptive research design. The target population for this study was 164 deposit taking Sacco societies licensed to undertake deposit-taking Sacco business in Kenya for the financial year ending December 2016. The study adopted census and considered all the DT Saccos for study. A balanced panel data for 135 deposit taking Sacco's for six years from 2010 to 2015 which represented 82.32% success rate was collected and analyzed using STATA Version 13. Data was analyzed using both descriptive and inferential statistics. A General Least Squares (GLS) model was adopted to correct the violations of ordinary Least Squares and since The P value of the wald chi-square statistic was found to be less than 0.05 this implies that GLS model fitted was generally significant. The result indicates that four variables; credit risk, liquidity risk, interest rate risk and operational risk have a negative and significant influence on financial performance. Firm size has a moderating effect on the relationship between financial risk and financial performance of deposit taking Saccos in Kenya. The study gives recommendations which include setting up a clear credit policy that will not negatively affects profitability and also they need to know how credit policy affects the operation of their DT Saccos to ensure judicious utilization of deposits and maximization of profit; DT Saccos should manage liquidity risk by reinforcing its own resources since depositors could at any time and under unexpected reasons, withdraw their deposits to seek investment elsewhere with higher returns; DT Saccos in Kenya should ensure that they adopt and implement of sound operational risk management practices.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

1.1.1 Global perspective on financial risk and financial performance

One major area in the aftermath of the global financial crisis is financial risk among financial intermediaries. Financial risk concerns the continuous financial position of an enterprise. Any kind of predisposition to activities that could result to possible loss of funds by the business is a financial risk (Njogo, 2012). The deposit taking Saccos in Kenya operates in the present-day volatile environment facing a large number of risks such as credit risk, liquidity risk, interest risk and operational risk among others. These risk if not managed may threaten the survival and success of deposit taking Saccos (SASRA, 2015). The risk and return are directly correlated to each other, which mean that increasing one will subsequently increase the other and vice versa is also true. Effective risk management leads to more balanced trade-off between risk and reward, to realize a better position in the future (Fatemi & Fooladi, 2006).

Discussions on the impact of risk management on financial performance of firms have also figured prominently at global level. Some of the empirical studies worth mentioning are: Hussein *et al.* (2007); Basle (2007); Klimczak (2007); Henri and Peter (2006); Fraser, Madura and Weigand (2002) and; Gudbrand *et al.* (2003) among others.

In all these studies the scholars rightly identify a risk as the possibility of an event or activity impacting adversely on an organization, preventing it from achieving organizational outcomes.

Risk management comprises the activities and actions taken to ensure that an organization is conscious of the risks it faces, makes informed decisions in managing these risks, and identifies and harnesses potential opportunities. Managing risk well requires careful consideration of the key concepts of minimizing loss, maximizing opportunity and preparing for uncertainty (Australia government, 2008).

It is widely accepted that most people are risk averse and that risk and return are related. Some studies however, point out that managers may not necessarily believe that risk and return are positively related (Shapira, 2000; Brenner & Shapira, 1983) According to Sharpe (1964) one of the major theory of portfolio analysis is that risk and return are positively correlated.

Several other empirical studies have documented positive effects of risk management on firm performance they include risk management and financial performance of banks in Nigeria (Oluwafemi, Israel, Simeon & Olawale, 2014); factors affecting risk management practices and financial performance of private banks in Iraqi (Mahmoud & Ahmed, 2014); Akindele (2012), examined the effect of risk management and corporate governance on bank performance in Nigeria; Risk Management Practices and Financial Performance of Islamic Banks in Malaysia (Ariffin & Kassim, 2009). These studies revealed that there is a positive relationship between risk management and bank performance; furthermore, the studies affirm that effective risk management enhances bank profitability and performances.

However, others such as Bowman (1980) show that there may be a negative correlation between accounting measures of risk and return. Yousfi (2012) carried a study on risk management practices and financial performance in Jordan: Empirical evidence from Islamic Banks also revealed that risk management practices; credit risk, liquidity risk, operational risk have a negative and significant statistical impact on performance. The study on risk management thus helps to clear such contradictions. The bottom line argument in all these discussions is that risk management increases the value of the firm as long as the hedging benefits outweigh the costs.

1.1.2 Regional Perspective on Financial Risk and Financial Performance

In Kenya several studies have been carried on financial risk and financial performance, they include; Effect of enterprise risk management determinants on financial performance of listed firms in Kenya (Yegon, 2015); Influence of risk management practices on financial performance of life assurance firms in Kenya: A survey study of Kisii County (Amaya & Memba, 2015); Effect of Enterprise Financial Risk Management on Performance in Kenya Commercial Bank, Western Region (Angote, Malenya & Musiega, 2015); The Impact of financial risks on the firms' performance (Noor & Abdalla, 2014); Effects of Risk Management Practices on the Performance of Insurance Firms in Kenya: A Case of AIG Insurance Company Ltd (Wanjohi & Ombui, 2013); Relationship between risk management practices and the profitability of Kenyan insurance companies (Muraguri, 2013); Effects of financial risk management on the growth of Microfinance sector in Kenya (Njuguna, Gakure, Anthony & Katuse, 2013); The effect of risk management on financial performance of insurance companies in Kenya (Omasete, 2012): Implications of Risk Management Practices on Financial Performance of Sugar Manufacturing Firms in Kenya (Mugenda, Momanyi & Naibei, 2012).

Despite the well-established literature on the banks, microfinance, insurance and manufacturing firms, studies on the relationship between risk management practices and financial performance, studies on risk management practices and financial Sacco performance is lacking at the moment.

This study aims to fill the gap in the literature by focusing on the risk management practices of the Deposit taking Saccos in Kenya. The study hopes to contribute in terms of recommending strategies to strengthen the risk management practices of the Deposit taking Saccos so as to increase the overall competitiveness in the Co-operative sector particularly the DT Saccos in Kenya

1.1.3 Deposit Taking Savings and Credit Co-operatives in Kenya

The Co-operative sector is growing rapidly and gaining importance in the global financial scenario. The World Council of Credit Unions (WOCCU) statistical report for 2014, recorded a total of 57,000 Credit Unions (SACCOs), spread across 105 countries and 6 continents in the World. The worlds Credit Union system has a combined savings of $ 1.5 trillion (US dollars), and an asset base of $ 1.8 trillion (US dollars) out of which $ 1.2 trillion (US dollars) constituted the loan portfolio. The average worldwide penetration rate of the Credit Union system stood at 8.2 percent (SASRA Report, 2015).

In 2007 the ICA ranked the Co-operative Sector in Kenya number seven in the world and one in Africa in terms of membership, capital, number of enterprises, and contribution to national economy. Today, Kenya has about 15,000 registered Co-operatives which can be broadly categorized as non-financial and financial Co-operatives. Non-financial co-operative include trading, produce and marketing Cooperatives. Financial Cooperatives include Savings and Credit Cooperatives (SACCO societies), Housing, Union of SACCOs, and Investment Co-operatives. SACCO societies have significantly increased to account for 50% of the registered Co-operatives (Sacco Supervision Annual Report, 2016).

The Kenya's national development blueprint and the Vision 2030 recognize SACCO societies as important players in deepening financial access to mobilize savings for investments in enterprises and personal development (Mohammed, 2013). Sacco sub sector comprises both Deposit Taking and non-Deposit Taking Saccos. Non-Deposit Taking Saccos is supervised by the Commissioner for Co-operatives while Deposit Taking Saccos (D.T. Saccos) are licensed and regulated by SASRA. SASRA licenses Saccos that have been duly registered under the Cooperative Societies Act CAP 490. The non-deposit taking segment is composed of those Sacco Societies whose business is limited to mobilization of deposits (non-withdrawable) for purposes of lending to members (Sacco Supervision Annual Report, 2016).

The deposits are non-withdrawable in that they may be used as collaterals for loans only, and can only be refunded upon the member' s withdrawal. On the other hand, the deposit-taking segment of the sub-sector is composed of those Sacco Societies which undertake both withdrawable and non-withdrawable deposits. Whereas there are no withdrawable deposits, portion of the business may be used as collateral and are not refundable unless on withdrawal from membership, the withdrawable deposits portion of the business can be accessed by the members at any time. In the year ending 2014, the total assets grew by 17.2 percent to Kshs 301,537 Million from Kshs 257,368 Million. This was supported by growth in deposits at 12.7 percent to Kshs 205,974 Million from Kshs 182,683 million; and growth in capital reserves at 30.6 percent to Kshs 43,086 million from Kshs 32,991 Million. The loans and advances portfolio grew by 15.5 percent over the same period, from Kshs 197,409 million to Kshs 228,524 Million (Sacco Supervision Annual Report, 2016).

The aggregate membership in the DTSs also increased by 15.3 percent over the same period. As at 31st December 2014, the Authority had a total of 184 licensed DTSs during the year, but at the close of the year 2014, three (3) of the licensed DTSs, had their deposit-taking licenses revoked and not renewed for the year 2015 due to persistent failure to address non-compliance issues which put to risk the interest of member deposits and financial sustainability of the deposit-taking business. These DTSs were equally directed to revert to BOSA only businesses under the Co-operative Societies Act. Therefore, the Authority had renewed a total of 180 licenses for DTSs to operate in 2015, and also granted a license to one more DTS bring the total number of licensed DTSs to 181. D.T Saccos are spread across the Counties and are categorized as follows:- Teacher based Saccos (42); Government based Saccos (42); Farmers based Saccos (58); Private institutions based Saccos (16); Community based Saccos (23) (SASRA Database, 2015). As at 26th January, 2016, there were 164 deposit taking Sacco societies licensed to undertake deposit-taking Sacco business in Kenya for the financial year ending December 2016. Twelve (12) Sacco Societies were granted restricted deposit-

taking licenses in accordance with Section 26(3) of the Act for a period of six (6) months, ending on 30 th June 2016. (Sacco Supervision Annual Report, 2016).

Out of the 6,151 Saccos 176 have ventured into front office service activities (FOSA). The FOSA offer bank-like services, like withdraw-able savings, debit cards, advances, deposits, money transfers etc. FOSA activity came about after banks withdrew from many rural areas and the people were left un-banked. Various FOSAs have received Salary Codes from employers and their members' salaries are paid through the FOSAs. The Saccos with FOSAs are spread all over the country and include both Rural and Urban Saccos.

The Ministry of Co-operative Development and Marketing (MoCD & M) is responsible for the development of the Cooperative sector through policy and legal framework to facilitate attainment of the national social-economic goals in Kenya. Unlike other commercial establishments, co-operatives are guided by the cooperative philosophy which is based on seven Co-operative Principles formulated by International Co-operative Alliance (ICA). The Sacco Societies Regulatory Authority (SASRA) is a creation of the Sacco Societies Act. The Authority's establishment falls within the broad Government of Kenya's reform process in the financial sector which has the dual objectives of protecting the interests of Sacco members and ensuring public confidence towards the Sacco. This ultimately will spur economic growth through deepening financial access, mobilization of domestic savings and affordable credit to Sacco members (Ademba, 2013).

1.2 Statement of the Problem

The overall performance of Deposit Taking Sacco in Kenya has been declining drastically as measured by ROE and interest margin to gross income. According to the Sacco Supervision Report (2016) Non- performing loans increased from 5.12 percent in 2015 to 5.23 percent in 2016, indicating elevated credit risk. This was driven mainly by the increase on the non-performing loans from Kshs 13.21 Billion in 2015 to Kshs 15.

57 Billion in 2016. Liquid assets to saving Deposits (Liquidity Ratio) reduced from 55.9 percent in 2015 to 49.95 percent in 2016, indicating the decline in liquidity thereby posing liquidity risk. Many DT Saccos are often unable to meet their short term obligations to their members, particularly the disbursement of loans. The interest spread has not been relatively stable from 2011 to 2016. Operating Expense to Total Assets Ratio increased from 5.13 percent in 2015 to 5.44 percent in 2016, indicating elevated operational risk. These risks faced by Saccos if not properly managed have the potentials to affect the financial performance of the Saccos and at extreme cases leads to their winding up.

Co-operative business is a risky and several risk factors such as credit, liquidity, operational and interest risks have been identified as critical to ensure that the Sacco position remain intact amid the intense competition in the industry (SASRA, 2015). The survival and success of a co-operative organization depends critically on the efficiency of managing these risks (Khan & Ahmed, 2001). More importantly, good risk management is highly relevant in providing better returns to the shareholders (Akkizidis & Khandelwal, 2008; Al-Tamimi & Al-Mazrooei, 2007).

Studies by Oluwafemi, Israel, Simeon and Olawale (2014); Mahmoud and Ahmed (2014); Akindele (2012); Mugenda, Momanyi and Naibei (2012); Ariffin and Kassim (2009) established that there is a positive relationship between financial risk and financial performance. However, a study by Yousfi (2012); Muriithi *et al*. (2016) on financial risk and financial performance revealed that financial risk; credit risk, liquidity risk, operational risks have a negative and significant statistical impact on financial performance. Findings of the empirical studies revealed that no study has been conducted to examine influence of financial risk on financial performance of DT Saccos in Kenya with size as the moderating variable. Further there is no consensus as to whether proper risk management leads to financial performance; this contradicting finding necessitates a study on influence of financial risk on financial performance of DT Sacco.

Despite well-established literature on banks, microfinance institutions, insurance companies and manufacturing firms, studies on the relationship between financial risk and financial performance relating to DT Saccos is inadequate at the moment. This study therefore seeks to fill the gap in the literature by focusing on the influence of financial risk on financial performance of the DT Saccos in Kenya.

1.3 Objectives of the Study

1.3.1 General Objective

To assess influence of financial risk on financial performance of deposit taking Savings and Credit Co-operative Societies (Saccos) in Kenya.

1.3.2 Specific Objectives

The Specific objectives of the study were:

1. To determine influence of credit risk on financial performance of deposit taking Saccos in Kenya.
2. To establish influence of liquidity risk on financial performance of deposit taking Saccos in Kenya.
3. To establish influence of interest rate risk on financial performance of deposits taking Saccos in Kenya.
4. To determine influence of operational risk on financial performance of deposit taking Saccos in Kenya.
5. To evaluate the moderating effect of firm size on the relationship between financial risk and financial performance of deposit taking Saccos in Kenya.

1.4 Research Hypotheses

The research hypotheses of the study were:

H_{01}: Credit Risk has no significant influence on financial performance of deposit taking Saccos in Kenya.

H_{02}: Liquidity Risk has no significant influence on financial performance of deposit taking Saccos in Kenya

H_{03}: Interest Rate Risk has no significant influence on financial performance of deposit taking Saccos in Kenya.

H_{04}: Operational Risk has no significant influence on financial performance of deposit taking Saccos in Kenya.

H_{05}: Firm Size has no significant moderating effect on the relationship between financial risk and financial performance of deposit taking Saccos in Kenya.

1.5 Significance of the Study

The findings of this study will be of paramount to the various stakeholders, scholars and other researchers. The study fills the gap of existing in literature in financial risk and performance of DT Saccos in Kenya. The study provides opportunities for further research in this area of financial risk which are Non- Deposit Taking. The finding of this study is of importance to scholars in the fields of finance as a source of information and will be used by other researchers as literature reviews when they will be studying financial risk and financial performance in relation to the DT Saccos in Kenya. In addition to scholars, the study will be of benefit to the following:

1.5.1 Regulatory Bodies

The DT Saccos are being regulated by the Sacco Societies Regulatory Authority (SASRA) which came into being as a result of an enactment of Sacco Societies Act (2008). This study is important to SASRA and other regulatory bodies and policy makers since it will help put in place policies to safeguard members' confidence in investing in the Sacco Sector.

1.5.2 Board Members of the DT Saccos

The study is also be of paramount importance to the members of the DT Saccos because it will enlighten them on the influence of financial risk on financial performance of the DT Saccos hence empower them monitor the implications of financial risk in order to ensure that the DT Sacco has optimal returns

1.5.3 Management of the DT Saccos

This study is instrumental in providing vital information to the management of the DT Saccos which are regulated by SASRA. They will be able to make informed decisions in regard to mitigation of risk and put in place policies to manage financial risk which in turn will affect the Sacco sector in a positive way and shareholders wealth will be increased.

1.5.4 Scholars and Academicians

This study adds to the body of existing knowledge on the influence of financial risk on financial performance. The finding of this study is of importance to scholars in the fields of finance as a source of information and will be used by other researchers as literature reviews when they will be studying financial risk and financial performance in relation to the DT Saccos in Kenya.

1.6 Scope of the Study

The study is concerned with assessing the influence of financial risk on financial performance of DT Saccos in Kenya. The study covered all the 164 DT Saccos in Kenya undertaking deposit-taking Sacco business in Kenya for the financial year ending 31st December 2016. The study covered only four independent variables under the financial risk which includes; credit risk, liquidity risk, interest rate risk and operational risk of deposit taking Saccos. The moderating effect of firm size on financial performance of deposit taking Saccos operating in Kenya will also be examined. Secondary data was collected from deposit taking Sacco's audited financial statement for six years from 2010 to 2015.

1.7 Limitation of the Study

The target population for the study was 164 DT Saccos and the researcher intended to do a census. The researcher managed to obtain a balanced panel data for 135 deposit taking Sacco's for six years from 2010 to 2015 which represented 82.32% success rate. Emphasis was also given to balanced panels thereby dropping DT Saccos which had incomplete information.

CHAPTER TWO

LITERATURE REVIEW

2.1. Introduction

This chapter examines the theoretical and empirical literature relevant to financial risk and financial performance. The chapter has five main sections; section 2.2 covers the theoretical review which focuses on the theories and models in financial risk. Section 2.3 is the conceptual framework which guides this study and specifies the interrelationship between the variables. Further on it moves on to the conceptualization of the variables, which specifies how the variables will be measured. Section 2.4 covers the empirical reviews which have been undertaken by various scholars and researchers, and section 2.5 provides the critique of empirical literature and finally the research gap in section 2.6

2.2. Theoretical Review

Wacker (1998) states that, a theory is an ordered set of assertions about a generic behavior or structure assumed to hold throughout a significantly broad range of specific instances. Theory-building is important because it provides a framework for analysis, facilitates the efficient development of the field, and is needed for the applicability to practical real world problems. To be good theory, a theory must follow the virtues criteria for good theory, including uniqueness, parsimony, conservation, generalizability, fecundity, internal consistency, empirical riskiness, and abstraction, which apply to all research methods. This section reviews the theories and models associated with the study and practice of risk management and financial performance.

2.2.1 Information Asymmetry Theory

Information Asymmetry was propounded by Akerlof(1970), Spence(1973), and Stiglitz(1976) and in 2001 they were awarded by Nobel Memorial Prize in Economics for their "analyses of markets with asymmetric information". (Ledyard, 2008).

Asymmetric information means that one party has more or better information than the other when making decisions and transactions. The imperfect information causes an imbalance of power. For example, when you are trying to negotiate your salary, you will not know the maximum your employer is willing to pay and your employer will not know the minimum you will be willing to accept. Accurate information is essential for sound economic decisions. When a market experiences an imbalance it can lead to market failure (Schrand, 2007).

According to Wilson (2008) Adverse selection is defined as a term used in economics that refers to a process in which undesired results occur when buyers and sellers have access to imperfect information. This uneven knowledge causes the price and quantity of goods or services in a market to shift. This results in "bad" products or services being selected. In addition to adverse selection, moral hazards are also a result of asymmetric information. A moral hazard is a situation where a party will take risks because the cost that could incur will not be felt by the party taking the risk. A moral hazard can occur when the actions of one party may change to the detriment of another after a financial transaction. In relation to asymmetric information, moral hazard may occur if one party is insulated from risk and has more information about its actions and intentions than the party paying for the negative consequences of the risk

Financial theories have proposed several reasons for corporate risk management in an imperfect world. Convex tax schedules (Mayers & Smith, 1982), (Smith & Stulz, 1985), costly financial distress (Smith & Stulz, 1985), (Mayers & Smith, 1990), costly external finance (Bessembinder, 1991), (Froot, Scharfstein & Stein, 1993) are some major arguments that support corporate risk management activities, even though shareholders may diversify on their own. Managerial risk aversion (Stulz, 1984), (Tufano, 1996) provides yet another reason for why managers may choose to hedge in order to increase their own welfare. While these theories of risk management focus on reasons firms might hedge (i.e., use contracts in order to reduce some measure of risk). There are a number of arguments that can be made in support of the idea that some managers use

derivatives to speculate, where speculation is defined as the actively taking derivatives positions based on a market view.

Speculation may well be value enhancing due to the option characteristics of equity (Black & Scholes, 1973) and the wealth transfer from debt holder to equity holders (Jensen & Meckling, 1976); Myers (1977). Other factors such as management compensation (Smith & Stulz, 1985), Tufano (1996) and private information (Ljungqvist (1992), (Degeorge & Zeckhauser, 1996) also provide management incentives to speculate (Géczy, Minton & Schrand, 2007) report survey findings that indicate that 61 out of 186 firms sometimes speculate and 13 frequently speculate.

One underlying factor that drives both hedging and speculation is the level of information asymmetry (IA) faced by the firm, since IA is highly correlated with cost of financing, firm quality, and firm valuation. Extant studies (DeMarzo & Duffie, 1991), (DeMarzo & Duffie, 1995), (Breeden & Viswanathan, 1996) have shown that firms with a higher level of asymmetric information are more likely to hedge to reduce the uncertainty that is out of managers' control.

However, Ljungqvist (1992) argues that when the degree of information asymmetry becomes too high, low quality corporations would have the most incentive to speculate, since "bankruptcy option" is the most valuable for these firms. Sapra and Shin (2008) argue that reducing asymmetric information by disclosing derivatives use information is likely to induce speculation. The study utilizes the information asymmetry theory in order to understand credit risk influence on financial performance of DT Saccos in Kenya. The DT Sacco are financial intermediaries and therefore they risk giving loans to members which may not been honored as a result of moral hazard on the part of the borrower and adverse selection on the part of the DT Sacco.

2.2.2 Shiftability Theory of Liquidity

Shiftability theory was developed by Mouton (1918) and published on his article named 'Commercial banking and capital formation. The theory revolves around the following central themes: A bank must arrange portfolio in such a way that it can have desired liquidity; Most investment is made in secondary money market securities so that liquidity can be achieved at a little/very insignificant amount of loss of value; Here investment money market securities includes, treasury bill, commercial paper and securities issued by reputed companies; Bank can also get cash from central bank in case of difficulty simply by keeping the instruments as security (Ngwu, 2009)

The shift-ability theory asserts that if the commercial banks maintain a substantial amount of assets that can be shifted on to the other banks for cash without material loss in case of necessity, then there is no need to rely on maturities. According to this view, an asset to be perfectly shiftable must be immediately transferable without capital loss when the need for liquidity arises. This is particularly applicable to short term market investments, such as treasury bills and bills of exchange which can be immediately sold whenever it is necessary to raise funds by banks. But in a general crisis when all banks are in need of liquidity, the shift-ability theory requires that all banks should possess such assets which can be shifted on to the central bank which is the lender of the last resort.

This theory has certain elements of truth. Banks now accept sound assets which can be shifted on to other banks. Shares and debentures of large companies are accepted as liquid assets along with treasury bills and bills of exchange. This has encouraged term lending by banks. The Shiftability theory has reduced the necessity of holding reserve of huge amount of idle cash balance. It has presented an alternative way of real bill doctrine/theory where there is possibility of risk because of economic depression in the case of buying and selling of commercial goods and raw material. With the help of Shiftability theory the probability of income can be increased and the probability of risk can be reduced (Cai & Anjan, 2008)

The study utilizes the Shiftability theory in order to understand the liquidity risk management influence on financial performance of DT Saccos in Kenya. It can be argued that liquidity of a DT Sacco is guaranteed when it has assets which can be shift before maturity when needed for example to pay member deposits to those exiting, pay loans and even call deposits (Acharya & Naqvi, 2012)

2.2.3 Loanable Funds Theory of Interest Rates

The loanable funds theory was formulated by Robertson & Ohlin (1930). According to this approach, the interest rate is determined by the demand for and supply of loanable funds. The term loanable fund includes all forms of credit, such as loans, bonds, or savings deposits (Wicksell & Robertson, 2003). The loanable funds theory extends the classical theory, which determined the interest rate solely by savings and investment, in that it adds bank credit. The total amount of credit available in an economy can exceed private savings because the bank system is in a position to create credit out of thin air. Hence, the equilibrium (or market) interest rate is not only influenced by the propensities to save and invest but also by the creation or destruction of fiat money and credit.

According to Ohlin (2013), one cannot say "that the rate of interest equalizes planned savings and planned investment, for it obviously does not do that. How, then, is the height of the interest rate determined. The answer is that the rate of interest is simply the price of credit, and that it is therefore governed by the supply of and demand for credit. The banking system – through its ability to give credit – can influence, and to some extent does affect, the interest level." The loanable funds theory has met a paradoxical fate. Although the fundamental elements of this theory have been accepted by the mainstream monetary theory, few contemporary economists quote it explicitly. An important exception can be found in the text of Woodford (2003) who, starting with the very title, makes an explicit link with Wicksell's work. Woodford (2003) points out that Wicksell's theory constitutes the theoretical foundation of the strategy adopted in recent

years by the central banks of western countries, i.e. pursuing the objective of price stability through a monetary policy rule based on interest rate manoeuvre.

Wicksell defines this rule by introducing the distinction between the rate of interest on money and the natural rate of interest, a distinction which has been accepted by the mainstream monetary theory that has supplanted Keynesian theory. Friedman (1968), for example, uses the distinction between natural rate of interest and market rate of interest to explain what monetary policy can and cannot do. Central banks use the wicksellian distinction to affirm that monetary policy can only influence the short term interest rates while in the long run the interest rates are determined by real factors. An explicit reference to the LFT can, moreover, be found in the works of the New Keynesians, who set out to re-elaborate the keynesian monetary theory by focusing on the credit market rather than the money market (Stiglitz & Greenwald, 2003).

Loanable funds theorists believe that higher saving through lower consumption and lower deficits would lead to a higher credit supply, lower interest rates, more investment and thus a higher capital stock and higher future income (Lindner, 2013). They explained the rate of interest in terms of the demand for money and supply of loanable funds. The demand comes from firms wishing to invest. As the rate of interest gets low the number of profitable projects increase. Thus, the demand curve for funds will slope downwards from left to right.

The supply of loanable funds comes from savings. If people are to save they will require a reward interest to compensate them for forgoing present consumption. If the interest rate is high, people will be encouraged to save and lend. If the interest rate is low, people will be discouraged from saving and lending. Hence, the supply curve of loanable funds slopes upwards. The demand for DT Sacco loans represents the willingness to borrow, and the supply curve for DT Sacco loans represents the willingness to lend or save. The demanders of loans are members of the DT Sacco. The quantity borrowed is inversely related to the interest rate, and the quantity lent is directly related to the interest rate (Mishkin, 2004). The study utilizes the Loanable

funds theory of interest rates in order to understand the interest rate risk management influence on financial performance of DT Saccos in Kenya.

2.2.4 Enterprise Risk Management Theory

The Enterprise risk management theory was propounded by Nocco and Stulz (2006). Enterprise Risk Management (ERM) is a framework that focuses on adopting a systematic and consistent approach to managing all of the risks confronting an organization. Operational risk is attached in all the core risks since it is the risk of human error in executing the business strategy. (Tseng, 2007).

Gordon *et al.* (2009) on the other hand define ERM as the overall process of managing an organization's exposure to uncertainty with particular emphasis on identifying and managing the events that could potentially prevent the organization from achieving its objective. ERM is an organizational concept that applies to all levels of the organization". In conducting ERM, the following are listed as some of the areas or aspects of the organization that a risk manager need to look into namely: the people, intellectual assets, brand values, business expertise and skills, principle source of profit stream and the regulatory environment This will help organization to balance the two most significant business pressures; the responsibility to deliver succeed to stakeholders and the risks associated with and generated by the business itself in a commercially achievable way. By doing so, the risk manager is constantly aware of the risks it faces and therefore constantly monitors its exposure and be positioned to change strategy or direction to ensure the level of risks it takes is acceptable. The study utilizes enterprise risk management theory in order to understand the operational risk management influence on financial performance of DT Saccos in Kenya. Operational risk is attached in all the core risks since it is the risk of human error in executing the business strategy.

2.3 Conceptual Framework

According to Ravitch and Riggan (2012) a conceptual framework is an analytical tool with several variations and contexts. It is used to make conceptual distinctions and organize ideas. Strong conceptual frameworks capture something real and do this in a way that is easy to remember and apply. Conceptual frameworks are abstract representations, connected to the research project's goal that directs the collection and analysis of data (on the plane of observation – the ground). A conceptual framework is a concise description of the phenomena under study accompanied by graphic or visual depiction of the major variables of the study (Mugenda, 2008).

A description of this framework contributes to a research report in at least two ways because it; firstly, identifies research variables, and secondly, clarifies relationships among the variables. Linked to the problem statement, the conceptual framework sets the stage for presentation of the specific research question that drives the investigation being reported. The study seeks to explain the dependent variables (Kothari, 2009). From the analysis of the literature presented the conceptual framework of the study can be presented as shown in figure 2.1.

Independent variables **Moderating Variable** **Dependent variable**

Financial Risk

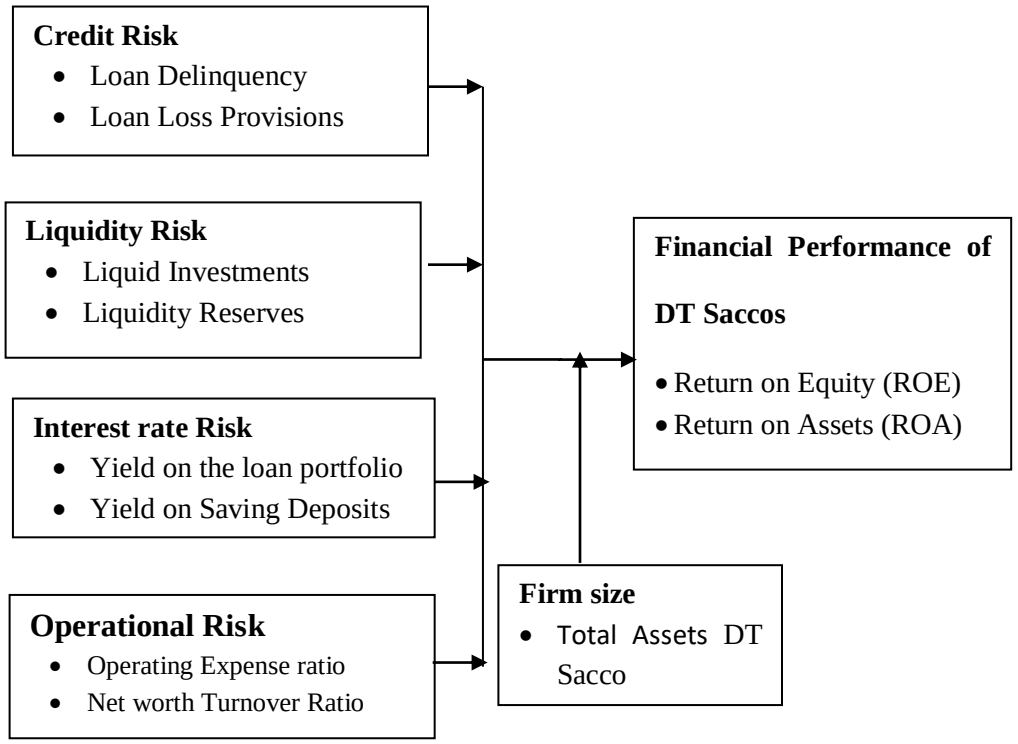

Figure 2.1: Conceptual Framework

2.3.1 Credit Risk

Credit risk happens when the counterparty fails to meet its obligations timely and fully in accordance with the agreed terms. It is the risk of loss due to the other party defaulting on contracts or obligations. This can lead not only to an increase in the liquidity crises but also declines the quality of the bank assets. This problem may arise for DT Saccos especially when there is a problem of asymmetry of information.

The uncertain honesty of the board of directors and there misdirected use of funds can lead DT Saccos into difficulty. (Arab & Elmelki, 2009).

2.3.2 Liquidity Risk

The potential loss arising from the DT Saccos inability either to meet its obligations or to invest fund increases in assets as they fall due without incurring unacceptable costs or losses. Form this definition it's obvious that liquidity risk doesn't mean just the shortage in financial resources but also the excess of these unused funds (Crouhy & Galai, 2004).

2.3.3 Interest Rate Risk

The volatility of lending rates in the commercial banking sector remains an important facet of the performance of the co-operative sector, and the DT-SACCOs segment in particular. This is premised on the fact that a good number of DT-SACCOs rely heavily on external financing to fund a significant portion of their core business activities. The total loans to total deposits by the DT-SACCOs stood at 108.39% in 2016, against 108.74% in 2015 implying that a great proportion of DT-SACCOs' loans are still funded from the external sources, which are subject to changes in commercial banking lending rates (Sacco Supervision Report, 2016).

2.3.4 Operational Risk

Operational risk is defined as the risk of losses resulting from inadequate or failed internal processes, people and systems or from external events. Operational risk is further classified in the following categories; People risk (Incompetence and fraud); Process Risk (transaction, operational controls); Technology risk (system failure, telecommunication failure) (Crouhy *et al*., 2004). Some risks are difficult to quantify (like incompetence under people risk), whereas others lend themselves much easier to quantification (as for instance execution error under transaction risk).Operational risk include frauds and forgeries by Sacco staff and outsiders, inability to use information and communication technology well that allow outsiders access to system such as ATM frauds (Owojori, Akintoye & Adidu, 2011). Operational risk is attached in all the core risks since it is the risk of human error in executing the business strategy.

2.3.5 Firm Size

The size reflects how large an enterprise is in infrastructure and total assets. McMahon (2001) found that enterprise size significantly linked to better business performance. Larger enterprises were found to have higher level of success. Firm size has also been shown to be related to industry-sunk costs, concentration, vertical integration, and overall profitability (Dean *et al*., 1998).

The size of a firm is one of the major drivers of operational costs. McMahon (2001) points out large firms are more productive in terms of average cost per borrower and also have better write-off ratios. He also found that bigger firms are associated with smaller average costs making them more efficient. Similarly, Usman and Zahid (2011) found that larger firms have higher ROA, ROE and operational self-sufficiency. Small firms not only find it difficult to compete with larger firms in the market but they also face problems in obtaining finance, thereby hampering their ability to grow. Heshmati, Usman and Zahid (2011) examined the relationship between size and sales growth small firms in Sweden and found that sales growth was higher in larger firms compared to the smaller ones. In relation to this study the size of the DT Sacco is viewed in reference to the total assets of the SACCO.

2.3.6 Financial Performance

Financial performance refers to the act of performing financial activity. In broader sense, financial performance refers to the degree to which financial objectives have been accomplished. It is the process of measuring the results of a firm's policies and operations in monetary terms. It is used to measure firm's overall financial health over a given period of time and can also be used to compare similar firms across the same industry or to compare industries or sectors in aggregation. (Metcalf & Titard, 2006)

Rowe and Morrow (1999) found evidence of a financial performance dimensions composed of profitability, market value and growth. Table 2.3.6 shows the financial

performance dimensions and the indicators. In this regard therefore profitability dimension is adopted because from the empirical review most studies have adopted it therefore inference will be possible.

Table 2.1: Financial Performance Dimensions and Indicators

Dimensions	Indicators
Profitability	Return on Assets and Return on Equity
Market Value	Earnings per share, Dividend yield
Growth	Market share growth, Assets growth and Net Income growth

2.4. Empirical Review

2.4.1 Credit Risk and Financial Performance

Rasika and Sampath (2015) carried out a study to investigate in to the effect of Credit Risk on the Financial Performance of Commercial Banks in Sri Lanka with special reference to Systemically Important Banks from 2011 to 2015 using quarterly financial reports. The secondary data collected from the bank's annual reports was analyzed using multiple regression analysis. In the model Return on Equity was used as the financial performance indicator while Non-Performing Loan Ratio and Capital Adequacy Ratio as credit risk indicators. Results of the analysis states that both NPLR and CAR have negative and relatively significant effect on ROE, with NPLR having higher significant effect on ROE in comparison to CAR. Credit risk still remains a major concern for the commercial banks in Sri Lanka because and it is an important predictor of bank financial performance.

Alshatti (2015) did a research aiming at examining the effect of credit risk management on financial performance of the Jordanian commercial banks from 2005 to 2013, thirteen commercial banks were chosen to express on the whole Jordanian commercial banks. The study revealed that the credit risk indicators have significant negative effects on banks' financial performance as measured by ROA. The study recommends banks

should improve their credit risk management to achieve more profits, in that banks should take into consideration, the indicators of Non-performing loans/Gross loans, Provision for facilities loss/Net facilities and the leverage ratio that were found significant in determining credit risk management.

Li and Zou (2014) carried out a study with a purpose to investigate the impact of credit risk management on profitability of commercial banks in Europe. In the research model, ROE and ROA are defined as proxies of profitability while NPLR and CAR are defined as proxies of credit risk management. Data was collected from the largest 47 commercial banks in Europe from 2007 to 2012 and formulates four hypotheses which are related to the research question. A series of statistical tests are performed in order to test if the relationship exists. Other statistical tests are performed to investigate if the relationship is stable or not. The study reveals that credit risk management does have positive effects on profitability of commercial banks in Europe. Between the two proxies of credit risk management, NPLR has a significant effect on the both ROE and ROA while CAR has an insignificant effect on both ROE and ROA.

Poudel (2012) carried out a study on the impact of credit risk management on financial performance of commercial banks in Nepal. The independent variable was credit risk management, the parameters were; default rate, cost per loan assets and capital adequacy ratio. Data was collected from the financial report of 31 banks were used to analyze for eleven years (2001-2011) comparing the profitability ratio to default rate, cost of per loan assets and capital adequacy ratio which was presented in descriptive, data was analyzed using correlation and regression. From the finding from the study all the parameters of credit risk have an inverse impact on commercial banks financial performance in Nepal; however, the default rate is the most predictor of bank financial performance. The study recommends that banks to design and formulate strategies that will not only minimize the exposure of the banks to credit risk but will enhance profitability.

Hosna, Manzura and Juanjuan (2009), conducted a study to establish the effect of Credit Risk Management on Profitability of Commercial Banks in Sweden. The study was limited to identifying the relationship of credit risk management and profitability of four commercial banks in Sweden. The dependent variable was ROE while credit risk was the independent variable; the indicators were NPLR and CAR. The data was collected from the sample banks annual reports (2000-2008) and capital adequacy and risk management reports (2007-2008). From the findings it can be seen that credit risk management has negative effect on profitability in all 4 banks.

Olawale (2016) did a study to examine the effect of credit risk on commercial banks performance in Nigeria. Secondary data source was explored in presenting the facts. Secondary data was obtained from annual reports and relevant literatures. The result shows that the ratio of loan and advances to total deposit negatively relate to profitability though not significant at 5% and that the ratio non-performing loan to loan and advances negatively relate to profitability at 5% level of significant. This study shows that there is a significant relationship between bank performance (in terms of profitability) and credit risk management (in terms of loan performance).

Bizuayehu (2015) carried a study to examine the impact of credit risk management on profitability of banks in Ethiopia. The study used a secondary data for eight banks which stayed in the industry more than eleven years among nineteen banks which is functional at the moment in Ethiopia banking industry. Secondary data was obtained from banks annual report, National Bank annual report and MoFED. ROE was dependent variable while nonperforming loan, capital adequacy, bank size, loan and advance to deposit ratio, inflation and GDP have taken as independent variables. The study concluded that the credit risk which is measured by nonperforming loan ratio had a significant inverse impact on banks financial performance and capital adequacy also same impact on profitability. However, loan to deposit ratio and bank size have a positive significant impact on banks financial performance. In general, Bank Specific factors have a significant impact on banks profitability while external factors like GDP, Inflation and interest rate spread had no significant impact on banks profitability.

Afriyie and Akotey (2015) Carried as study on the impact of credit risk management on the profitability of rural and community banks in the Brong Ahafo Region of Ghana. Financial statements of ten rural banks from the period of 2006 to 2010 (five years) were used for analysis. The panel regression model was employed for the estimation. The dependent variable was Profitability, the indicators were; Return on Equity (ROE) and Return on Asset (ROA) while Non-Performing Loans Ratio (NLPR) and Capital Adequacy Ratio (CAR) as credit risk management indicators. The findings indicate a significant positive relationship between non-performing loans and rural banks' profitability revealing that, there are higher loan losses but banks still earn profit.

Kaaya and Pastory (2013) conducted a study titled credit risk and commercial banks performance in Tanzania: Panel data analysis. The study was meant to find the relationship between the credit risk and bank performance as measured by return on asset. Casual research design and descriptive research design was employed as the study was keen to establish the relationship between the variables. The econometrics test such as VIF (Variance Inflation Factor) and DW (Durbin Watson) was adopted. Since the study seeks to establish the relationship, regression analysis was adopted to identify the causality of the sample. The study employed the panel data from the 11 banks in Tanzania. Return on asset (ROA) is the dependent variable which measure how the banks are profitable relatively to their assets and how the management is efficient in utilizing the company assets to generate revenue. The independent variables are loan loss to gross loan, Non-Performing loan, loan loss to net loan, impaired loan to gross loan. The control variables are deposit and bank size. Data was analyzed using regression model. From the finding of the study credit risk indicators produced negative correlation which indicate the higher the credit risk the lower the bank performance. Loan loss to gross loan, loan loss to net income and Non-performing loan negatively affect the profitability of the banks because of the negative coefficients. The study recommends the bank understudy to increase the capital reserve to protect the bank for the future losses and to increase bank credit risk management techniques.

Muriithi, Waweru and Muturi (2016) carried out a study with the objective to assess the effect of credit risk on financial performance of commercial banks in Kenya. The study covered the period between year 2005 and 2014. The independent variable was credit risk which was measured by capital to risk weighted assets, asset quality, loan loss provision, loan and advance ratios and financial performance by return on equity (ROE). Data was collected from balance sheets components and financial ratios of 43 commercial banks in Kenya registered by year 2014. Panel data techniques of fixed effects estimation and generalized method of moments (GMM) were used to purge time–invariant unobserved firm specific effects and to mitigate potential endogeneity problems. From the results credit risk has a negative and significant relationship with bank profitability. Poor asset quality or high non-performing loans to total asset is related to poor bank performance both in short run and long run. Based on the study findings, it is recommended that management of commercial banks in Kenya should enhance their capacity in credit analysis and loan administration. Clear credit policies and lending guidelines should be established.

Nyambere (2013) carried a study to determine the effect of credit risk management on financial performance of deposit taking Savings and Credit Co-operative Societies in Kenya. The researcher adopted a cross sectional survey research design in this study. The population for this study was therefore, all heads of credit risk management function in the 215 total number of deposit taking SACCOs that are under supervision by SASRA. Primary and secondary data was used for the study. Pearson correlation analysis and a multiple regression model were used to analyze the data whereby the dependent variable was the financial performance of the SACCOs which was measured using Return on Equity (ROE) whereas the independent variables were the CAMEL components of Capital adequacy, Asset quality, Management efficiency, Earnings and Liquidity.

The finding revealed positive relationship between financial performance (ROE) and all the tested independent variables at 0.179, 0.063, 0.240, 0.003 and 0.160 for Capital Adequacy, Asset Quality, Management Efficiency and Earnings Liquidity respectively.

Ogilo (2012) carried a study to analyze the impact of credit risk management on the financial performance of commercial banks in Kenya. A causal research design was undertaken in this study and this was facilitated by the use of secondary data which was obtained from the Central Bank of Kenya publications on banking sector survey. The study used multiple regression analysis in the analysis of data and the findings have been presented in the form of tables and regression equations. The findings from the study also established that capital adequacy, asset quality, management efficiency and liquidity had weak relationship with financial performance (ROE) whereas earnings had a strong relationship with financial performance.

2.4.2 Liquidity Risk and Financial Performance

Khan and Syed (2013) conducted a study on liquidity risk and performance of the banking system. This study identifies and examines the potential causes of liquidity risk in Pakistani banks and evaluates their effect on banks' profitability. Data was collected from the income statements and balance sheet of 15 Pakistani banks during 2006-2011. Multiple regressions were applied on data in order to evaluate the impact of liquidity risk on banks' profitability. The results of multiple regressions show that banks' profitability is affected by liquidity risk significantly. Non-performing loans and liquidity gap were the two independent variables which exacerbate the liquidity risk i.e., creating a negative association with bank's profitability. It was concluded that to mitigate liquidity risk the bank should have adequate cash assets this minimizes the liquidity gap thus decreasing the dependence on repo market.

Hakimi and Zaghdoudi (2017) carried a study on Liquidity risk and bank performance for Tunisian Banks. An important part of banking literature is the relationship between credit risk and bank performance. However, only few studies investigate the association between liquidity risk and bank performance. A sample of 10 Tunisian banks over the period 1990-2013. Liquidity risk is negatively and significantly correlated with bank performance. Liquidity risk decreases significantly bank performance.

Marozva (2015) carried a study on Liquidity and bank performance in South Africa. This study was based on empirical research on the relationship between liquidity and bank performance for South African banks for the period between 1998 and 2014. The study employed the Autoregressive Distributed Lag (ARDL)-bound testing approach and the Ordinary Least Squares (OLS) to examine the nexus between net interest margin and liquidity. Liquidity in this study is viewed in the context of the market liquidity risk and funding liquidity risk. NIM is defined as interest income minus interest expenses divided by total assets, MLR is the Ratio of Liquid Assets to current liabilities, proxying the market liquidity risk faced by banks, FLR is the funding liquidity risk represented by loan-to-deposit ratio. The study observes that there is a negative significant deterministic relationship between net interest margin and funding liquidity risk. However, there is an insignificant co-integrating relationship between net interest margin and the two measures of liquidity. Based on this research it is recommended that further research should be conducted to investigate liquidity in the context of asset- liability mismatches. Financial institutions also should realize that liquidity is a short-run phenomenon that has to be analyzed as such.

Song'e (2015) conducted a study the effect of liquidity management on the financial performance of deposit taking Saccos in Nairobi County. A sample of the 27 Deposit taking Saccos that are licensed under Sacco Society Regulatory Authority was carried out where secondary data was collected from their published financial statement between years 2010 to 2014. SASRA. The researcher used descriptive statistics, regression analysis and correlation efficient method. In order to test this relationship regression analysis was run with total profit before tax to total assets as the dependent variable and the liquidity, funding liquidity risk, operational efficiency, and quick ratio log of total assets as the independent variables. The findings were that financial performance as measured by profit before tax over total assets is positively related to Liquidity, funding liquidity risk, operational efficiency, quick ratio and log of total assets. The study therefore recommends that the deposit taking Saccos should put in

place the best liquidity management practices to increase their financial performance.

Mwangi (2014) carried a study on the effects of liquidity on financial performance of deposit taking microfinance institutions in Kenya. This study analyzed the liquidity and financial performance of Deposit taking microfinance institutions in Kenya for the period 2009 to 2013. For the purpose of this study, the data was extracted from the published institution's annual audit reports, Association of Micro Finance Institutions Reports (AMFI) and CBK's banks supervision annual reports for the five years under examination. This study used inferential statistics to explain the main features of a collection of data in quantitative terms while correlation and linear regression analysis are used for analyzing the data. Financial performance was measured using return on assets while liquidity of DTMFIs was measured by cash and cash equivalents divided by total average assets. The results revealed that there is a positive relationship between liquidity and financial performance as the coefficient of determination was found to be .910 explaining that the liquidity explains 91% of the variance in the financial performance. The correlation revealed a significant association of .941 at 5% level of significant. Recommendations made include; strategies to facilitate increased liquidity of MFIs to be adopted, emphasize on asset growth as a stimulator of financial performance and competitiveness as well as improvements in operational efficiency through application of modern technology and innovative operational strategies.

Kamau and Njeru (2016) conducted a study to establish the effect of liquidity risk on financial performance of Listed Insurance Companies in Kenya. The risks to be studied included operational risk, Liquidity risk and credit risk. The six listed insurance companies comprised of the target population for the period 2012-2015. The study was descriptive in nature. The financial statements of these companies were studied and comparisons made on the return on equity and net premiums earned for those years. It was found out that operational risk, Liquidity risk and credit risks have negative effect on the financial performance of these companies. The researcher recommended that measures should be put into place to hedge these risks and hence maintain a healthy financial performance.

Muriithi and Waweru (2017) conducted a study to examine the effect of liquidity risk on financial performance of commercial banks in Kenya. The period of interest was between year 2005 and 2014 for all the 43 registered commercial banks in Kenya. Liquidity risk was measured by liquidity coverage ratio (LCR) and net stable funding ratio (NSFR) while financial performance by return on equity (ROE). Data was collected from commercial banks 'financial statements filed with the Central Bank of Kenya. Panel data techniques of random effects estimation and generalized method of moments (GMM) were used to purge time-invariant unobserved firm specific effects and to mitigate potential endogeneity problems. Pairwise correlations between the variables were carried out. Findings indicate that NSFR is negatively associated with bank profitability both in long run and short run while LCR does not significantly influence the financial performance of commercial banks in Kenya both in long run and short run. However, the overall effect was that liquidity risk has a negative effect on financial performance. It is therefore advisable for a bank's management to pay the required attention to the liquidity management.

Otieno, Nyagol and Onditi (2016) conducted a study to establish the relationship between liquidity risk management and financial performance of Microfinance banks in Kenya. Longitudinal research design utilizing panel data covering the period from 2011 to 2015 was used. Target population comprised 12 licensed MFBs. Purposive sampling was used to obtain a sample of 6 MFBs. Pearson correlation was used to determine strength and association among variables. Panel data analysis based on system GMM technique was used to estimate a multiple regression model and test for significance of relationship between Liquidity Risk management and financial performance. The findings were that Liquidity risk management with FGR and CAR parameters had a strong Positive correlation (r=0.45), giving a significant negative relationship with both ROAA and ROAE performance measures as depicted by regression coefficient of 0.3 estimated by GMM. Thus, the study concluded the existence of a significant relationship Liquidity risk management and performance and that liquidity risk management impacts positively on performance of MFBs. The study

recommended establishment of a funding strategy that provides effective diversification in the sources and tenor of funding and regularly gauges its capacity to raise funds quickly from each source. Also Finance managers to identify the main factors that affect MFBs ability to raise funds and monitor those factors closely to ensure that estimates of fund raising capacity remain valid.

Maaka and Ondigo (2013) carried a research to establish the relationship between liquidity risk and financial performance of commercial banks in Kenya. The study adopted correlation research design where data was retrieved from the balance sheets, income statements and notes of 33 Kenyan banks during 2008-2012. Multiple regressions were applied to assess the impact of liquidity risk on banks' profitability. The findings of the study were that profitability of the commercial bank in Kenya is negatively affected due to increase in the liquidity gap and leverage. With a significant liquidity gap, the banks may have to borrow from the repo market even at a higher rate thereby pushing up the cost of banks. The level of customer deposit was also found to positively affect the bank's profitability and it will therefore be encouraged for banks to open more branches in the country.

2.4.3 Interest Rate Risk and Financial Performance

Waseem and Abdul, (2014) conducted a study on impact of interest rate changes on the profitability of four major commercial banks in Pakistan. The core objective of this project was to analyze the impact of interest rates changes on the profitability of commercial banks being operated in Pakistan by examining the financial statements of four major banks during 2008 to 2012. In this paper interest rate is an independent variable and bank profitability is a dependent variable. To examine the impact of interest rate changes on the profitability of commercial banks in Pakistan, Pearson correlation method is used in this study. As a result it is found that there is strong and positive correlation between interest rate and commercial banks‟ profitability. It means if the value of interest rate is increases/decreases then as result value of banks‟ profitability will also increases/decreases.

Kolapo and Dapo (2015) carried a study on the influence of interest rate risk on the performance of deposit money banks in Nigeria. Banks perceive interest rate as either the price of deposits on one hand and cost of borrowing on the other hand. It performs a major function of rationing limited available financial resources (credit) among numerous competing demands. This study makes inquiry into the influence of interest rate risk on the performance of DMBs in Nigeria between 2002 and 2011, using a sample consisting of 6 tier 1 capital banks. The regression model specifies return on assets to measure bank performance as a function of interest rate risk indexed with loans to asset ratio, average lending ratio, and risk of interest diversity. Employing fixed effect regression method, each measure of interest rate risk is found to have insignificant effect on bank performance. It is also found that interest rate risk weakly determines changes in return on assets; hence, it does not possess significant influence on bank performance.

Odeke and Odongo (2014) conducted a study on interest rate risk exposure and financial performance of commercial banks in Uganda. The Ugandan banks still faced with challenges of non-performing assets based on in-accurate information on clients, wrong clients and weak controls within the financial system. Consequently, evidence of weak financial performance of many banks was seen in large provisions for bad loans being made, and subsequent write offs of delinquent loans when they went bad, thus affecting bank efficiency. A cross sectional survey and descriptive research design was used, a sample size of 9 commercial banks was analyzed and interpreted using financial ratios of DuPont analysis of commercial banks. Findings show that a combined variation of maturity gaps, basis risk and assets and liabilities margins for all the commercial banks accounted for up to 14.9% variation in their banks performance. The variation explained 20.19% of the performance of the commercial banks, would predict maturity gaps, basis risk, and assets and liabilities margins. The overall analysis of interest rate risk exposure and bank performance showed generally a positive relationship except basis risk

Ndichu (2014) carried a study on the effect of interest rate spread on financial performance of deposit taking microfinance banks in Kenya. The main objective of the study was to establish the effect of interest rate spread and on the financial performance of DTMBs in Kenya. Additionally, the researcher wanted to ascertain the influence of other industry specific variables and macro-economic environment on DTMBs financial performance. The research study utilized descriptive research design and embraced systematic random sampling technique on selecting the four DTMBs in Kenya out of the nine existing in the country Secondary data were analyzed and presented inform of tables and figures to provide a clear picture of how interest rates spread contribute in the success or failure of the DTMB business and to show the various characteristics and relationships among the variables in consideration. Findings showed that interest rate spread is statistically significant at 95% and 99% significant level with a negative correlation thus as IRS increases the financial performance of DTMBs decreases. The other controlling market (industry) specific and macro-economic environment variables, that is, leverage, non-performing loans, liquidity ratio and GDP per capita annual growth in % ratio showed a statistically significant positive correlation hence play a major role in positively influencing the performance of micro-banking industry and are therefore important for DTMB business to operate as a going-concern in the foreseeable future. It is evident from the research findings that the interest rate spread provided sufficient margins for microfinance banks to continue operating in the market. In conclusion, the study found out that interest rates spread negatively affect the financial performance of DTMBs in Kenya.

Ngumi and Ondigo (2014) conducted a study on the effect of lending interest rates on financial performance of deposit taking micro finance institutions in Kenya. The objective of this study was to find out whether there exists a relationship between lending interest rates and the financial performance of Deposit Taking Microfinance Institutions in Kenya. The study involved collecting secondary data from Central Bank of Kenya, individual Deposit Taking Microfinance Institutions and the Association of Microfinance Institutions in Kenya. Consequently data for nine DTMs was analyzed for

five years (2009-2013) using multivariate regression model. The study found out that a strong positive relationship exists between lending interest rates and financial performance of DTMs.

Njoroge and Barasa (2013) carried a study on the relationship between interest rates and financial performance of firms listed at the Nairobi Securities exchange. The main purpose of the study was to assess the nature of the relationship between interest rates and financial performance of firms listed at the Nairobi Securities Exchange. The study covered five years from 2008 to 2012 inclusive and the research was based on secondary data obtained from published financial statements of the firms and publications by the Central Bank of Kenya. The causal research design was employed to assess the nature of the relationship between interest rates and financial performance of firms listed at the Nairobi Securities Exchange. Regression analysis was used to assess the nature of the relationship. Results obtained from the study indicated a not significant positive relationship between interest rates and financial performance. On disaggregation and grouping of the firms to their respective industries, it was found that linear regression model can selectively be used to forecast financial performance of firms' at given levels of interest rates for firms where statistically significant relationship was found.

2.4.4 Operational Risk and Financial Performance

Epetimehin and Fatoki (2015) carried a study on Operational risk management and the financial sector development. Operational risk in inherent in all financial products, activities and processes and systems and the effective management of operational risk is paramount importance for every financial institution board and senior management. With globalization and deregulation of financial markets, increased competition combined with the advent of high-end, innovative, sophisticated technology tremendous changes have taken place in the products distribution channels and serviced delivery mechanism of financial sector. These have introduced more complexities into the operations and consequently the risk partners and profiles of the

sector have also become complex, diverse and catastrophic. The New Capital Adequacy Framework of most of most financial institutions requires them to study the regulatory frame work related to operational risk management. A research was conducted on 150 employees from different financial institutions, such as banks, insurance, stockbrokers and microfinance companies. Analysis of Variance (ANOVA) was used to test the hypothesis and response of respondents was analyzed through the use of Statistical Package for Social Science (SPSS).

The result showed that operational risk management effects have positive effects on the financial development and growth in the financial sector. In conclusion, Managing Operation Risk is emerging as an important element of sound risk management practice in modern day banks in the wake of phenomenal increase in volume of transactions, high degree of structural changes and complex technological support systems. The Central bank of Nigeria expects all Nigeria banks and other financial institutions to strengthen their operation risk management system and to be in readiness graduate to more sophisticated approaches of operational risk management under Basel norms, in order to drive maximum gains bank and financial institutions need to gear up efforts for speedy and effective implementation of comprehensive operational risk management frameworks and thereby bring more efficiency, transparency, profitability and sustainability into their operations No doubt this will result in growth (Epetimehin & Fatoki, 2015).

Odunga, Nyangweso, Carter, and Mwarumba (2013) conducted a study on credit risk, capital adequacy and operating efficiency of commercial banks in Kenya. Operating efficiency for banks is therefore essential for a well-functioning economy. The banking sector in Kenya has grown tremendously over years in terms of numbers, size and profitability. Despite growth in the sector, challenges still remain, market risk, credit and operational risk possess a major challenge. Kenyan commercial banking is not the largest supplier of credit yet the largest in terms of assets in the financial services industry. Guided by operational efficiency theory, this study aimed at

examining the effect of bank specific performance indicators, credit risk and capital adequacy on the operating efficiency of commercial banks in Kenya. Specifically, we sought to establish the effect of bank specific credit risk ratios (Net charge off to gross loans ratio, loan loss provision to total loans ratio, loan loss provision to equity, loan loss reserves to equity ratio) and capital adequacy ratios (Core capital ratio, risk-based capital ratio, total capital ratio and equity capital to total assets ratio) on their operating efficiency. The study adopted an explanatory research design and analyzed the panel data using Fixed Effects Regression. The results of the study indicated that the previous year operational efficiency and risk based capital ratio positively and significantly affected the bank's operating efficiency. Banks should seek mechanisms to improve their risk based capital ratio in order to improve operating efficiency and remain competitive in the market.

Kamau and Njeru (2016) conducted a study to establish the effect of liquidity risk on financial performance of Listed Insurance Companies in Kenya. The risks to be studied included operational risk, Liquidity risk and credit risk. The six listed insurance companies comprised of the target population for the period 2012-2015. The study was descriptive in nature. The financial statements of these companies were studied and comparisons made on the return on equity and net premiums earned for those years. It was found out that operational risk, Liquidity risk and credit risks have negative effect on the financial performance of these companies. The researcher recommended that measures should be put into place to hedge these risks and hence maintain a healthy financial performance.

Simiyu, Clive and Musiega (2016) carried a study on the influence of operational risk on the financial performance of deposit taking savings and credit cooperatives in Kakamega County. The study used a descriptive survey design. The population consisted four deposit taking Saccos operating in Kakamega County. A semi-structured questionnaire was used to collect the data from a sample size of 56 respondents. The data from the respondents was coded on statistical package for social science (SPSS) software and analyzed by descriptive statistics. The study revealed that there was a significant positive

linear relationship between financial systems and financial performance of SACCOs in Kakamega County. The study concluded that SACCOs and other financial institutions must focus on the financial systems in minimizing their operational risks. The study recommended that management of SACCOs in Kenya should ensure that adoption and implementation of sound operational risk management practices.

2.5 Critique of Existing Literature

A number of empirical studies have been carried out relating credit risk on financial performance of firms. They include; Rasika and Sampath (2015), Alshatti (2015), Li and Zou (2014), Poudel (2012), Hosna, Manzura and Juanjuan (2009), Olawale (2016), Bizuayehu (2015), Afriyie and Akotey (2015); Kaaya & Pastory (2013); Muriithi, Waweru and Muturi (2016); Nyambere (2013); Ogilo (2012). All these studies have been done on commercial banks except for Nyambere (2013) which was on Deposit taking Saccos in Kenya. All these studies are using ROE, ROA or Net Interest Margin as the indicator of financial performance which is the dependent variable. None of these studies are using all this indicators to measure financial performance. Studies by Li and Zou (2014), Afriyie and Akotey (2015); Nyambere (2013) indicate that there is a significant positive relationship between non-performing loans and banks' profitability while studies by Rasika and Sampath (2015), Hosna, Manzura and Juanjuan (2009), Olawale (2016), Bizuayehu (2015), Kaaya and Pastory (2013); Muriithi, Waweru and Muturi (2016) reveal that risk indicators produced negative correlation which indicate that, the higher the credit risk the lower the bank performance.

In relation to influence of liquidity risk on financial performance of the deposit taking Saccos in Kenya, several empirical studies have been carried out relating liquidity risk and on financial performance of firms. They include; Khan and Syed (2013); Hakimi and Zaghdoudi (2017); Marozva (2015); Song'e (2015); Mwangi (2014); Kamau and Njeru (2016); Muriithi and Waweru (2017); Otieno, Nyagol and Onditi (2016); Maaka and Ondigo (2013). Some studies found that there is a positive relationship between liquidity and financial performance (Song'e, 2015; Mwangi,

2014; Otieno, Nyagol & Onditi, 2016). The other studies found out that liquidity risk is negatively related to financial performance.

In regards to the influence of interest rate risk on financial performance of the deposit taking Saccos in Kenya, few empirical studies have been carried out relating interest rate risk and on financial performance of firms. They include; Waseem and Abdul, (2014), Kolapo and Dapo (2015), Odeke and Odongo (2014), Ndichu (2014), Ngumi and Ondigo (2014), Njoroge and Barasa (2013). The studies have only been carried on banks and Deposit taking microfinance, none of the studies have been carried on DT Saccos There are conflicting results in regard to the study. According to (Waseem & Abdul, 2014; Odeke & Odongo, 2014) there is strong and positive correlation between interest rate and commercial banks profitability. Interest rate risk is found to have insignificant effect on bank performance. It is also found that interest rate risk weakly determines changes in return on assets; hence, it does not possess significant influence on bank performance. (Kolapo & Dapo, 2015).

Finally in respect to the influence of operational risk on financial performance of the deposit taking Saccos in Kenya, few empirical studies have been carried out relating operational risk on financial performance of firms. They include; Epetimehin and Fatoki (2015), Odunga, Nyangweso, Carter, and Mwarumba (2013), Kamau and Njeru (2016); Simiyu, Clive and Musiega (2016). These studies have the same finding that operational risk management effects have positive effects on financial performance. However a study by Kamau and Njeru (2016) reveals that operational risk have negative effect on the financial performance of a firm.

2.6 Research Gaps

From the empirical review different approaches and methodologies ranging from descriptive survey design, historical research design, causal research design, explanatory research design survey and regression techniques have been done which resulted to various findings and conclusions. Despite all these studies, the moderating factor of size

on the relationship between financial risk and financial performance of the deposit taking Sacco has not been addressed. From the literature review it is important to note that most of the studies have been carried out in the developed world (Rasika & Sampath, 2015; Alshatti, 2015; Li & Zou, 2014; Poudel, 2012; Hosna *et al.*, 2009; Khan & Syed, 2013; Marozva, 2015; Waseem & Abdul, 2015) very little attention has been paid in this area locally.

This research is intended to fill the gap of inadequate information and understanding that exists in relation to the risk management practices and financial performance of deposit taking Saccos in Kenya. As reflected by the presented theoretical and empirical literature there is inadequacy of research findings as to whether risk management practices leads to the financial performance. In addition it will add to the growing list of studies on risk management in Kenya.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This section outlines the research methodology that was be adopted by the study. The chapter is organized as follows: It starts off with the research philosophy in section 3.2 then the research design to be adopted for this study in section 3.3, and then moves on in section 3.4 which covers the target population, then sampling frame in section 3.5. Section 3.6 covers sampling technique and sample size determination, data collection instruments is covered in section 3.7, section 3.8 covers data analysis and processing, section 3.9 covers measurement of variables and eventually model specification is covered in section 3.10.

3.2 Research Philosophy

Research philosophy, refers to the development of knowledge adopted by the researchers in their research (Saunders, Lewis & Thornhill, 2007).There are three research of philosophical perspectives; positivism, realism and interpretivism. In this study, the aim is to explore the risk management in order to understand its influence on financial performance of DT Saccos in Kenya. Thus, the philosophy of positivism was adopted in this study for collecting credible data from the DT Saccos to produce some "law-like generalizations". This philosophy is based on theories that are used to generate hypothesis that are tested to give statistical justification of conclusions from the empirically testable hypothesis (McMillan & Schumacher, 2010).

3.3 Research Design

A research design is the overall plan for obtaining answers to the questions being studied and for handling some of the difficulties encountered during the research process (Polit & Beck, 2003). Descriptive research investigates trend of characteristics

of population (Cooper & Schindler, 2011). Research design constitutes the blue-print for the collection, measurement and analysis of data (Cooper & Schindler, 2011). Kothari (2009) posits that a research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure.

This study adopted descriptive research design. Descriptive research is oriented towards the determination of the status of a given phenomenon rather than toward the isolation of causative factors accounting for its existence. The objectives of a descriptive research are to identify present conditions and point to present needs, to study immediate status of a phenomenon, facts findings, to examine the relationships of traits and characteristics (Saunders & Thornhill, 2007).

3.4 Study Population

Robson (2002), states that a population refers to all the elements under consideration for a particular study. Singh (2006), states that a population could be finite or infinite. A finite population is a population made up of a definite number of countable elements, while an infinite population may not be clearly defined and therefore the number of elements comprising it may not be clearly determinable. The target population is a segment of the entire population that meets a particular characteristic which the study intends to study in order to make inference on the whole population (Bryman & Bell, 2003). The target population for this study was all the deposit taking Saccos in Kenya regulated by SASRA. As at 26th January, 2016, there were 164 deposit taking Sacco societies licensed to undertake deposit-taking Sacco business in Kenya for the financial year ending December 2016. DT Saccos were selected as they contribute more than 70 percent of the assets, member deposits, loans and 78 percent turnover of the total SACCO sector in Kenya (Alukwe, 2015).

3.5 Sampling Frame

A sampling frame is the source material or device from which a sample is drawn. It is a list of all those within a population who can be sampled, and may include individuals, households or institutions (Särndal, Swensson & Wretman, 2003). The sampling frame for this study is the entire list of 164 deposit taking Saccos operating in Kenya sourced from the SASRA website for the financial year ending 31st December, 2016 and is displayed in the Appendix II.

3.6 Sampling Technique

A sample is a collection of units chosen from the universe to represent it. It is therefore important to determine an appropriate sample size (Kombo & Tromp, 2009). According to Salant and Dillman (1994), conducting a census by basing the study on the entire population would yield a more precise and unbiased results. A sample only represents the population but there is no guarantee that the sample will be precisely representative of the population. The size of the sample taken would determine the sampling error that may arise comprising of the differences between the sample and the population.

Sampling is adopted in cases where the cost of conducting a census is too high, there is limited time to contact the entire population or the entire population is inaccessibility. In some cases where the population is small such that the costs, time and accessibility is within the researchers reach, it is advisable to conduct a census for accuracy rather than taking a sample. This study targeted the 164 deposit taking Saccos that are licensed with SASRA. The population is large but due to the nature of data collection used, the study adopted a census and considered all the DT Saccos for study. The study proposed to use secondary data of audited financial statements from all the 164 firms which was collected from SASRA for six years from 2010 to 2015. Due to the collection of the entire dataset from SASRA, accessibility and cost of data collection was negligible allowing for possibility of conducting a census. The classification table of the 164 DT

Saccos based on their kind of membership is represented in table 3.1 with the proportional representation of the entire population.

Table 3.1: Population Census

DT Saccos	Number of Saccos
Teacher based	36
Government based Saccos	38
Farmers based Saccos	55
Private Institutions based Saccos	14
Community based Saccos	21
Total	**164**

Source: SASRA 2015

3.7 Data Collection Procedure

The Secondary data was extracted from the audited financial statement submitted to SASRA by the DT Saccos after they have been registered by the commissioner of Co-operatives. The data which was of interest to the researcher included credit risk, liquidity risk, interest rate risk and operational risk for 6-year period from 2010-2015. The data collection sheet is attached in Appendix I. The researcher wrote to SASRA requesting for access of annual audited financial statements for six years from 2010 to 2015. The research department provided the audited financial statement for the six years from 2010 to 2015 from which the relevant data were extracted. Data collection was carried out in the month of December 2016 to February 2017. No research assistants were involved in the process so as to make sure that the data collected is reliable and valid. The Panel data was collected because it will help to study the behavior of each DT Sacco over time and across space (Baltagi, 2005 & Gujarati, 2003).

3.8 Data Analysis and presentation

Dansereau and Hall (2006), states that data analysis includes ways of working with data to support the goals and plans of research. Data analysis is a process: a series of connected activities designed to obtain meaningful information from data that have been collected. The data was organized and financial ratios computed using spread sheets. The balanced panel data collected was analyzed quantitatively using regression equations, with the help of a statistical tool known as STATA Version 13.

3.9 Measurement of variables

The study adopted financial performance as the dependent variable. Credit risk, liquidity risk, interest rate risk and operational risk constituted the independent variables for the study. The moderating variable is firm size. This section provides details of how each of the study variables are measured and operationalized**.**

The Independent variables are measured using financial ratios adopted from PEARLs. A PEARLs is a set of financial ratios or indicators that help to standardize terminology between institutions. In total, there are 44 quantitative financial indicators that facilitate an integral analysis of the financial condition of any financial institution. The purpose for including a myriad of indicators is to illustrate how change in one ratio has ramifications for numerous other indicators. Each indicator has a prudential norm or associated goal. The target goal, or standard of excellence for each indicator is put forth by the World Council of Credit Unions, Inc. (WOCCU) based on its field experience working to strengthen and modernize credit unions and promote savings-based growth. Depositors can have confidence that savings institutions that meet the standards of excellence are safe and sound (Evans & Branch, 1980). Table 3.9 shows the measurement of variables.

As depicted in the literature review, credit risk can be measured in two ways: Loan Delinquency and Loan Loss Provisions. Loan Delinquency measures the total percentage of delinquency in the loan portfolio, using the criterion of outstanding delinquent loan balances. The Goal is to have Less Than or Equal to 5%. Allowances for Loan Losses measures the adequacy of the allowances for loan losses when compared to the allowances required for covering all loans delinquent over 12 months. The goal 100% (Kiyota, 2011; Sufian, 2009)

Liquidity Risk was measured using 2 indicators: Liquid Investments and Liquidity Reserves. Liquid Investments measures the adequacy of the liquid cash reserves to satisfy deposit withdrawal requests, after paying all immediate obligations. The rule of thumb is that this ratio should have Minimum 15%. Liquidity Reserves measures compliance with regulator on Liquidity Reserve Deposit requirements. The liquidity reserve must have a Minimum 10%. (Sufian, 2009)

Similarly Interest Rate Risk had two indicators Yield on Loan Portfolio and Yield on Saving Deposit. Yield on Loan Portfolio measures the yield on the loan portfolio. The goal is to have a Minimum 10%. Yield on Saving Deposit measures the yield (cost) of Savings Deposits. The goal is to have a rate which protect the nominal value of the savings deposits.

Operational Risk was also measured using 2 indicators Operating Expense Ratio and Net worth Turnover Ratio. Operating Expense Ratio measures the cost associated with the management of all DT Sacco assets. This cost is measured as a percentage of total assets and indicates the degree of operational efficiency or inefficiency. This ratio should be <10%. Net worth Turnover Ratio indicates the extent to which the owners' cash is frozen in the form of fixed assets, such as property, plant, and equipment, and the extent to which funds are available for the company's operations

The study adopted financial performance as the dependent variable. Financial performance is measured by ROE and ROA. Financial performance is measured using return on equity (ROE) which value the overall profitability of the fixed income per dollar of equity, While ROA is a financial ratio that shows the percentage of profit a company earns in relation to its overall resources. It is commonly defined as net income divided by total asset (Saunders & Marcia, 2011). Natural logarithm of total assets was used as a proxy of DT Sacco size to captures the possible cost advantages associated with size (economies of scale). (Alrafadi *et al*., 2014; Awdeh & Moussawi, 2009)

Table 3.2: Measurement of Variables

Variable	Goal	Proxy	Indicators	Formulae
Credit Risk	**<5%**	CR1	Loan Delinquency	=Total Loan Delinquent Loan/ Total Loan*100
	=100%	CR2	Loan Loss Provisions	= Allowances of Loan Losses/ Total Loan of all delinquent Loan*100
Liquidity Risk	**Min 15%**	LR1	Liquid Investments	= Total Liquidity Investments/Total Saving Deposits*100
	Min 10%	LR2	Liquidity Reserves	= Total Liquidity Reserve/Total Saving Deposits*100
Interest Rate Risk	**Min 10%**	IRR1	Yield on Loan Portfolio	= Total Loan Income/ Net Loan Portfolio*100
		IRR2	Yield on Saving Deposit	= Total Paid on Saving Deposits/Total Saving Deposits*100
Operational Risk	**<10%**	OR1	Operating Expense Ratio	= Operating Expenses/ Total Assets*100
		OR2	Networth Turnover Ratio	= Gross Interest/ Networth *100
Financial Performance		FP1	ROE	=PBT/Equity*100
		FP2	ROA	=PBT/ Total Asset*100
Firm Size		SIZE	Total Assets	=Log of Total Assets of DT Sacco

3.10 Panel Model specification

Factor analysis was adopted as a dimension reduction technique for variables with more than one indicator measures. The moderating variable and the dependent variables are each measured by two indicators. Using confirmatory factor analysis, the factor loadings of the indicators will confirm whether they belong to the latent variables. According to Reyna (2007) an indicator belongs to the latent variable if the factor loadings are greater than 0.4. Factor scores were generated that were used to for weighted scores of the indicators of the latent variable in the study.

The data collected for the study was panel data implying the model adopted will need to take into account the panel nature of the data collected. According to Gujarati (2012) Panel data is a dataset with both time series and cross-sectional dimensions. Observations repeated of one single unit forms a panel which can be followed over time to form panel data. The study adopted the ordinary least squares (OLS) model of regression. OLS is adopted to determine and test the estimated influences of the independent variables on the dependent variable. OLS is used on panel data requires correction of assumptions that may be violated when dealing with panel data.

3.10.1 Model choice and diagnostics

The study tested the data so as to know which model will be adopted either fixed effect or random effect model. A fixed effect model would assume that the variables that influence performance vary over time but have a fixed effect across the entities. The model assumes homogeneity of the estimates across the entities and the error term between the entities $\mu_{it}$is equal to zero.A fixed model also assumes correlation between error term $\mu_{it}$and the predictor variables. A random would imply that the variation across entities is random. The error term between the entities μ_{it} is equal not equal to zero and is estimated. (Baltagi, 2005 & Gujarati, 2003).

$Y_{it} = \beta + \beta_1 X_{it} + \varepsilon_{it}$ …….. Fixed effect model (3.1)

$Y_{it} = \beta + \beta_1 X_{it} + \mu_{it} + \varepsilon_{it}$ …….. Random effect model (3.2)

A test was done to examine whether the data violates the assumption of the fixed effect model. A Hausman test was performed to determine the model to adopt. The test uses a null hypothesis that the preferred model is the random effect model. A Chi-square statistic p-value of the Hausman test less than 0.05 would imply that the preferred model is the random effect model. (Reyna, 2007)

The study adopted the use of OLS thus test of assumptions of Homoscedasticity and serial correlation that might be violated by the chosen model will be tested. The assumption of Homoscedasticity was tested. In cases of presence of heteroscedasticity, heteroscedasticity robust estimators will be generated in stata that corrects the Homoscedasticity assumption violation. The Wooldridge test for autocorrelation in panel data was adopted. A P-value of the F statistic greater than zero implies non-autocorrelation. (Reyna, 2007)

Panel Model 1

The first objective is to determine influence of credit risk on financial performance of deposit taking Saccos in Kenya. ROE and ROA are the measures of financial performance which is the dependent variable whereas credit risk is independent variable measured by loan delinquency and allowances for loan losses. By factor analysis, the latent variables financial performance and credit risks are generated from the observed measures and used for analysis. The study assumes that the independent variables and the dependent variables have a general multiplicative Cobb Douglas functional relationship shown in the equation

Financial performance = f (Credit Risks) ……... (3.3)

The model was as follows

$$Y_{it} = \beta + \beta_1 X_{it} + \varepsilon_{it} \quad \text{.....(3.4)}$$

Y_{it}Financial performance

X_{it} Credit risks

Model 2

The second objective is to establish influence of liquidity risk on financial performance of deposit taking Saccos in Kenya. ROE and ROA are the measures of financial performance which is the dependent variable whereas liquidity risk is independent variable measured by liquid investments and liquidity reserves. By factor analysis, the latent variables financial performance and credit risks are generated from the observed measures and used for analysis. The study assumes that the independent variables and the dependent variables have a general multiplicative Cobb Douglas functional relationship shown in the equation

Financial performance = f (Liquidity Risks) ……..(3.5)

The model was as follows

$$Y_{it} = \beta + \beta_1 X_{it} + \varepsilon_{it} \quad \text{.....(3.6)}$$

Y_{it} Financial performance

X_{it}Liquidity risks

Panel Model 3

The third objective is to establish influence of interest rate risk on financial performance of deposits taking Saccos in Kenya. ROE and ROA are the measures of financial performance which is the dependent variable whereas interest rate risk is independent variable measured by yield on loan portfolio and yield on saving deposits. By factor analysis, the latent variables financial performance and credit risks are generated from the observed measures and used for analysis. The study assumes that the independent variables and the dependent variables have a general multiplicative Cobb Douglas functional relationship shown in the equation.

Financial performance = f (Interest rate Risks)……..(3.7)

The model was as follows

$$Y_{it} = \beta + \beta_1 X_{it} + \varepsilon_{it} \quad \text{.....(3.8)}$$

Y_{it} Financial performance

X_{it}Interest rate risks

Panel Model 4

The fourth objective is to determine influence of operational risk on financial performance of deposit taking Saccos in Kenya. ROE and ROA are the measures of financial performance which is the dependent variable whereas operational risk is independent variable measured by operating expense ratio and net worth turnover ratio. By factor analysis, the latent variables financial performance and credit risks are generated from the observed measures and used for analysis. The study assumes that the

independent variables and the dependent variables have a general multiplicative Cobb Douglas functional relationship shown in the equation.

Financial performance = f (operational Risks)……(3.9)

The model was as follows

$$Y_{it} = \beta + \beta_1 X_{it} + \varepsilon_{it} \quad \text{.....(3.10)}$$

Y_{it} Financial performance

X_{it}Operational risks

Panel Model 5

The fifth objective is to evaluate the moderating effect of size on the relationship between financial risk and financial performance of deposit taking Saccos in Kenya. Since the study has a moderating variable, moderated multiple regression (MMR) analysis was used to test the moderating effect of size on the relationship between financial risk and financial performance of the DT Saccos in Kenya. A transformation was used to generate interaction variables between the moderating variable firm characteristics and the independent variables. To determine the presence of moderating effects of size on the relationship between financial risk and financial performance, hierarchical regression analysis technique was used that is a stepwise regression analysis that will produce and test two models. The OLS model was compared with the MMR model do determine the moderating effect.

$$Y_{it} = \beta_0 + \beta_1 X^{J}_{it} + \beta_2 X^{K}_{it} + \beta_3 X^{L}_{it} + \beta_4 X^{M}_{it} + \varepsilon_{it} \text{..... (3.11)}$$

$$Y_{it} = \beta_0 + \beta_1 X^J{}_{it} + \beta_2 X^K{}_{it} + \beta_3 X^L{}_{it} + \beta_4 X^M{}_{it} + \beta_5 X^J{}_{it} Z + \beta_6 X^K{}_{it} Z + \beta_7 X^L{}_{it} Z + \beta_8 X^M{}_{it} Z + \varepsilon_{it}$$

……..……(3.12)

Where:

Y_{it} is Financial Performance of DT Saccos i at time t, with i = 1,. N; t =1;

X_{it} With subscripts J, K, L, M, denote the independent variables credit risk, liquidity risk, interest rate risk and operational risk variables respectively

Z is the moderating variables and ε_{it} is the error term.

β_0 is a constant term

$\beta_1, \beta_2, \beta_3, \beta_4$ are regression coefficients with denotes the influence of credit risk, liquidity risk, interest rate risk and operational risk variables respectively on financial performance.

β_5 to β_8 are the coefficients to the interaction variables $X_{it}Z$

3.10.2 Model Specification Test

The following test were conducted to establish the validity of the model and to enable the researcher to draw conclusion. Linear regression has several key assumptions; Linearity, normality, no auto-correlation, no or little multicollinearity, Homoscedasticity. When these assumptions are violated, the study results are likely to

give biased estimates of the parameters (Saunders, Lewis & Thornhill, 2007).

a) Test of linearity

Multiple regressions can only accurately estimate the relationship between dependent and independent variables if the relationships are linear in nature. As there are many instances in the social sciences where non-linear relationships occur it is essential to examine analyses for non-linearity. If the relationship between independent variables and the dependent variable is not linear, the results of the regression analysis will under-estimate the true relationship. Pedhazur and Schmelkin (2013), Cohen, Manion, & Morrison (2013); Berry and Feldman (1985) suggest ways to detect non-linearity. This is by routinely running regression analyses that incorporate curvilinear components. It is important that the nonlinear aspects of the relationship be accounted for in order to best assess the relationship between variables. Linearity plots (mean deviations) will reveal the dependent variables and independent variables are linear in nature.

b) Test of Normality

Regression assumes that variables have normal distributions. Non-normally distributed variables (highly skewed or kurtotic variables, or variables with substantial outliers) can distort relationships and significance tests. Normality can be checked with a goodness of fit test. Kolmogorov-Smirnov tests provide inferential statistics on normality (Tabachnick & Fidell, 2001).

c) Test of Autocorrelation

Regression analysis requires that there is little or no autocorrelation in the data. Autocorrelation occurs when the residuals are not independent from each other. Independent observations are assumed by most statistical procedures. The independence test for each of the four predictor variables was conducted using Durbin-Watson *d* statistics. Durbin-Watson is used to test auto correlation, a situation whereby the independent variables repeat themselves or influence each

other and therefore cannot sufficiently predict the dependent variable. Srivastava, Shenoy and Sharma (2005) pointed out the importance of testing autocorrelation is to assist in showing the distribution of disturbance (errors). It is always important to determine the presence of auto-correlated disturbance term in a series before the least squares techniques for estimating "*a*" and "*b*" are developed. The Durbin-Watson statistics value ranges from 0 to 4, an ideal value of 2 indicates non-autocorrelation, a value closer to 0 indicates a positive autocorrelation, a value closer to 4 indicate a negative autocorrelation (Srivastava *et al.*, 2005). This means that coefficient values ranging from 1.5 to 2.5 shows no presence of autocorrelation while above 2.5 to 4 show a positive autocorrelation.

d) Test of Multicollinearity

Regression assumes that there is little or no multicollinearity in the data. Multicollinearity occurs when the independent variables are not independent from each other. Multicollinearity test was done to check the presence of superfluous variables. When Multicollinearity is present, the exclusion of one of the variables from the model does not decrease the explanation of the dependent variable (Y). The strength of the relationship among independent variables is measured by the coefficient of correlation. When the relationship between two independent variables is strong, it is known as multicollinearity (Waters, 2011). The presence of multicollinearity indicates that one variable can successfully predict an outcome of another variable (Srivastava, Shenoy & Sharma, 2005).

O'Brien (2007) recommends that variance inflation factor and tolerance are both widely used to measure the degree of multicollinearity of the i^{th} independent variable with the other independent variables in a regression model. In such a scenario it is advisable to remove one of the variables creating this problem. Presence of multicollinearity is indicated by a tolerance of less than 0.1 or a variance inflation factor (VIF) of over 10. Robinson and Schumacker (2009) explain that a VIF measure the impact of multicollinearity among X's in a regression model on the

predictors degrades the precision of an estimate. Variance inflation factor (VIF) is a statistic used to measure possibility of multicollinearity amongst the predictor of explanatory.

e) Test of Homoscedasticity

Homoscedasticity means that the variance of errors is the same across all levels of the independent variables. When the variance of errors differs at different values of the independent variables, heteroscedasticity is indicated. Levene's test was carried out to test Homoscedasticity.

According to Berry and Feldman (1985) and Tabachnick and Fidell (2001) slight heteroscedasticity has little effect on significance tests; however, when heteroscedasticity is marked it can lead to serious distortion of findings and seriously weaken the analysis thus increasing the possibility of a Type I error.

The study initially intended to use OLS but because of violation of the assumption of OLS above, GLS was preferred to OLS. The diagnostic test that was carried out therefore were for panel data analysis.

CHAPTER FOUR

RESULTS AND DICUSSIONS

4.1 Introduction

This Chapter represents the empirical findings and discussion of results of the study on influence of financial risk on financial performance of deposit taking savings and credit co-operatives in Kenya. The unit of analysis was the 164 DT Saccos as at 31st December 2016. Data analysis has been done as per the specific objective and hypotheses were tested and inferences made on the results obtained from the study.

4.2 Data Processing

The secondary data was collected in raw form from the audited financial statements. Before the objective data analysis, the panel data was processed and analyzed for completeness and missing data. The data collected was data on audited financial statement kept by SASRA on each entity (the DT Saccos) over a period of time.

4.2.1 Success Rate

This study used secondary data that was extracted from audited financial statement and SASRA annual reports over the 6-year period from 2010-2015. The success rate results report is shown in table 4.1. The target population for this study was all the deposit taking Saccos in Kenya regulated by SASRA which constituted of 164 Saccos. The study adopted a census technique targeting the entire population of deposit taking Saccos in Kenya. The secondary data obtained from SASRA was from 135 Saccos implying 82.32% success rate. The success rate of 82.32% is within the range of Babbie (2010) who stated that a response rate of 50% is adequate while Bailey (2007) set an adequate response rate at 75%. A study by Velnampy (2013) on Corporate Governance and Firm Performance reported and used a response rate of 59%.

Table 4.1: Success Rate

DT Saccos	Population	Response	Rate
Teacher based Saccos	36	30	83%
Government based Saccos	38	31	82%
Farmers based Saccos	55	45	82%
Private Institutions based Saccos	14	12	86%
Community based Saccos	21	17	81%
Total	164	135	82%

4.2.2 Missing data analysis and data cleaning

The secondary data from SASRA was processed and analyzed for completeness and missing data. The data collected for the study was panel implying a mix of both time series and cross sectional aspects. This is data on audited financial statement from each entity (the DT Saccos) over a period of time. Missing data analysis implied looking at the magnitude of missing information of each entity cross the 6 year period.

Cohen, West and Aiken (2003) suggested that less 10% of missing data on a particular response is not large and does not constitutes a large amount of missing data. For this study, those entities that had more than 10% missing responses in any of the all the variables on the collection sheet across the 6 years would have been candidates for deletion. None of the entities had missing data beyond 10% thus no entity among the 135 that were collected was deleted. All the missing data was therefore cleaned by inserting the annual arithmetic means of the variables as the measure of central tendency.

Table 4.2: Missing data analysis

Missing Response	DT Saccos	Percentage	Cumulative Percentage	Action
2%	122	90%	90%	Retained
5%	8	6%	96%	Retained
7%	5	4%	100%	Retained

4.3 Factor Analysis

Factor analysis is a statistical tool for reducing dimensions of data collected with several observed measures. The study adopted confirmatory factor analysis CFA to reduce the dimensions of the data based on theories for the formulated constructs. Each of the study variable, both independent and dependent was measured by 2 observed indicators based on theoretical and empirical reviews. Confirmatory factor analysis was used to confirm that the observed measures used for each variable belonged to the variable and to generate unobserved latent variables from the indicators. The researcher based the grouping of observed measurements on theories and empirical criteria of measurement for each latent factor. According to Worthington and Whittaker (2006), researchers should retain a factor only if they can interpret it in a meaningful way no matter how solid the evidence for its retention based on the empirical criteria. Considering the use of two observed measurements for each latent variable, the variables load on each factor with equal magnitude regardless of the sign. The basic statistic used in factor analysis is the correlation coefficient which determines the relationship between two variables. A factor with 2 variables is only considered reliable when the variables are highly correlated with each another but fairly uncorrelated with other variables (Yong & Pearce 2013). Yoo and Donthu (2001) developed a SITEQUAL scale with 4 dimensions with a total of only 9 Items, ease of use (2), aesthetic design (3), processing speed (2), and security (2).

Factor loadings were computed as shown in table 4.3 that measured the extracted variances from each observed measure loading a factor. The observed indicator belong to the construct if it loads the factor by more than 0.4 which is within the cut-off value of 0.4 recommended by Hair *ju* (2006). All the indicators were found to load the factors by more than 0.4 therefore none of the indicators was expunged. Factor scores were also computed and used as weights to generate latent variables that were used for the inferential analysis to draw conclusions on the objectives.

Table 4.3: Factor Loadings Matrix

	Factor 1	**Factor 2**	**Factor3**	**Factor 4**	**Factor 5**
Delinquent loans to gross loan portfolio ratio	0.4431				
Allowance for Loan Losses / Allowances Required For Loans Delinquent >12 Months	0.4431				
Cash reserve adequacy ratio to satisfy deposit withdrawal requests		0.4838			
Liquidity reserve compliance ratio		0.4838			
The yield on the loan portfolio			0.704		
The yield (cost) of Savings Deposits			0.704		
Ratio of operating expenses to average total assets				0.8547	
Net worth turnover				0.8547	
Return on assets					0.8846
Return on equity					0.8846

4.4 Descriptive Analysis

The descriptive analysis was done to present the univariate analysis of the outcomes of the study variables. The variables of the study include all the independent variables; credit risk, liquidity risk, interest rate risk and operational risk and the dependent variable financial performance of deposit taking Saccos. The analysis was based on the observed indicators used to measure each variable. Considering that the scales of measurements used for each observed variables was on ratio scale, the researcher used the mean as the measure of central tendency considering the standard deviation as a measure of dispersion for all. According to Cohen, and Swerdlik (2005), nominal categorical variables can be analyzed by the mode as the measure of central tendency, ordinal categorical variables can use the mode and median while both interval and ratio scales can be analyzed using either the mean, the mode or the median as measures of central tendency.

4.4.1 Credit risk

Credit risk is one of the financial risks that was used in the formulation of the first specific objective of the study. The variable was measured by 2 observed indicators of regarding credit issuing by the Saccos. The ratio measurements were collected for each Sacco across the 6 year period and analyzed.

The first indicator of credit risks was the measure of the total percentage of delinquency in the loan portfolio. This ratio used the criterion of outstanding delinquent loan balances and was calculated for each entity each year as a ratio of the sum of all delinquent loan balances out of the total (gross) loan portfolio outstanding. The ratio being a continuous variable was analyzed using the mean as a measure of central tendency and the standard deviation as a measure of dispersion. The results of the analysis of this indicator are in table 4.4. The mean ratio delinquent loans to gross loan portfolio were found to be greater than 5% across all the years. The year 2010 had the greatest value of 11.84% with a standard deviation of 3.222. These mean ratios saw

subsequent drop in the following year of 9.60%, 7.34%, 4.72%, 5.78% and 5.78% for the years 2011, 2012, 2013, 2014 and 2015 respectively. The standard deviation measured the levels variation in the delinquent loans to gross loan portfolio ratio across the entities for each year. The standard deviation was also high in the earlier years and kept reducing through the years. The mean Delinquency to loan ratio has declining trend from the year 2010. In the earlier years 2010 to 2012 the mean delinquency to loan ratio was well outside the required target for financial institutions. Saccos should target this credit risk ratio to be less than or equal to 5%. The figure however drops with time to the minimum being 4.72% which is within the target goal. The standard deviations of this ratio also have a declining trend with 2010 having the highest variance. This mean in earlier years, the Saccos were more heterogeneous with respect to delinquency ratio as compared to the latter years. This further implies that the high mean ratio in 2010 is more attributed to the high heterogeneity across entities.

Table 4.4: Delinquent loans to gross loan portfolio ratio

Year	Obs	Mean	Std.	Min	Max
2010	135	11.840	3.222	0.090	26.094
2011	135	9.600	1.892	0.307	13.508
2012	135	7.340	1.257	0.169	8.574
2013	135	4.720	0.840	0.052	6.415
2014	135	5.730	1.737	0.009	12.931
2015	135	5.12	0.544	0.006	4.344

The overall mean delinquency to loan portfolio ratio across all entities for all the years was found to be 7.642. This mean is higher than the required maximum of 5% and is attributed to the high mean and high variation in the earlier years. As shown in table 4.5, the overall standard deviation is 3.165 which is a component of a very high variation within groups with a standard deviation of 3.085 and a low variance between groups of a standard deviation 0.709. This shows that with respect to delinquency ratio, there is homogeneity across DT Saccos but the year's exhibit heterogeneity.

Table 4.5: Overall delinquency ratio

	Mean	Std. Dev.	Min	Max	Observations	
Overall	7.642	3.165	0.796	20.489	N =	810
Between		0.709	5.598	9.165	n =	135
Within		3.085	1.540	19.130	T =	6

The second indicator that was observed and used to measure credit risks was the ratio of allowance for loan losses to allowances required for loans delinquent over 12 months. This indicator aimed at measuring the adequacy of the allowances for loan losses when compared to the allowances required for covering all loans delinquent over 12 months. This ratio had means that were all below 10% with the heist being in 2010 followed by subsequent drops over the 6 year period. The measure was also analyzed using the arithmetic mean for central tendency and the standard deviation. Table 4.6 shows the results for the analysis. The mean ratio of allowances for loan losses when compared to the allowances required for covering all loans delinquent over 12 months were found to be 100.933, 70.175, 43.439, 14.678, 17.35and 14.686 for the years 2010, 2011, 2012, 2013, 2014 and 2015 respectively.

The standard deviations for the ratio over these years were found to be 16.569, 2.14, 1.77, 1.333, 2.277and 0.733 respectively. The standard deviation was always about 1 and 2 for all the years except for 2010 that was different from the others. The standard deviation measures the variation from the mean of which a large standard deviation figure implies chances that an entity could have a ratio that is largely different from the mean. As seen from the results from 2010, a Sacco could have a ratio as high as 142% from the maximum figure in 2010. Similarly to the first measure of credit risks, the DT Saccos recorded high mean loan loss provisions ratios in the first three years that later significantly dropped from the year 2013. However, unlike the first credit risks ratio, the provisions ratio did not show a continuous declining trend over the years, from the year

2011, the standard deviations of this ratio were low implying homogeneity across entities. This means that the decline in mean loss provision ratio was not due to increased homogeneity but could have been due to a general, uniform reduction in the ratio in all firms. Generally across the years, the entities had low provisions ratios to the targeted 100%.

Table 4.6: Allowance for Loan Losses / Allowances Required For Loans Delinquent >12 Months

Year	Obs	Mean	Std.	Min	Max
2010	135	100.933	16.569	63.344	142.832
2011	135	70.175	2.140	64.035	76.765
2012	135	43.439	1.770	38.760	48.790
2013	135	14.678	1.333	11.572	18.157
2014	135	17.350	2.277	11.304	22.052
2015	135	14.686	0.733	12.363	16.398

Table 4.7 shows the overall statistics of loan loss provisions to delinquent loans ratio. The overall mean ratio was found to be 43.544%. This ratio across the years for all entities is well below the targeted 100% implying that the entities provide for only 43.544% of loan losses. The variation of this ratio is 33.293 which is high and mainly contributed to by the variation within the entities caused by the differences across the years and not across the entities. This confirms that within the entities, the ratio saw significant decline over the years.

Table 4.7: Overall provisions for loan losses ratio

	Mean	Std. Dev.	Min	Max	Observations	
Overall	43.544	33.293	11.304	142.832	N =	810
Between		2.817	37.372	50.548	n =	135
Within		33.175	7.533	135.828	T =	6

A unit root test was done on the latent variable credit risks to test for stationarity of the variable. The test based on the null hypothesis that the panels contain unit roots against an alternative that the panels are stationary. The LLC bias-adjusted test statistic t*= -39.425 is significantly less than zero ($p < 0.05$). So we reject the null hypothesis of a unit-root and favour the alternative that panels are stationary.

Table 4.8: Unit-root test for panel stationarity of credit risks

	Statistic	p-value
Unadjusted t	-36.304	
Adjusted t*	-39.425	0.000

4.4.2 Liquidity risk

The second specific objective of the study was based on the independent variable liquidity risks. The measurements of this variable based on the 2 liquidity ratios that were observed and collected over the 6 year period from 2010 to 2015 by the Saccos.

The first indicator was the measure of the adequacy of the liquid cash reserves to satisfy deposit withdrawal requests, after paying all immediate obligations <30 days. This ratio of liquid cash reserve adequacy was measured for each Sacco, each year as liquid investments (+) liquid assets (-) short-term payables / savings deposits. The mean cash reserve adequacy being a ratio was analyzed using the mean and the standard deviation. The mean was high in the earlier years with subsequent declines. The mean cash reserve adequacy ratio was found to be 19.469, 10.322, 13.136, 34.106, 17.91and 17.304 for the years 2010, 2011, 2012, 2013, 2014 and 2015 respectively with standard deviations of 24.413, 19.235, 23.633, 17.931, 28.597and 8.645 respectively. These results are shown in table 4.9. The mean cash reserve ratio had neither a decreasing nor decreasing trend with time. The heist mean was found to be in 2013 and the lowest in 2011. The standard deviations were also relatively high given the means and showed no trend with time

except for the sudden drop in variation seen in the year 2015. This shows that the considering cash reserves ratios, there was heterogeneity across entities as well as time. The cash reserves kept by the Saccos were well above the required minimum of 15% in the years except for 2011 an 2012 that had reserves of 10.322 and 13.136 respectively.

Table 4.9: Cash reserve adequacy ratio to satisfy deposit withdrawal requests

Year	Obs	Mean	Std.	Min	Max
2010	135	19.469	24.413	-35.916	81.201
2011	135	10.322	19.235	-44.871	69.555
2012	135	13.136	23.633	-49.323	84.584
2013	135	34.106	17.931	-7.681	80.896
2014	135	17.910	28.597	-58.030	76.964
2015	135	17.304	8.645	-10.114	37.499

The overall mean cash reserve adequacy ratio was found to be 18.708 and it is above the minimum 15% for all firms across all the years implying the DT Sacco are liquid and in a position to meets its obligation when due. The variations are however high implying heterogeneity with an overall standard deviation of 22.597. There are tangible differences in the amounts of reserves kept by different DT Saccos at different times of the year. As shown in table 4.10, this is a contribution of both variations between groups and within group, however there is a higher variation within groups than between groups.

Table 4.10: Cash reserves adequacy ratio

	Mean	Std. Dev.	Min	Max	Observations	
Overall	18.708	22.597	-58.030	84.584	N =	810
Between		8.072	-6.657	36.265	n =	135
Within		21.116	-50.258	75.440	T =	6

Also used to measure liquidity was the measure of compliance with regulator SASRA on liquidity reserve deposit requirements. This was measured as a ratio of [Total Liquidity Reserves (Earning Asset) + Total Liquidity Reserves (Non-earning Asset)]/ Total Savings Deposits. As shown it table 4.11, the compliance ratio was found to have a very high in average and variation the year 2010 and seemingly constant in the subsequent years. As shown in table 4.11, the mean ratio for each year 2010, 2011, 2012, 2013, 2014 and 2015 was found to be 22.227, 11.725, 13.108, 37.452, 15.658and 17.423 respectively with standard deviations 37.707, 8.52, 12.75, 7.871, 8.53and 4.883 respectively. These mean ratios have no increasing or decreasing trends but only have the highest mean as 37.452% followed by 22.227% in the years 2013 and 2010 respectively. The standard deviations also show no sort of trend but a sudden drop after 2010 followed 12.750 in 2012.

Table 4.11: Liquidity reserve compliance ratio

Year	Obs	Mean	Std.	Min	Max
2010	135	22.227	37.707	0.009	117.577
2011	135	11.725	8.520	0.405	37.962
2012	135	13.108	12.750	0.132	51.653
2013	135	37.452	7.871	0.68	57.990
2014	135	15.658	8.530	19.11	33.273
2015	135	17.423	4.883	1.937	28.830

The overall liquidity reserve compliance ratio as shown in table 4.12 was found to be 19.598 which is above the required minimum goal of 10%. This liquidity reserves however had a standard deviation of 19.386 which is relatively high considering the mean which is almost as equal. This shows that the mean above 10% is not necessarily kept by all entities, the Saccos exhibit heterogeneity in this variable implying that some entities keep reserve compliance ratios below he required minimum. The heterogeneity is both between groups and within groups. The heterogeneity within groups is however higher as shown by the standard deviation within groups which is higher than that

between groups. The entities vary their reserve compliance ratio with time. The entities would not necessarily have the same ratio across time but they entities change the ratio kept with time.

Table 4.12: Overall liquidity reserve compliance ratio

	Mean	Std. Dev.	Min	Max	Observations	
Overall	19.59878	19.38591	0.009	117.5767	N =	810
Between		7.017354	1.795938	35.64224	n =	135
Within		18.07968	22.273	101.7103	T =	6

A unit root test was also done on liquidity risks to test for stationarity of the variable which yielded results as shown in table 4.13. The LLC bias-adjusted test statistic t* was found to be -18.179. This value is significantly less than zero with a p-value of 0.000 which is less than 0.05 which significantly imply that the panels are stationary.

Table 4.13: Unit-root test for panel stationarity of liquidity risks

	Statistic	p-value
Unadjusted t	-17.480	
Adjusted t*	-18.179	0.000

4.4.3 Interest rate risk

Interest rate risks are measures based on the risk of the rate of return, bench mark risk and price volatility risk. The Saccos are interested in interest rate risks to measure and manage the firm's vulnerability to interest rate fluctuations. The interest rate risks observed and measured using 2 ratios for a period 2010 to 2015 by the Saccos was analyzed.

One of the ratios used to measure interest ratio risks was the measure of the yield on the loan portfolio as shown in table 4.14. This was measured as the total loan income / average net loan portfolio, the total loan income being a sum of total loan income (including commissions, fees, and delinquent interest penalties) during year and insurance premiums paid on loans while the average net loan portfolio being a sum of net loan portfolio (net of allowances for loan losses) as of current year-end and the net loan portfolio (net of allowances for loan losses) as of last year-end. As shown in the table, the mean ratio on the yield on portfolio for the years were 2010, 2011, 2012, 2013, 2014 and 2015 found to be 40.483, 35.274, 19.862, 19.257, 17.384 and 16.011 respectively with standard deviations 65.342, 59.987, 14.044, 9.771, 6.197 and 4.69 respectively. The highest mean yield on loan portfolio was 40.483 in 2010 which was followed by a decreasing trend with time with the lowest mean being 16.011 in 2015.

The standard deviations also show a similar trend with the earlier years with high yields on loan portfolio having high standard deviation. This shows that the decline in yield on loan ratio was not due to a general decline in the ratio across the entities but due to changes in variations. This could have been attributed to streamlining of the interest rate to bring out homogeneity in the interest rates with time. The lowest standard deviation was 4.690 in 2015.

Table 4.14: The yield on the loan portfolio

Year	Obs	Mean	Std.	Min	Max
2010	135	40.483	65.342	0.537	382.126
2011	135	35.274	59.987	0.014	336.870
2012	135	19.862	14.044	5.935	138.147
2013	135	19.257	9.771	0.000	69.784
2014	135	17.384	6.197	3.038	58.261
2015	135	16.011	4.690	5.152	50.357

In table 4.15, the overall yield on loan portfolio was found to be 33.701 with a high standard deviation of 111.575 across all Saccos for all years. This implies heterogeneous population of entities with regards to the yield on loan portfolio. The Saccos realize different yields in different years also shown by the high variations both within and between the groups. The overall average yield on loan portfolio of 33.701 was above the least required goal of 10%. With the high heterogeneity, this implies that not all firms are keeping the ratio within the goal requirement.

Table 4.15: Yield on loan portfolio

	Mean	Std. Dev.	Min	Max	Observations	
Overall	33.701	111.575	0.000	2013.020	N =	810
Between		51.429	7.574	485.030	n =	135
Within		99.098	-440.032	1561.692	T =	6

Another measure for interest rate risks was the yield (cost) of savings deposits which was measured as a ratio of total paid on Savings Deposits to Total Savings Deposits. Table 4.16 shows the results of the cost of savings deposits. The mean cost ratio of savings deposits was found to be 24.066, 25.666, 23.21, 9.765, 11.355 and 6.118 for the years 2010, 2011, 2012, 2013, 2014 and 2015 respectively with standard deviations 47.201, 60.348, 38.983, 16.64, 20.567, 4.149 respectively. Both the mean cost of savings deposit ratio and the standard deviations had declining trends with time. Both had slow declining trends in the fast three years and a sudden drop in the subsequent years. There was however a slight increase in both the mean and standard deviations from the year 2013 to 2014. The subsequent reduction in the variance does not streamline the heterogeneity of this variable. The reduction in both keeps the standard deviation above the mean in all the years implying constant heterogeneity across time. This means that the decline in the mean is generally across all the entities.

Table 4.16: The cost of Savings Deposits

Year	Obs	Mean	Std.	Min	Max
2010	135	24.066	47.201	0.010	314.306
2011	135	25.666	60.348	0.014	374.806
2012	135	23.210	38.983	0.001	195.308
2013	135	9.765	16.640	0.000	194.062
2014	135	11.355	20.567	0.447	203.395
2015	135	6.118	4.149	1.546	35.057

As shown in the previous table, table 4.17 also shows the persistent heterogeneity across the entities through time. The overall mean cost in savings deposits is 24.529% with a high standard deviation of 107.406. The high standard deviation is from the high variation between groups and within groups. The goal of the Saccos is to keep rates which protect the nominal value of the savings deposits. The high variation within groups could be attributed to the attempt by the Saccos to keep the ratio up to speed with the varying inflation rates in the country over time.

Table 4.17: Overall cost of Savings Deposits

	Mean	Std. Dev.	Min	Max	Observations	
Overall	24.529	107.406	0.000	1892.411	N =	810
Between		48.965	0.905	389.598	n =	135
Within		95.673	-362.796	1556.315	T =	6

The results on the unit root test done on interest rate risks are in table 4.18 This is a test on the stationarity of the variable basing on the null hypothesis that the panels contain unit roots against an alternative that the panels are stationary. The LLC bias-adjusted test

statistic t* = -1000.00 is significantly less than zero ($p < 0.05$) leading to a rejection of the null hypothesis of a unit-root in favour of the alternative that panels are stationary.

Table 4.18: Unit-root test for panel stationarity of interest rates risks

	Statistic	p-value
Unadjusted t	-950.00	
Adjusted t*	-1000.00	0.000

4.4.4 Operational risk

Operational risk is the risk of losses resulting from inadequate or failed internal processes, people and systems or from external events. The study used operational risks as an independent variable for one of the specific objectives. The variable was measured basing on measurements of 2 ratios as observed indicators over the 6 year period.

The first ratio was the measure of the cost associated with the management of all Credit Union assets which was the ratio of operating expenses to average total assets. The operating expense was the total operating expenses (exclusive of provisions for loan losses) and the total assets. The mean ratios of operating expenses to total assets over the years 2010, 2011, 2012, 2013, 2014 and 2015 were found to be 13.953, 5.752, 3.567, 4.87, 4.49 and 5.13 respectively with standard deviations 26.226, 16.883, 2.435, 1.853, 7.876and 14.669 respectively. The Saccos have a goal to keep this ratio well below10%. The Saccos averagely kept this ratio below the required 10% for all the years expect 2010 which had a mean of 13.953. This was followed by a sudden drop in the year 2011 after which there was no definite increasing or decreasing trend. The standard deviation was also high in 2010 and 2011 but saw a sudden decline in 2011 followed by a slight decreasing then increasing trend.

Table 4.19: Ratio of operating expenses to average total assets

Year	Obs	Mean	Std.	Min	Max
2010	135	13.953	26.226	0.230	80.271
2011	135	5.752	16.883	0.000	57.743
2012	135	3.567	2.435	1.371	10.930
2013	135	4.87	1.853	0.000	9.954
2014	135	4.49	7.876	0.608	21.759
2015	135	5.13	14.669	0.585	40.130

The overall mean operating efficiency ratio was found to be 6.624 with a standard deviation of 14.831. The overall mean is well below the required minimum, but with the high overall variation, it implies heterogeneity across entities over time. This is further decomposed into 6.154% variation between groups and 13.502 within groups. There is a higher variation due to differences in operating efficiency across time than across entities.

Table 4.20: Overall Ratio of operating expenses to average total assets

	Mean	Std. Dev.	Min	Max	Observations	
Overall	6.624	14.831	0.000	80.271	N =	810
Between		6.154	1.941	19.474	n =	135
Within		13.502	2.794	68.946	T =	6

The second ratio used to measure operating risks was the net worth turnover ratio. This was observed as a ratio of the gross interest over the net worth where the net worth was taken as the difference of total assets and total liabilities. As in table 4.21, the net worth turnover ratios were found to be generally high but with a seeming decline over the period. The mean variation of the net worth turnover was also very high implying that

the Saccos have very different net worth turnover. The mean net worth turnover for the years 2010, 2011, 2012, 2013, 2014 and 2015 were 283.177, 300.928, 142.771, 118.096, 88.037 and 83.94 respectively with standard deviations of 543.837, 531.872, 106.461, 67.879, 36.704 and 27.417 respectively. The Saccos recorded high net worth turnover ratios between 83.9 and 283.17. The first 4 years had high mean net worth turnover all above 100. The variation also decline suddenly after 2011 then also suddenly after 2012. The decline in standard deviations shows that the Saccos so a change from high heterogeneity to a relatively more homogeneous populations with time.

Table 4.21: Net worth turnover

Year	Obs	Mean	Std.	Min	Max
2010	135	283.177	543.837	-2715.516	2812.076
2011	135	300.928	531.872	0.343	2865.819
2012	135	142.771	106.461	30.718	821.446
2013	135	118.096	67.879	-45.937	492.390
2014	135	88.037	36.704	23.525	245.925
2015	135	83.940	27.417	37.227	210.029

The overall net worth turnover ratio shows the high overall heterogeneity and high heterogeneity within groups due to the changes in variation within groups over time. As shown in table 4.22, the Saccos show a more homogeneous population across entities which is changing over time.

Table 4.22: Overall Net worth turnover

	Mean	Std. Dev.	Min	Max	Observations	
Overall	223.844	965.611	-2715.516	23497.800	N =	810
Between		409.982	-362.370	3981.918	n =	135
Within		874.848	-3699.760	19739.720	T =	6

On the stationarity of operational risks, a unit root test was also to test for stationarity of the variable based on the null hypothesis that the panels contain unit roots against an alternative that the panels are stationary. The LLC bias-adjusted test statistic t* was found to be -140.00 and significantly less than zero at 0.05 level of significance with a p-value of 0.000. Since the p-value was less than 0.05, the null hypothesis of a unit-root was rejected and the alternative taken to conclude that the panels are stationary.

Table 4.23: Unit-root test for panel stationarity of operational risks

	Statistic	**p-value**
Unadjusted t	-130.00	
Adjusted t*	-140.00	0.000

4.4.5 Financial performance of deposit taking Saccos in Kenya

Financial performance is the dependent variable of the study. The researcher sought to find out the influence of financial risks on the financial performance of deposit taking Saccos in Kenya. To measure financial performance the researcher collected longitudinal data on the return on equity and the return on investment of the Saccos across a six year period. As shown in table 4.24, the study noted that across the period, the maximum annual mean returns on equity ranged from 14.176 for the year 2015 and 162.767 in 2010. The mean ROE thus seem to have a general drop against time with a slight improvement from the years 2013 to 2014 that had mean ROE of 21.052and 23.284 respectively. The mean ROE have high variability across the entities throughout the periods that are as high as 463.585 in the year 2010 and the lowest standard deviation from the mean being 10.574. The table shows a plausible declining trend in mean roe over time. The decline could however be attributed to the change in heterogeneity of the Saccos over time. In the initial years there was high variations in roe which were well above the means. With time a streamline of the roe showed a decline in both means and standard deviations but with more declines in the variances

resulting to standard deviations lower than the means and 2013 and 2015. This implies improved homogeneity with time. The mean roe overtime shows a possible decreasing trend in mean roe over time.

Table 4.24: Annual Mean Returns on Equity

Year	Obs	Mean	Std.	Min	Max
2010	135	162.767	463.585	-888.950	1335.043
2011	135	43.513	91.000	-217.606	323.745
2012	135	55.453	76.353	-146.333	286.280
2013	135	21.052	15.126	-14.197	60.521
2014	135	23.284	35.307	-70.474	96.194
2015	135	14.176	10.574	-19.358	38.878

The overall ROE confirmed the results from table 4.24. Table 4.25 shows that the overall mean ROE was 28.345 over the years for all entities with a very high variation indicated by the standard deviation of 213.105. This variation is however higher within groups due to the changes in variation and mean roe with time. The is some heterogeneity across entities indicated by the standard deviation between groups however this is attribute by the high variation in the earlier years as shown in table 4.24.

Table 4.25: Overall ROE

	Mean	Std. Dev.	Min	Max	Observations	
Overall	28.345	213.105	-743.405	5349.398	N =	810
Between		88.528	-130.836	919.596	n =	135
Within		193.972	-880.999	4458.148	T =	6

Figure 4.1 shows the virtual presentation of the return on equity across the entities for against time for the years 2010 to 2015. The distribution of the return on equity across the entities for all the years is virtually showing high variability in earlier years which decreases with time. Plotting the mean ROE for each year, the line shows a curve that seem flat implying a seemingly constant mean ROE with time. Mean ROE plots shows possible contradicting phenomena compared to the tabulated results of the mean roe over time. The plot shows a virtually horizontal line which is an indication if no trend.

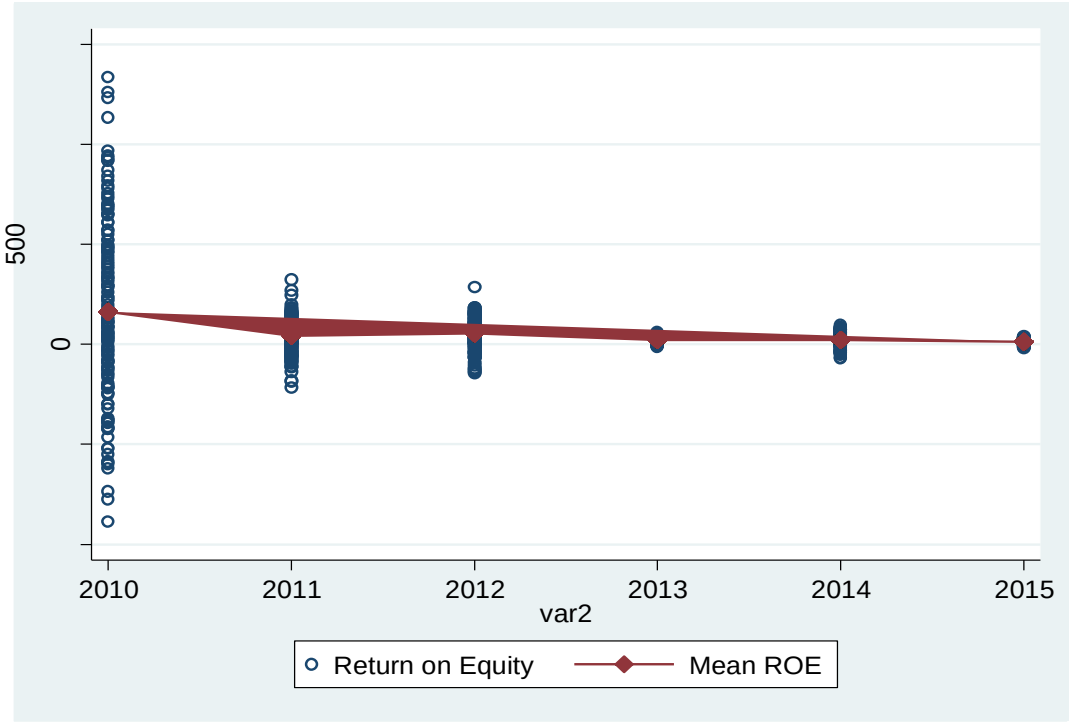

Figure 4.1: Return on Equity against time

Figure 4.2 shows a spaghetti plot of roe with time. This trend lines of each all the panel groups over time. The confirms a virtual indication of high heterogeneity in the earlier years which is streamlined over time to a more homogeneous population of Saccos with less variation in roe in the latter years. This could be attributed to similar observations in the streamlining of financial risk factors that further influence the streamlining of

performance in terms of ROE. The homogeneity in the population of Saccos could be due to the implementation of the regulations by SASRA which over the time has strengthened by limiting the operations and within the regulations.

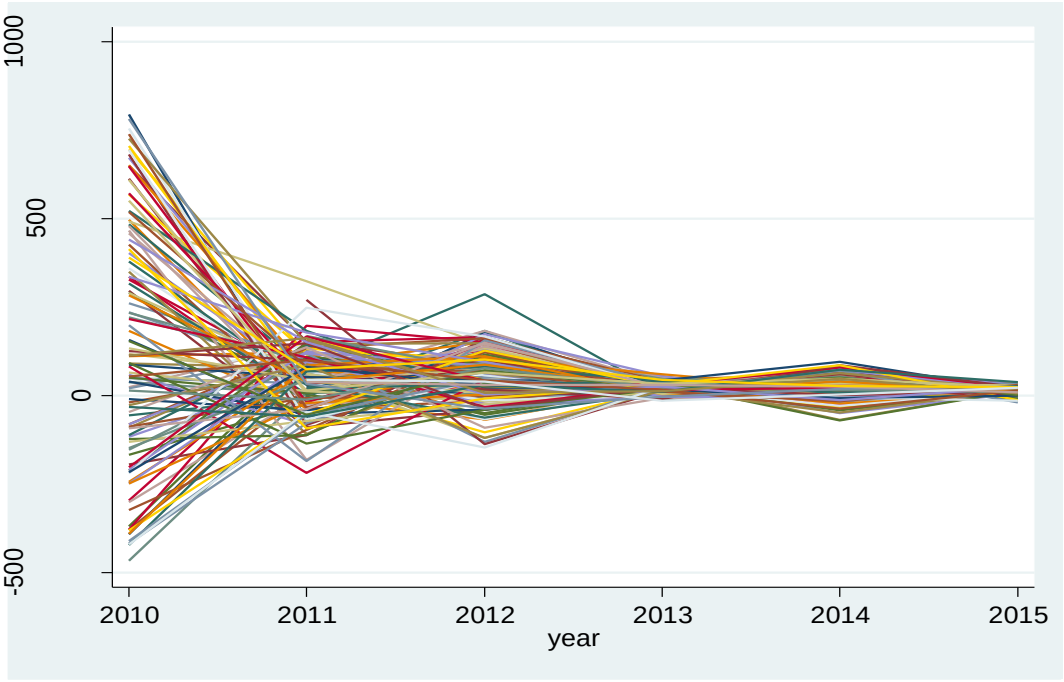

Figure 4.2: ROE Spaghetti plot

Further to the spaghetti plot, the box plots in figure 4.3 also confirm the changes in heterogeneity of the Sacco ROEs over time with more homogeneous population of Saccos with less variation in roe in the latter years. This could be attributed to the streamlining of financial risk factors that further influence the streamlining of performance in terms of ROE. Further the box plots also explain how the streamlining causes a reduction in the mean ROE. The ROE box plot in 2010 shows a distribution slightly skewed to the right. The median is below the centre of the box and closer to the lower quartile and the lower tail is shorter than the upper tail. This implies presence of outliers on the higher side pooling the mean ROE of 2010 to the upper side.

Streamlining the operations over time reduced the outliers causing the overall mean to reduce with time. Subsequent box plots shows more homogeneous populations that are probably normally distributed and not virtually skewed on either sides.

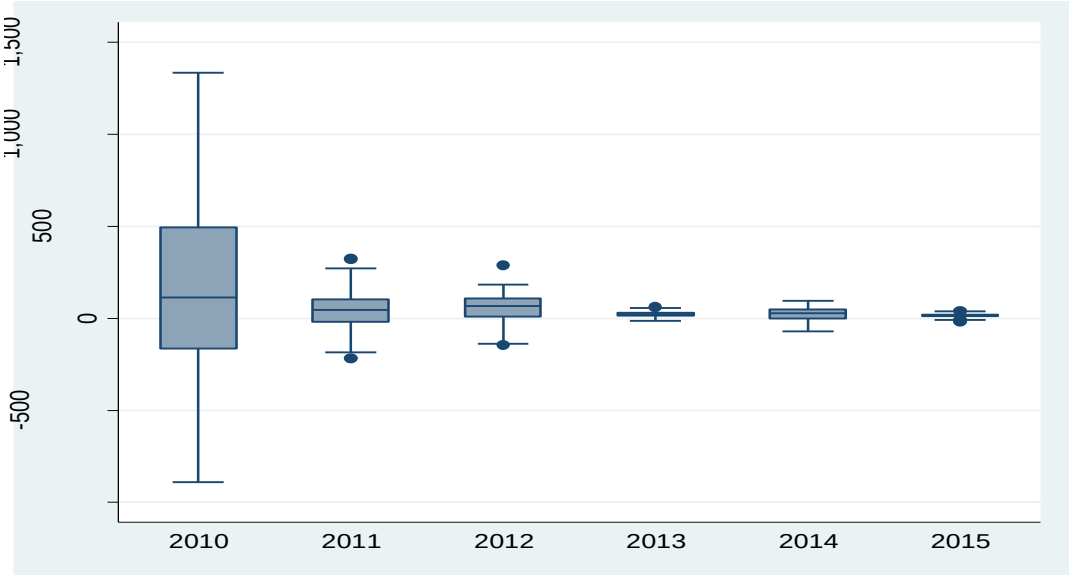

Figure 4.3: Box plot over time

A further graphical analysis of the distribution of roe over time using the mean plots with confidence intervals shows that the indicator probably exhibits heteroscedasticity. Heteroscedasticity of a variable implies constant variance. The confidence intervals over the periods are varying in with earlier years showing shorter CI drop to varying lengths over time.

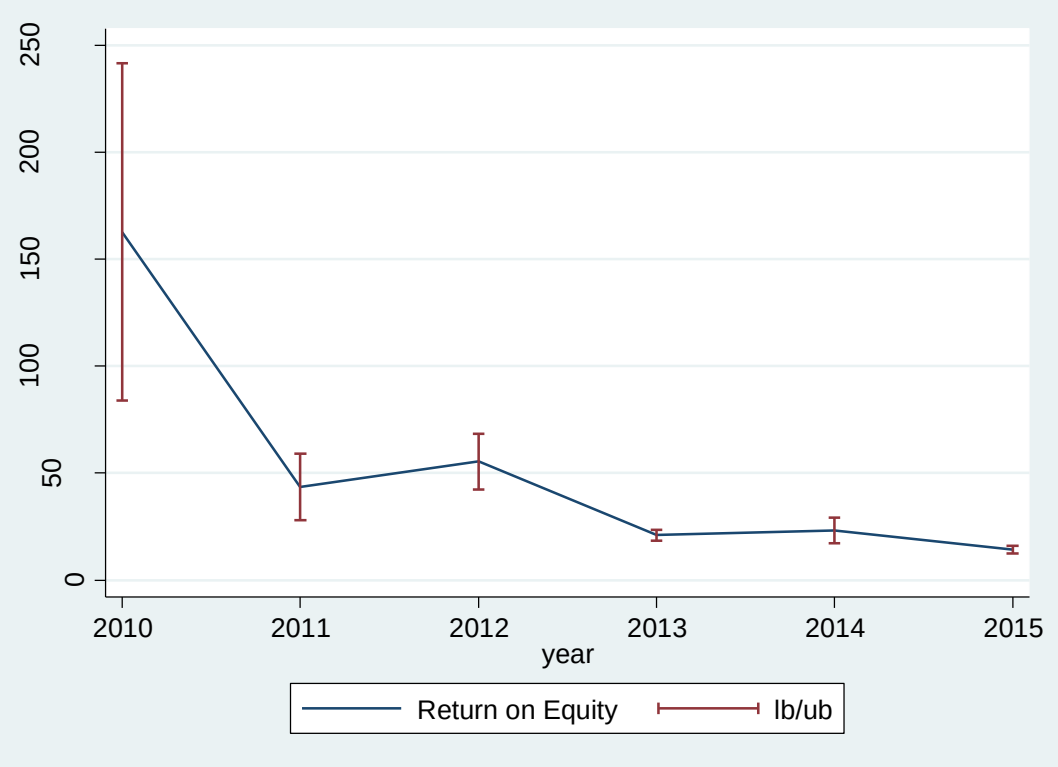

Figure 4.4: Roe over time (mean, CI) plot

The scatter plots in Figure 4.1 showed a rather seemingly horizontal line implying no virtual trend despite the seemingly trended data on mean roe as shown in table 4.20. Figure 4.5 is a curve smoothened by lowess estimation, showing a virtually decreasing trend over time with a decreasing slope. The curve shows a steep decline in the earlier years that seem to flatten with time. This shows a possible asymptotic decreasing trend.

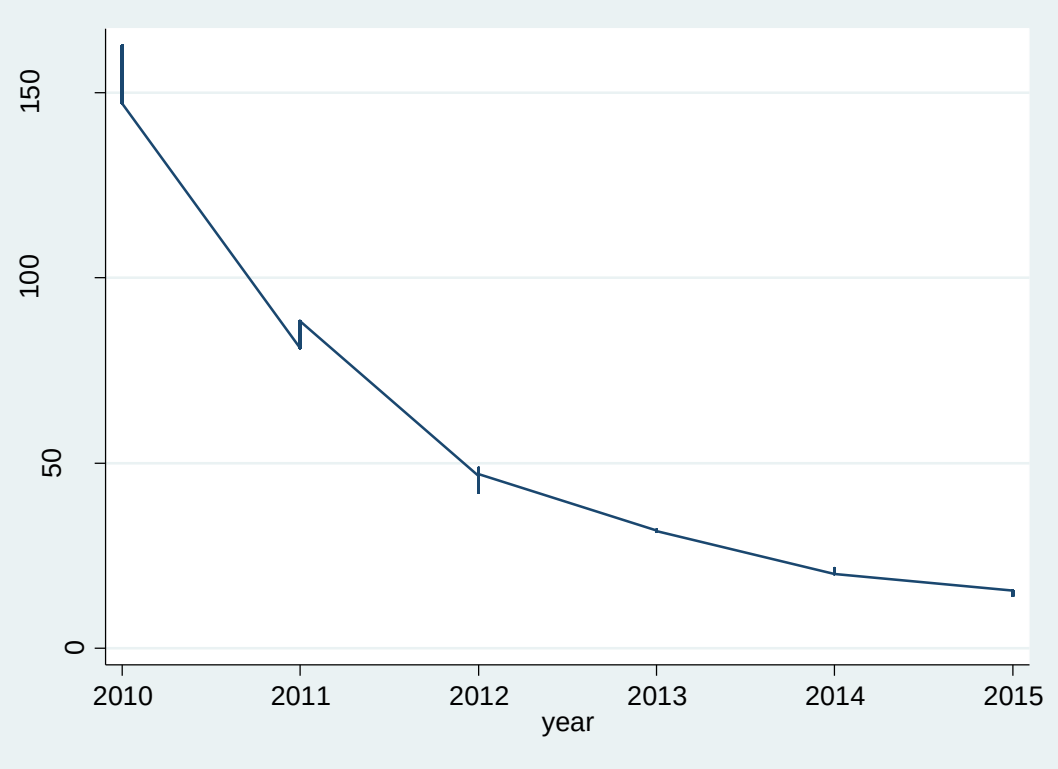

Figure 4.5: Lowess smoothened curve

Being that ROE is an observed measure of performance which is the dependent variable, it is important to know the behaviour of ROE with time. The table 4.20 on the annual mean ROE showed a possible difference in mean ROE across time but due to large variances of ROE across entities, the graphical presentation portrayed a seemingly constant mean ROE across time. To confirm with statistical significance the significant joint difference in mean ROE in the 6 time periods, an analysis of variance was performed on ROE across the 6 periods of time. The analysis is presented in table 4.26 the p-value for the F-statistic is 0.018 which is less than 0.05 implying a significant difference in mean ROE over the 6 years.

Table 4.26: ROE One way ANOVA against time

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	619204.415	5.000	123840.883	2.757	0.018
Within Groups	36120616.923	804.000	44926.140		
Total	36739821.338	809.000			

Considering the second observed indicator for performance returns on assets (ROA), the maximum annual mean ROA was 13.879 and the lowest annual mean ROA obtained was in the year 2015 which was found to be 1.870. Despite the first year having heist and the last year having lowest ROE, across time, ROE does show a possible increasing trend over the rest of the years. Considering the amounts of mean ROA, the variability of ROA across the entities was also considerably high with standard deviations ranging between 2.247 and 28.552. Table 4.27 presents the results. The tabulated mean ROA over time do not show any possible decreasing or increasing trend. The variation as shown by the standard deviation show a sharp drop from the year 2010 to 2011 then to 2012 after which it exhibits both slight declines and increases. However, the standard deviations of ROA is persistently above the mean ROA across all years implying that despite the changes in heterogeneity and possible heteroscedasticity, there are also are general uniform changes in ROA across the entities over time.

Table 4.27: Annual Mean Returns on Assets

Year	Obs	Mean	Std.	Min	Max
2010	135	13.879	26.345	-45.890	80.499
2011	135	1.980	10.850	-30.293	34.252
2012	135	2.070	2.313	-4.043	9.063
2013	135	2.976	4.911	-8.468	15.792
2014	135	3.655	8.583	-19.137	21.379
2015	135	1.870	4.578	-12.420	12.792

The overall mean ROA was found to be 4.405 with a standard deviation of 13.203. This shows that the mean ROA over the years for all entities has a very high variation. The variation is however higher within groups due to the changes in variation and mean roe with time. There is some heterogeneity across entities indicated by the standard deviation between groups. This is inline with the high variation in the earlier years and the variation that is persistently higher than the mean ROA despite the reductions as shown in table 4.24.

Table 4.28: Overall ROA

	Mean	Std. Dev.	Min	Max	Observations	
Overall	4.405	13.203	-45.890	80.499	N =	810
Between		5.023	-6.963	15.654	n =	135
Within		12.217	-35.840	69.098	T =	6

Figure 4.7 shows the virtual presentation of the return on investment across the entities for against time from the year 2010 to 2015. Plotting the mean ROA for each year, the line shows a curve that seem flat implying a seemingly constant mean ROA with time. This virtual presentation seems flat due to the high dispersion of ROA across the entities for all the years. Plotting the mean ROA for each year, the line shows a curve starting with a sharp decline but a slight increasing function for the remaining periods. These mean ROE plots show a similar virtual phenomenon of a possible trend observed in the the tabulated results of the mean roe over time. The plot shows a virtually positive slope of line from the year 2011 onward which is an indication if a possible trend mired with heteroscedasticity in from the variations in the first year.

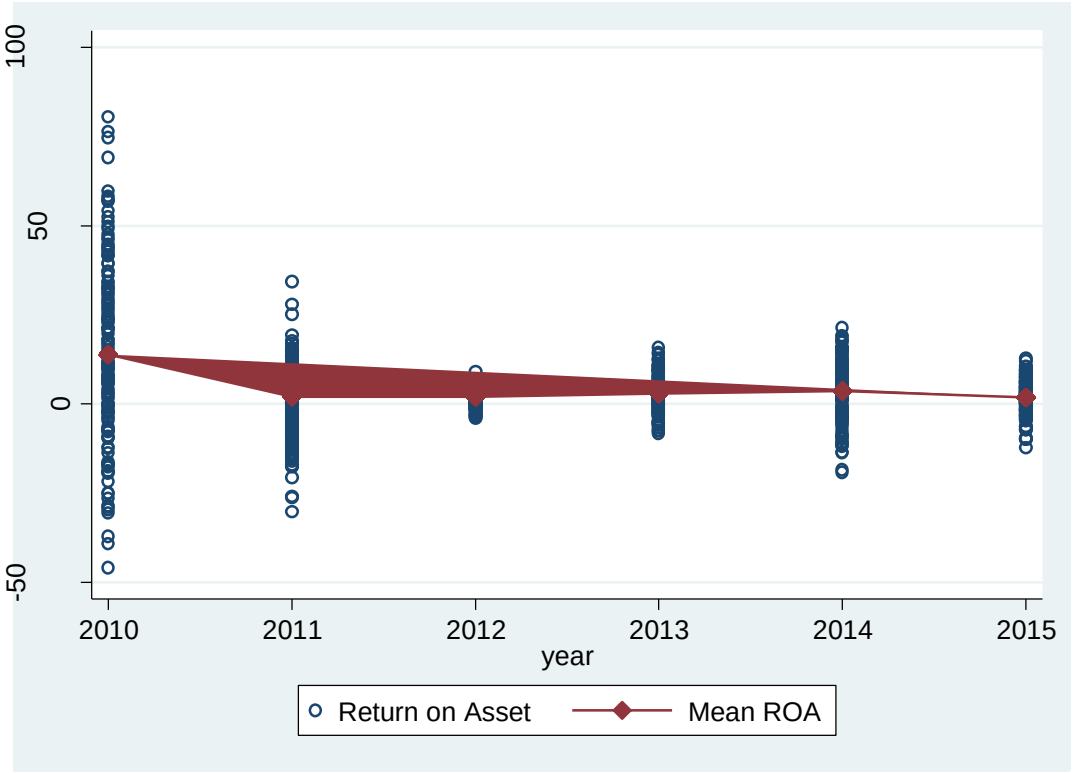

Figure 4.5: Return on Assets against time

Figure 4.8 shows a spaghetti plot of roa with time. These are trend lines of each all the panel groups over time. The plot confirms a virtual indication of high heterogeneity in the earlier years which is seemingly streamlined over time to a more homogeneous population of Saccos with less variation in roa in the latter years. In comparison to the ROE spaghetti plot which a measure of performance was also, the heterogeneity is more persistent in ROA than ROE. The changes from heterogeneity to seeming homogeneity over time could also be attributed to similar observations in the streamlining of financial risk factors that further influence the streamlining of performance in terms of ROE. The homogeneity in the population of Saccos could be due to the implementation of the regulations by SASRA which over the time has strengthened by limiting the operations and within the regulations.

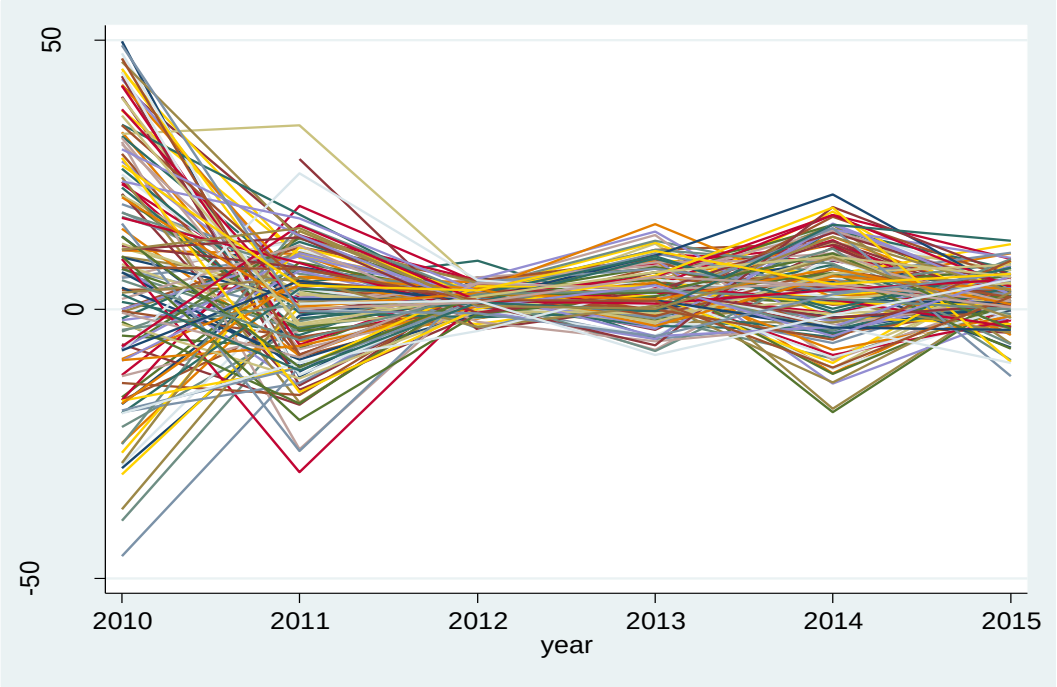

Figure 4.7: ROA Spaghetti plot

Figure 4.7 show the box plots of ROA over time. The also confirm the changes in variations in ROA characterized by high heterogeneity of the Sacco ROAs in the first year followed by virtually seeming homogeneity over time. Compared to the box plots of ROE over time, the ROA plots show a seemingly more persistent variation despite the drops over time. The changes in variation could be attributed to the streamlining of financial risk factors that further influence the streamlining of performance in terms of ROA. Further the ROA box plots also show that despite the drops in variation of possible heteroscedasticity, the changes in mean ROA might also be due to some overall changes in ROA across entities from homoscedastic variations. Across the timeline, the distributions of the box plots are virtually seemingly all normally distributed with none showing signs of skewedness on either sides. The medians are all about the centre with equidistant tails. That shows no changes in mean ROA over time is attributed to reduction of one-sided outliers.

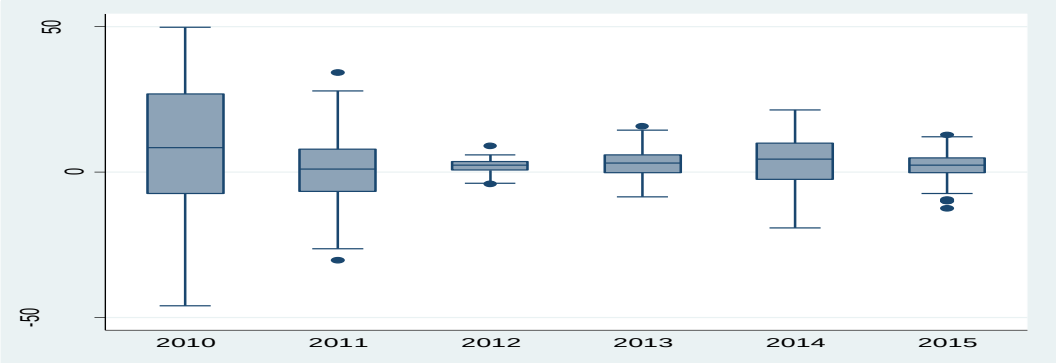

Figure 4.8: ROA Box plots over time.

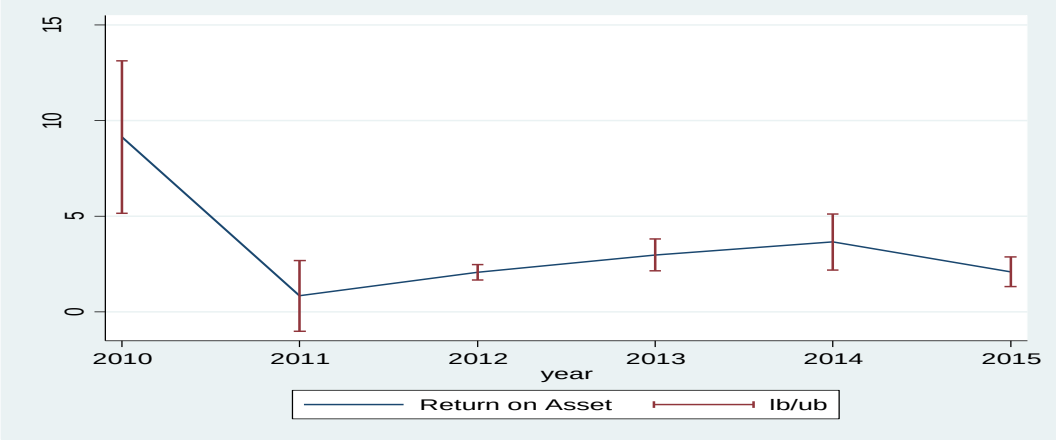

Figure 4.9: ROA over time (mean, CI) plot

Further exploratory graphical presentation shows an estimated lowess smoothened trend over time. The estimations shows a steep decline in the earlier years followed by a positive trend from the year 2012 and a slight decline in the year 2015.

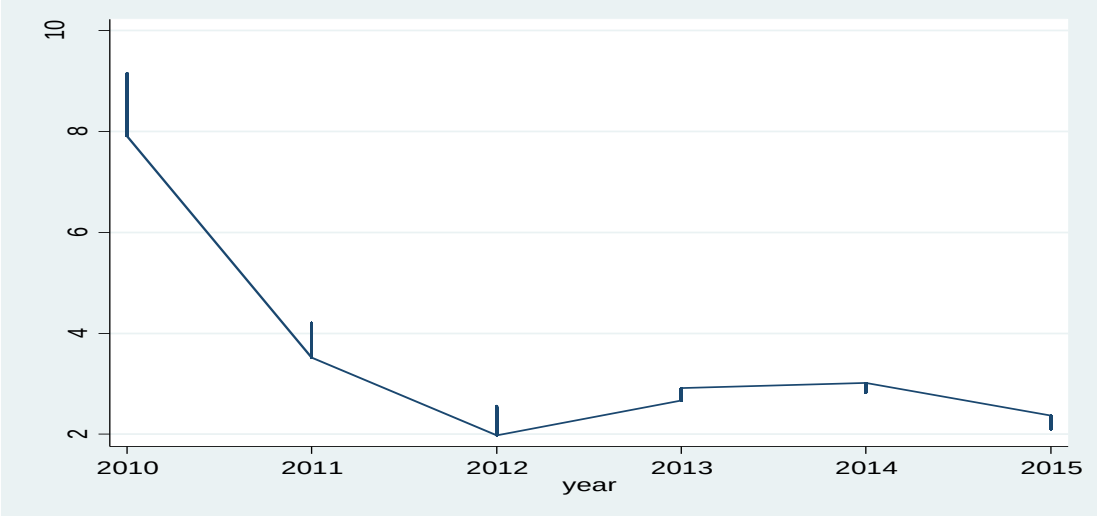

Figure 4.10: Lowess smoothened curve

Further to the graphical analysis and tabular presentation of the mean ROA, an analysis of variance was carried out to confirm with statistical significance whether there is a difference in mean ROA across time. As presented in table 4.29, the p-value for the F-statistic is 0.009 which is less than 0.05 implying a significant difference in mean ROE over the 6 years.

Table 4.29: ROA one way ANOVA against time

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	2803.64	5	560.728	3.0997	0.00886
Within Groups	145442	804	180.898		
Total	148245	809			

Similarly the overall mean performance of the Saccos was found to be significantly different across time. Performance as a construct was an unobserved latent variable measured using the 2 observed indicators ROE and ROA. From factor analysis, the latent variable was computed from the factor scores of the 2 observed indicators and used for further analysis. The ANOVA for overall performance and time is shown in table 4.30 the p-value for the F-statistic is 0.014 which is less than 0.05 implying a significant difference in mean performance over the 6 years.

Table 4.30: Overall performance one way ANOVA against time

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	0.397	5.000	0.079	2.863	0.014
Within Groups	21.356	770.000	0.028		
Total	21.753	775.000			

For further analysis involving the dependent variable performance and time, it was deemed important to consider the panel nature of the data and assess the time series aspect of performance. A stationarity unit-root test was done to confirm whether there is stationary in all panels. The LLC bias-adjusted test statistic $t * \delta = -4.000$ is significantly less than zero ($p < 0.00005$), so we reject the null hypothesis of a unit-root and favour the alternative that panels are stationary.

Table 4.31: Unit-root test for panel stationarity

	Statistic	p-value
Unadjusted t	-360	
Adjusted t*	-400	0.000

4.5 Statistical Modeling

Inferential analysis formed the basis behind which the study drew conclusions on the objectives. The aim of the study was to determine the influence of financial risk on financial performance of deposit taking Saccos in Kenya. Inferential analysis techniques were used to determine the influence that each of the independent variables credit risk, liquidity risk, interest rate risk and operational risk has on the dependent variable performance. First the study performed bivariate analyses between each independent variable and the dependent variable followed by a multivariate analysis to determine the joint influence of the financial risks on performance of deposit taking Saccos.

The inferential analyses involved model estimation for the data collected. The collected data was panel therefore the right choice of model for estimation was critical. Panel data sets combine time series and cross sections in the data. The data set was noted to contain considerably large cross sections consisting of 135 entities but a relatively small time period of only 6 years. The data was also noted to have balanced panels where each entity in the data set was observed over the same number of time periods which was 6 years. The general form of the model structure adopted was of the form of the form given by the equation;

$$\boldsymbol{Y_{it} = \beta + \beta_1 X_{it} + \varepsilon_{it}}$$ ……. Fixed effect …… …….. equation 4.1

Or

$$\boldsymbol{Y_{it} = \beta + \beta_1 X_{it} + \mu_{it} + \varepsilon_{it}}$$ ……Random effect …….. equation 4.2

The above are bivariate models where X_{it} is the predictor variable. A fixed effect model assume homogeneity of estimates across entities and that the independent variable that influence performance vary over time but have a fixed effect across the entities. A random implies that the variation across entities is random. The study fitted both the

fixed and random effect models basing on ordinary least squares and further tested the appropriate model to be adopted.

4.5.1 Bivariate analysis of Credit risk and financial performance of deposit taking Saccos

The first objective of the study was to determine the influence of credit risk on the financial performance of deposit taking Saccos in Kenya. Bivariate fixed effect and random effect models were used to assess the influence of this one predictor model. The Haussmann specification test for the bivariate model between credit risk and performance is shown in table 4.32. The chi-square statistic for the Hausman test was found to be equal to 3.17 with a p-value of 0.0751 that is greater than 0.05. This implies that the random effect model is more favorable than the fixed effect model.

Table 4.32: Haussmann specification; bivariate model with credit risk as predictor

	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
Credit risks	-1.001	-0.928	-0.073	0.041

Chi2(1) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 3.17, Prob>chi2 = 0.0751

Table 4.33 shows the model summary of the random effect model adopted. The total number of observations is 810 with 135 groups of entities. The minimum number of observations per groups is equal to the average and also to the maximum number of observations as 6 implying a balanced panel. The R^2 is the variation of the dependent variable that is explained by the variation of the predictors in the model. The R^2s within, between and the overall are 0.176, 0.148 and 0.167 respectively. The R^2 within gives you the goodness of fit measure for the individual mean de-trended data which disregards all the between information in the data. The Wald statistics here analyses the general significance of the model. The table shows that the p-value of the chi-square

statistic is 0.000 which is less than 0.05 implying that the estimated parameters in the model are at least not equal to zero. This implies that credit risks have an influence on financial performance of the Saccos.

Table 4.33: Model Summary Fixed-effects within group variable entity; credit risk

Model Statistics				Panel Observations			
R-sq:	Within	=	0.1762	Number of Obs		=	810
	Between	=	0.1478	Number of groups		=	135
	Overall	=	0.1672				
Wald	chi2(1)	=	163.680	Obs per group:	min	=	6
	Prob > chi2	=	0.000		avg	=	6
	corr(u_i,X)	=	0.000		max	=	6

The model coefficients are presented in table 4.34. The random effect model confirms that the estimated coefficient of credit risks is significantly not equal to zero (β = -0.928, z = -12.79, p-value= 0.000) the P-value is less than 0.05 implying that at 0.05 level of significance, credit risk influence the financial performance of the DT Saccos. The p-value of the constant is greater than 0.05 implying an insignificant constant term and an equation through the origin. Sigma_u is the standard deviation of residuals within groups and Sigma_e is the standard deviation of the overall error term. Rho is calculated from sigma_u and sigma_e and gives the intraclass correlation. Form the table, the interclass correlation is 0.174 implying that 17.4% of the variance is due to the differences across panels. A unit increase in the level of credit risk taken would lead to a decrease in the level of performance of the deposit taking Saccos by 0.928.

From the findings credit risk affects the financial performance of the DT Saccos negatively. This is in line with studies conducted by Rasika and Sampath (2015), Hosna, Manzura and Juanjuan (2009), Olawale (2016), Bizuayehu (2015), Kaaya and Pastory

(2013), Muriithi, Waweru and Muturi (2016) that credit risk negatively affects financial performance of banks. However, Li and Zou (2015), Afriyie and Akotey (2015) and Nyambere (2013) found that there exist a positive relationship between credit risk and banks' profitability. This implies that DT Sacco increased exposure to credit risk reduces its profitability. This indicates that poor asset quality or high non-performing loans to total asset related to poor DT Sacco financial performance. This implies that DT Saccos can make a profit as far as they can minimize the credit risk.

Table 4.34: Coefficients table; random effect model with credit risk as predictor

	Coefficients.	**Std. Err.**	**Z**	**P>z**
Credit risks	-0.928	0.072	-12.790	0.000
Constant	0.000	0.032	0.000	1.000
sigma_u	0.163			
sigma_e	0.823			
Rho	0.038			

4.5.2 Bivariate analysis of liquidity risk and financial performance of deposit taking Saccos

The second objective of the study was to determine the influence of liquidity risks on financial performance of deposit taking Saccos in Kenya. For the bivariate model between liquidity risks and performance, the Haussmann test yielded results in favor of the fixed effect model. Haussmann specification test for the model determining the bivariate influence of liquidity risks on performance is shown in table 4.35. The chi-square statistic for the Hausman test was found to be equal to 37.8 with a p-value of 0.000 which is less than 0.05. This implies that the fixed effect model would yield reliable results.

Table 4.35: Haussmann specification; bivariate model with liquidity risk as predictor

	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
Liquidity risks	-9.333	-8.134	-1.199	0.196

Chi2(1) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 37.38, Prob>chi2 = 0.000

The model summary of the fixed effect model is shown on table 4.36. The total number of observations is 810 with 135 groups of entities. The minimum number of observations per groups is equal to the average and also to the maximum number of observations as 6 implying a balanced panel. The R^2 is the variation of the dependent variable performance that is explained by the variation of the predictors in the model. The R^2s within, between and the overall are 0.400, 0.160 and 0.320 respectively. The R^2 within groups is larger than the other 2 values of R^2 implying that the greater amount of information is exploited with the fixed effect estimator. The R^2 within gives you the goodness of fit measure for the individual mean de-trended data which disregards all the between information in the data. The anova statistics here analyses the general significance of the model. The table shows that the p-value of the F-statistic is 0.000 which is less than 0.05 implying that the estimated parameters in the model are at least not equal to zero. This implies that liquidity risks have an influence on performance of the DT Saccos.

Table 4.36: Model Summary Fixed-effects within group variable entity; liquidity risk

Model Statistics				Panel Observations			
R-sq:	Within	=	0.400	Number of Obs		=	810
	Between	=	0.160	Number of groups		=	135
	Overall	=	0.320				
Anova	F(1,674)	=	448.860	Obs per group:	Min	=	6
	Prob > F	=	0.000		Avg	=	6
	corr(u_i,Xb)	=	-0.282		max	=	6

The model coefficients are presented in table 4.37. The fixed effect model confirms that the estimated coefficient of liquidity risks is significantly not equal to zero (β=-9.333, t= -21.19, p-value= 0.000) the P-value is less than 0.05 implying that at 0.05 level of significance, liquidity risks influence the performance of the DT Saccos. The p-value of the constant is greater than 0.05 implying an insignificant constant term and an equation through the origin. Sigma_u is the standard deviation of residuals within groups while Sigma_e is the standard deviation of the overall error term. Rho is calculated from sigma_u and sigma_e and gives the intra-class correlation. Form the table, the intra-class correlation is 0.267 implying that 26.7% of the variance is due to the differences across panels. The coefficient of liquidity risk here shows that a unit increase in liquidity risks causes the levels of performance to decrease by 9.333 units.

The results are in line with these studies Khan and Syed (2013), Hakimi and Zaghdoudi (2017), Marozva (2015), Kamau and Njeru (2016), Muriithi and Waweru (2017) and Maaka & Ondigo (2013) but contradict the finding by (Song'e, 2015; Mwangi, 2014; Otieno, Nyagol and Onditi, 2016). The empirical results imply that liquidity risk decreases significantly the DT Saccos financial performance. Significant role should be placed on liquidity since DT Sacco activities are based on liquidity.

Table 4.37: Coefficients table; fixed effect model with liquidity risks as predictor

	Coefficients.	Std. Err.	T	P>t
Liquidity risks	-9.333	0.441	-21.190	0.000
Constant	0.000	0.025	0.000	1.000
sigma_u	0.424			
sigma_e	0.703			
Rho	0.267			

4.5.3 Bivariate analysis of interest rate risk and financial performance of deposit taking Saccos

Another specific objective of the study was to determine the influence of interest rate risks on the performance of deposit taking Saccos in Kenya. Bivariate fixed effect and random effect models were used to assess the influence of this one predictor model. The Haussmann test was also used to determine the appropriate model for the bivariate analysis between interest rate risks an performance as shown in table 4.38. The Wald chi-square statistic for the test was found to be 5.94 with a p-value of 0.0148. The p-value being less than 0.05 implies that the fixed effect model is the appropriate model.

Table 4.38: Haussmann specification; bivariate model with interest rate risk as predictor

	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
Interest rate risks	0.345	0.394	-0.049	0.020

Chi2(1) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 5.94, Prob>chi2 = 0.0148

Table 4.39 shows the model summary of the fixed effect model. The total number of observations is 810 with 135 groups of entities. The minimum number of observations per groups is equal to the average and also to the maximum number of observations as 6 implying a balanced panel. The R^2 is the variation of the dependent variable performance that is explained by the variation of the predictors in the model. The R^2s within, between and the overall are 0.084, 0.268, and 0.113 respectively. The R^2 within gives the goodness of fit measure for the individual mean de-trended data which disregards all the between information in the data. The anova statistics here analyses the general significance of the model. The table shows that the p-value of the F-statistic is 0.000 which is less than 0.05 implying that the estimated parameters in the model are at least not equal to zero. This implies that interest rate risks have an influence on performance of the saccos.

Table 4.39: Model Summary Fixed-effects within group variable entity; interest rate risks

Model Statistics				Panel Observations			
R-sq:	Within	=	0.084	Number of Obs		=	810
	Between	=	0.268	Number of groups		=	135
	Overall	=	0.113				
Anova	F(1,674)	=	61.900	Obs per group:	Min	=	6
	Prob > F	=	0.000		Avg	=	6
	corr(u_i,Xb)	=	0.109		max	=	6

The model coefficients are presented in table 4.40. The fixed effect model confirms that the estimated coefficient of interest rate risks is significantly not equal to zero (β=0.345, t= 7.870, p-value= 0.000) the P-value is less than 0.05 implying that at 0.05 level of significance, interest rate risks influence the performance of the saccos. The p-value of the constant is greater than 0.05 implying an insignificant constant term and an equation

through the origin. Sigma_u is the standard deviation of residuals within groups and Sigma_e is the standard deviation of the overall error term. Rho is calculated from sigma_u and sigma_e and gives the intraclass correlation. Form the table, the infraclass correlation is 0.143 implying that 14.3% of the variance is due to the differences across panels. The results show that a unit increase in the interest rates from would increase the financial performance of deposit taking saccos by 0.345 units.

DT Saccos perceive interest rate as either the price of deposits on one hand and cost of borrowing on the other hand. From the findings interest rate risk affects the financial performance of the deposit taking Saccos positively. The findings are inconsistent with a study which was carried out by (Kolapo & Dapo ,2015) which found out that Interest rate risk has insignificant effect on bank performance. The results are however consistent to studies carried out by Odeke and Odongo (2014), Njoroge and Barasa (2013); Waseem and Abdul, (2014).

Table 4.40: Coefficients table; fixed effect model with interest rate risks a predictor

	Coefficients.	**Std. Err.**	**T**	**P>t**
Interest rate risks	0.345	0.044	7.870	0.000
Constant	0.000	0.031	0.000	1.000
sigma_u	0.355			
sigma_e	0.868			
Rho	0.143			

4.5.4 Bivariate analysis of operational risk and financial performance of deposit taking Saccos

The study also sought to determine the influence of operational risk risks on the performance of deposit taking Saccos in Kenya. Bivariate fixed effect and random effect models asses the influence of this one predictor model.

A random effect model was adopted for the bivariate model between operational risks and performance of deposit taking Saccos based on the results of the Hausman test. As shown in table 4.41, the Wald chi-square statistic for the Hausman specification test was found to be 0.01 with a p-value 0.934. Since the p-value of is greater than 0.05, the random effect was chosen as the appropriate model.

Table 4.41: Haussmann specification; bivariate model with operational risk as predictor

	(b) fixed	**(B) random**	**(b-B) Difference**	**sqrt(diag(V_b-V_B)) S.E.**
Operational risks	-0.850	-0.849	-0.001	0.011

Chi2(1) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 0.01, Prob>chi2 = 0.9335

Table 4.42 shows the model summary of the random effect model. The total number of observations is 810 with 135 groups of entities. The minimum number of observations per groups is equal to the average and also to the maximum number of observations as 6 implying a balanced panel. The R^2 is the variation of the dependent variable that is explained by the variation of the predictors in the model. The R^2s within, between and the overall are 0.667, 0.779 and 0.688 respectively. The R^2 within groups is larger than the other 2 values o R^2 implying that the greater amount of information is exploited with

the fixed effect estimator. The R^2 within gives you the goodness of fit measure for the individual mean de-trended data which disregards all the between information in the data. The Anova statistics here analyses the general significance of the model. The table shows that the p-value of the chi-square statistic is 0.000 which is less than 0.05 implying that the estimated parameters in the model are at least not equal to zero. This implies that operational risk risks have an influence on performance of the DT Saccos.

Table 4.42: Model Summary random-effects within group variable entity; operational risk

Model Statistics				Panel Observations			
R-sq:	Within	=	0.6668	Number of Obs		=	810
	Between	=	0.7796	Number of groups		=	135
	Overall	=	0.6883				
Wald	chi2(1)	=	1784.10	Obs per group:	Min	=	6
	Prob > chi2	=	0.000		Avg	=	6
	corr(u_i,X)	=	0.000		Max	=	6

The model coefficients are presented in table 4.43. The random effect model confirms that the estimated coefficient of operational risk in the bivariate model is significant (-0.849, t= -42.240, p-value = 0.000). The P-value is less than 0.05 implying that at 0.05 level of significance, taking operational risks influence the performance of the saccos. The p-value of the constant is greater than 0.05 implying an insignificant constant term and an equation through the origin. Sigma_u is the standard deviation of residuals within groups and Sigma_e is the standard deviation of the overall error term. Rho is calculated from sigma_u and sigma_e and gives the intraclass correlation. Form the table, the infraclass correlation is 0.000 implying that the variance is not caused by the differences across panels. A unit increase in the level of operational risks taken by a deposit taking sacco would lead to an decrease in the firms level of performance by 0.849.

Operational risk in inherent in all financial products, activities and processes and systems and the effective management of operational risk is paramount importance for every DT Sacco board and senior management. From the findings operational risk affects the financial performance of the deposit taking Saccos negatively. The findings are consistent with a study done by Kamau and Njeru (2016). However, the finding contradicts with studies carried out by Epetimehin and& Fatoki (2015), Odunga *et al*. (2013); Simiyu *et al* (2016)

Table 4.43: Coefficients table; random effect model with operational risk predictor

	Coefficients.	**Std. Err.**	**Z**	**P>z**
Operational risk risks	-0.849	0.020	-42.240	0.000
Constant	0.000	0.018	0.000	1.000
sigma_u	0.000			
sigma_e	0.524			
Rho	0.000			

4.5.5 Joint effect of financial risk on the financial performance of deposit taking Saccos

To test hypotheses and draw conclusions on the objectives of the study on the influence of financial risks on the effect of performance of deposit taking Saccos in Kenya, the study adopted a multiple OLS panel data regression model. Both fixed a fixed effect model and random effect model were fitted of the general model structure form given by the equation;

$$\boldsymbol{Y}_{it} = \beta_0 + \beta_1 \boldsymbol{X^J}_{it} + \beta_2 \boldsymbol{X^K}_{it} + \beta_3 \boldsymbol{X^L}_{it} + \beta_4 \boldsymbol{X^M}_{it} + \varepsilon_{it}$$ … Fixed effect equation 4. 3

Or

$Y_{it} = \beta_0 + \beta_1 X^J{}_{it} + \beta_2 X^K{}_{it} + \beta_3 X^L{}_{it} + \beta_4 X^M{}_{it} + \mu_{it} + \varepsilon_{it}$ .Random effect. equation

4. 4

The Hausman specification test was then used to determine the appropriate and more viable model of the 2. The tests is based on testing orthogonally of the common effects and the repressors. As shown in table 4.44, the test requires computation of the beta coefficients of both the fixed effect (b) and of the random effect (B) and determining the differences and further a covariance matrix of the difference vector. A chi-square Wald statistic is then computed and used to conclude on the model specification. The stata table footer shows that the Wald ch-square statistic computed was 13.11 with a p-value of 0.0107. This p-value is less than 0.05 implying that the fixed effect is the more viable model for the joint effect of financial risks on the effect of performance of deposit taking Saccos. The study therefore carried on with the fixed effect model towards drawing conclusions.

Table 4.44: Hausman test; multiple regressions

	(b)	**(B)**	**(b-B)**	**sqrt(diag(V_b-V_B))**
	fixed	**random**	**Difference**	**S.E.**
Credit risks	-0.286	-0.216	-0.069	0.029
Liquidity risks	-1.727	-1.155	-0.573	0.279
Interest rate risks	-0.173	-0.163	-0.010	0.013
Operational risks	-0.797	-0.834	0.037	0.018

Chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 13.11, Prob>chi2 = 0.0107

Table 4.45 shows the model summary of the fixed effect multiple regression model. The total number of observations is 810 with 135 groups of entities. The minimum number of observations per groups is equal to the average and also to the maximum number of observations as 6 implying a balanced panel. The R^2 is the variation of the dependent variable that is explained by the variation of the predictors in the model. The R^2s within, between and the overall are 0.707, 0.751 and 0.715 respectively. The R^2 within gives you the goodness of fit measure for the individual mean de-trended data which disregards all the between information in the data. The overall R^2 implies that 71.5 per cent of the variation in financial performance of deposit taking Saccos is explained by the variation in financial risks. The anova statistics here analyses the general significance of the model. The table shows that the p-value of the F-statistic is 0.000 which is less than 0.05 implying that at least one of the estimated parameters in the model is not equal to zero. This implies that financial risks have a significant influence on performance of the Saccos.

Table 4.45: Model Summary Fixed-effects within group variable entity; multiple regression

Model Statistics				Panel Observations			
R-sq:	Within	=	0.707	Number of Obs		=	810
	Between	=	0.751	Number of groups		=	135
	Overall	=	0.715				
Anova	F(1,674)	=	404.680	Obs per group:	Min	=	6
	Prob > F	=	0.000		Avg	=	6
	corr(u_i,Xb)	=	-0.033		max	=	6

The model coefficients estimates are presented in table 4.46. The fixed effect model confirms that the estimated coefficients of financial risk are all significantly not equal to zero. The coefficient estimates of credit risks, liquidity risks, interest rate risks and operational risks in the combined effect model were found to be -0.286, -1.727, -0.173 and -0.797 respectively with t statistics -5.260, -4.090, -5.920 and -23.330 the p-values to these t statistcs were all equal to 0.000. Being that all the P-values are less than 0.05,

it implies that financial risk influence financial performance of the DT Saccos. The p-value of the constant is greater than 0.05 implying an insignificant constant term and an equation through the origin. Sigma_u is the standard deviation of residuals within groups and Sigma_e is the standard deviation of the overall error term. Rho is calculated from sigma_u and sigma_e and gives the intraclass correlation. Form the table, the intraclass correlation is 0.144 implying that 14.4% of the variance is due to the differences across panels.

Table 4.46: Coefficients table; fixed effect model multiple regression

	Coefficients.	Std. Err.	T	P>t
Credit risks	-0.286	0.054	-5.260	0.000
Liquidity risks	-1.727	0.422	-4.090	0.000
Interest rate risks	-0.173	0.029	-5.920	0.000
Operational risks	-0.797	0.034	-23.330	0.000
Constant	0.000	0.017	0.000	1.000
sigma_u	0.202			
sigma_e	0.492			
Rho	0.144			

4.6 Panel Data Diagnostic Tests

To test hypotheses and draw conclusions basing on the fixed effect model, other tests of assumptions for the fitted model were deemed necessary. The researcher thus continued to perform other diagnostic tests basing on the various assumptions of the fitted fixed effect model. Table 4.43 presents the tests for the panel data diagnostic tests.

Having tested and confirmed the fixed effect of the entities, it was necessary to test if there is a time fixed effect on the model. This involved generating dummy variables for each year and testing if the effects of the dummy years are all jointly equal to zero. The test involved fitting a fixed effect model including the dummy variables for each year and an analysis of variance for the joint effect. The analysis yielded results below for the F statistic and it's P-value. The p-value of this F-statistic is greater than 0.05. This implies that there is no time fixed effect required for the model. All coefficients of time are jointly equal to zero.

Ordinary least squares estimation for panel data also assumes that there is cross-sectional independence of the disturbance term. A violation of cross sectional independence of the disturbance term imply that that the model was not correctly specified as the predictors (X_{it}) of the model are not strongly exogenous as assumed in OLS regression that X_{it} is strongly exogenous if the error term is independent of it's past present and future (Sarafidis & Wansbeek, 2010). The multivariate model fitted for this study was found to exhibit cross-sectional dependence thus violating the assumption of cross-sectional independence. This was tested using the Breusch-Pagan Lagrangian multiplier test for cross-sectional independence that uses a chi-square statistic. The p-value of the chi-square is 0.000 which is less than 0.05 implying cross-sectional dependence.

It is also assumed that the error term exhibit group wise homoscedasticity in the panels. Homoscedasticity implies that the disturbance term has constant variance and violation of this assumption is referred to as heteroscedasticity. group wise heteroscedasticity implies that variance of the eror terms of the model at the different time periods vary and are significantly larger in some time periods more than the other. A Wald test was used to test for group wise heteroscedasticity using a chi-square statistic. This tested the null hypothesis that the variances of the error term were equal for all time periods. This was rejected at 0.05 level of significance due to the p-value of the chi-square statistics that was found to be 0.000 denoting presence of heteroscedasticity and violation of group wise homoscedastic error terms.

The study also tested if the fitted fixed effect multivariate model was consisted with the assumption of non-serial correlation of the error term. Fitting an OLS model for panel data assumes that the error term do not exhibit serial correlation. This was assessed using the Breusch-Godfrey test for the existence of first order autocorrelation of the error term. This test uses the F-statistic to test the null hypothesis that there is no existence of first order autocorrelation. The p-value of the f-statistic was found to be 0.017 which is less than 0.05 implying the existence of first order autocorrelation of the error term. This implies that the fitted model also violated the assumption of OLS regression for panel data of non-autocorrelation of the error term.

The normality of the error term was also tested to as assumed by OLS regression fitting that the error term follows a Gaussian distribution. Unlike cross-sectional analysis, it was key that the researcher tested normality for panel data based on the both components that could cause it. The researcher therefore tested normality on u which is the normality on the entity specific errors within groups and normality on e that is the normality of the remainder or overall error term. The normality test used the Jacque Bera approach for normality test which is based on the consideration that a Gaussian distribution of the eror terms should have a mean of 0.000, a skewness of 0.000 and a kurtosis of 3. The Jacque Bera approach tests the deviation of the skewness from 0.000 an Kurtosis from 3 using a ch-square statistic. The p-values of the chi-square statistics for both u and e were found to be greater than 0.05 implying normality in both cases.

Table 4.47: Panel Data Diagnostic Tests

Test	Test statistic	P-value
Time fixed effect (Wald test)	F(5, 666) = 1.34	Prob > F = 0.245
Cross-sectional dependence (Breusch-Pagan LM test)	Chi2(9045) = 16878.136	Pr = 0.000
GroupWise Heteroscedasticity (Wald test)	Chi-Square (135) = 3.8e+06	Prob>chi2 = 0.000
First order autocorrelation in Panels (Wooldrige test)	F(1, 134) = 5.804	Prob > F = 0.017
Joint test for Normality on e (Jacque Bera)	Chi2(2) = 3.18	Prob > chi2 = 0.204
Joint test for Normality on u (Jacque Bera)	Chi2(2) = 192.96	Prob > chi2 = 0.051

4.7 Generalized Least Squares model

Due to the violation of the assumptions of Cross-sectional dependence, homoscedasticity and non-serial correlation of the error term in the fixed effect model, the model was deemed inefficient for drawing conclusions on the influence of financial risk on financial performance of deposit taking Saccos in Kenya. A generalized least squares model was therefore adopted to correct the violations. The GLS model fitted allowed for heteroskedastic errors, cross-sectional dependence and fitted an estimated coefficient for first order autocorrelation of the error term to correct the violations. Table 4.48 shows the model summary of the generalized least squares model. The GLS model was fitted for 810 observations with 135 groups of entities for 6 time periods. The model fitted allowed for heteroskedastic residuals and cross sectional dependence which were

violated considering the fixed effect model. The GLS model also allowed for autocorrelation of the residuals to order 1 as tested from the fixed effect model. To allow for autocorrelation of order 1, the autoregressive first lag coefficient was computed and found to be -0.2705 which was used on fitting GLS estimated with first order auto-correlated residuals. To test the significance of the model, the Wald Chi-square statistic was computed as 2229.77. The p-value of the Wald chi-square statistic was found to be 0.000 which is less than 0.05. This implies that the GLS model fitted is generally significant and that estimated coefficients of the predictors are not jointly equal to zero. This means that financial risks significantly influence financial performance of deposit taking Saccos.

Table 4.48: Generalised least squares model summary

Coefficients: generalized least squares
Panels: heteroskedastic with cross-sectional correlation
Correlation: common AR(1) coefficient for all panels (-0.2705)

Model Statistics		Panel Observations	
Estimated covariances	9180	Number of Obs	810
Estimated autocorrelations	1	Number of groups	135
Estimated coefficients	5	Time periods	6
Wald chi2(4) =	2229.77		
Prob > chi2 =	0.000		

The model coefficients estimates are presented in table 4.49. The fixed effect model confirms that the estimated coefficient of financial risks is all significantly not equal to zero. The coefficient estimates of credit risks, liquidity risks, interest rate risks and operational risks in the combined effect model were found to be -0.153, -0.628, -0.097 and -0.772 respectively with z statistics -6.98, -4.42, -3.89 and -37.51. The p-values to these t statistics were all equal to 0.000. Being that all the P-values are less than 0.05, it

implies that financial risk influence financial performance of the DT Saccos. The equation generated from the model fitted is given by the equation.

$$Y_{it} = 0.009 - 0.153X^{J}{}_{it} - 0.628X^{K}{}_{it} - 0.097X^{L}{}_{it} - 0.772X^{M}{}_{it}$$ …….. Equation 4. 5

Table 4.49: Coefficients table; generalised least squares model

	Coefficients.	Std. Err.	Z	P>z
Credit risks	-0.153	0.022	-6.980	0.000
Liquidity risks	-0.628	0.142	-4.420	0.000
Interest rate risks	-0.097	0.025	-3.890	0.000
Operational risks	-0.772	0.021	-37.510	0.000
Constant	0.009	0.006	1.690	0.091

4.8 Hypothesis testing

The final multivariate GLS fitted model was considered better model compared to the OLS model which violated the assumptions. The GLS model taking care of the violations was considered a more robust model and was used to test the hypotheses of the study.

H_{01}: Credit Risk has no influence on financial performance of deposit taking Saccos in Kenya.

From the GLS model fitted, the p-value of the t-statistic for the estimated coefficient of credit risk is 0.000 which is less than 0.05. The null hypothesis was rejected at 0.05 level of significance and a conclusion drawn that credit risk has a significant influence on performance of deposit taking Saccos in Kenya.

H_{02}: Liquidity Risk has no influence on financial performance of deposit taking Saccos in Kenya

Considering the fitted GLS model, the p-value of the t-statistic for the estimated coefficient of liquidity risk is 0.000 which is less than 0.05. The null hypothesis was rejected at 0.05 level of significance and a conclusion drawn that liquidity risk has a significant influence on performance of deposit taking Saccos in Kenya.

H_{03}: Interest Rate Risk has no influence on financial performance of deposit taking Saccos in Kenya.

It was found according to the fitted GLS model, the p-value of the t-statistic for the estimated coefficient of interest rate risk is 0.000 which is less than 0.05. The null hypothesis was rejected at 0.05 level of significance and a conclusion drawn that interest rate risk has a significant influence on performance of deposit taking Saccos in Kenya.

H_{04}: Operational Risk has no influence on financial performance of deposit taking Saccos in Kenya.

The fitted GLS model showed that the p-value of the t-statistic for the estimated coefficient of operational risk is 0.000 which is less than 0.05. The null hypothesis was rejected at 0.05 level of significance and a conclusion drawn that operational risk has a significant influence on performance of deposit taking Saccos in Kenya.

4.9 Moderating effect of firm size on the relationship between financial risk and financial performance of deposit taking Saccos in Kenya

The last objective of the study was to determine the moderating effect of firm size on the relationship between financial risk and financial performance of deposit taking Saccos in Kenya. To achieve this objective, the researcher fitted a panel data model that assessed the moderating effect. The moderating effect was assessed by first generating the interaction variables between the moderator firm size and the independent variables. The

moderating variable and the interaction variables were then added to the multivariate model and the effect of the addition assessed. Since the comparison of the new model was to be made with the first model without the interactions, a similar model estimation technique was adopted. The researcher thus fitted a GLS model including the moderator and the interaction terms in the model. The GLS model of test the moderating effect was also fitted for 810 observations with 135 groups of entities for 6 time periods. As shown in table 4.46, the moderated model was also fitted to allow for heteroskedastic residuals and cross sectional dependence which were violated considering the fixed effect model. This GLS model also allowed for autocorrelation of the residuals to order 1 as tested from the fixed effect model which involved the estimation of the autoregressive first lag coefficient found to be 0.2466 that was used on fitting GLS estimated with first order auto-correlated residuals. The introduction of the interaction variables to the model yielded a statistically significant model as shown by the Wald Chi-square statistic analysis. The wald chi-square statistic for this model was found to be 79.09 with a p-value of the of 0.000. The p-value being less than 0.05 implied that at 0.05 level of significance, the estimated GLS model was generally significant.

Table 4.50: Generalised least squares model summary

Coefficients: generalized least squares

Panels: heteroskedastic with cross-sectional correlation

Correlation: common AR(1) coefficient for all panels (0.2466)

Model Statistics		Panel Observations	
Estimated covariances	9180	Number of Obs	810
Estimated autocorrelations	1	Number of groups	135
Estimated coefficients	10	Time periods	6
Wald chi2(9) =	79.09		
Prob > chi2 =	0.000		

The introduced interaction variables between firm size and each independent variable were all found to have significant influence on the financial performance of DT Saccos except the interaction between firm size and credit risks. The results of the coefficients of the moderating effect are shown in table 4.51. The interaction variables of firm size and credit risks, liquidity risks, interest rate risks and operational risks had coefficient estimates of 0.012, 0.879, 0.273 and 0.07 respectively that all had p-values equal to 0.000 expect the interaction variable between firm size and credit risks. The variable firm size intersection credit risks had a p-value of 0.523 that is greater than 0.05. This implies that firm size generally moderate the relationship between performance and financial risks but does not moderate the relationship between firm performance and credit risks.

Table 4.51: Coefficients table; Generalised least squares model with moderation

	Coefficients	Std. Err.	Z	P>z
Credit risks	-0.336	0.059	-5.696	0.000
Liquidity risks	-17.374	2.806	-6.190	0.000
Interest rate risks	-5.004	0.550	-9.090	0.000
Operational risks	-1.803	0.253	-7.120	0.000
firm characteristics	-0.044	0.006	-7.260	0.000
Firm Size intersection credit risks	0.012	0.018	0.640	0.523
Firm Size intersection liquidity risks	0.879	0.142	6.200	0.000
Firm Size intersection interest rate risks	0.273	0.030	9.240	0.000
Firm Size intersection operational risks	0.070	0.014	5.020	0.000
Constant	0.885	0.118	7.520	0.000

To make statistical comparison between the models and draw conclusions on the significance of the moderating effect, the study adopted the use of Information criterion statistics. The Bayesian information criterion (BIC) was computed for both models and compared. Information criterion statistics are measures of goodness of fit that use the measures of likelihood for estimations to compute statistics that can be used to make

comparisons and draw conclusions on choice of better models or improvement of models due to changes in the structures. The type of estimation model must however be the same for both models. Table 4.52 shows the Information criterion statistics for the 2 models. Basing on both the Akaike information criterion (AIC) and the Bayesian information criterion, the values for the second model with the moderating variable and the interaction variables are less than the AIC and BIC of the first model. This shows that the second model is better than the first model. This implies that the addition of the interaction effect improves the model.

Table 4.52: Information criterion statistics

Model	Obs	ll(null)	ll(model)	Df	AIC	BIC
1	810	.	-569.979	5	1149.958	1173.443
2	810	.	-474.837	10	969.674	1016.645

To test the hypothesis of the moderating effect and draw conclusions, the researcher based on the p-values of the interaction effects and the BIC difference

H_{05}: Firm Size has no moderating effect on the relationship between financial risk and financial performance of deposit taking Saccos in Kenya.

The difference in the BIC of the model without the interaction terms and the final model with the interaction terms was -156.798 which less than 0.000 is. The moderated model has a significantly lower BIC value implying an improvement from the first model. The p-values of the interaction terms between all the independent variables and the moderator firm size were all less than 0.05. The null hypothesis was therefore rejected and a conclusion drawn that firm size has a moderating effect on the relationship between financial risk and financial performance of deposit taking Saccos in Kenya.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of major findings of the study, relevant discussions, conclusions and the necessary recommendations. The summary, conclusions and recommendations are guided by the specific objectives of the study and the research questions. The chapter also recommends areas for future studies.

5.2 Summary of findings

The summary of major findings is aligned to the objectives of the study. The main objective of this study was to determine influence of financial risk on financial performance of deposit taking Saccos in Kenya. The specific objectives were formulated to determine the influences of the components of financial risks (Credit risk, liquidity risk, interest rate risk and operational risk) on the performance of deposit taking Saccos in Kenya.

5.2.1 Credit Risk and Financial Performance of Deposit Taking Saccos

The study measured credit risks by 2 indicators the total percentage of delinquency in the loan portfolio and the ratio of allowance for loan losses to allowances required for delinquent loans. The Saccos were found to keep high delinquencies with an overall average ratio of 7.642 which is above the target below 5%. The overall mean ratio of allowance for loan losses to allowances required for delinquent loans was found to be 43.544. This was also outside the target of 100%. On statistical modeling, credit risk was found to have a significant influence on financial performance of Saccos. The coefficient of credit risks on the joint effect model was found to be significant ($B = -0.153$, $z = -6.98$, $p = 0.000 < 0.05$). This shows that credit risks negatively influences performance of

deposit taking Saccos, implying that taking excessive credit risks would be detrimental to the DT Sacco.

5.2.2 Liquidity Risk and Financial Performance of Deposit taking Saccos

Liquidity risks were also found to have an influence on performance of deposit taking Saccos in Kenya. Liquidity risks in this study was measured in terms of adequacy of the liquid cash reserves to satisfy deposit withdrawal requests, after paying all immediate obligations <30 days. Considering this cash reserves adequacy ratio, Saccos were found to be keeping an overall ratio of 18.708 which is above the expected minimum of 15%. Liquidity risks was also measured using the ratio of Total Liquidity Reserves to Total Savings Deposits as an indicator that was also found to be averagely kept well above the minimum target of 10%. The overall average ratio for the Saccos was found to have a mean of 19.386 across entities across years.

The latent measure of liquidity risks was found to have a negative coefficient on the joint effect model (B = -0.628, z= -4.42, p= 0<0.05). This implies that liquidity risk decreases significantly the DT Sacco financial performance. Significant role should be placed on liquidity since DT Sacco activities are based on liquidity.

5.2.3 Interest Rate Risk and Financial Performance of Deposit Taking Saccos

The first indicator that was used to measure interest rate risk was yield on the loan portfolio that was found to have a mean of 33.701 which is a ratio high above 100%. The other indicator ratio used to measure interest rates risks was the yield of savings deposits which was measured as a ratio of Financial Cost to Average Savings Deposits and was found to have a mean of 24.529 across entities across years. Interest rates risks was also found to have a negative influence on the performance of deposit taking Saccos (B = -0.097, z= -3.89, p= 0.000<0.05).

5.2.4 Operational Risk and Financial Performance of Deposit Taking Saccos

Operational risk was also found to have an influence on performance of DT Saccos in Kenya. This variable was measured based on the indicator ratios of operating efficiency and the net worth turnover ratios. Operating efficiency was measure as a ratio considering operating expenses to average total assets. The 2 ratios were found to have overall averages of 6.624 and 223.844 respectively. The joint effect model showed that operational risks pose a relatively high significant negative influence on financial performance compared to other risks ($B = -0.772$, $z= -37.51$, $p= 0.000<0.05$). This implies that DT Saccos that take very high operational risks tend to perform poorly.

5.2.5 Moderating effect of Firm Size on the relationship between Financial Risk and Financial Performance of Deposit Taking Saccos in Kenya

The moderating variable firm size was measured by the total assets of the DT Saccos. To standardize the scales of measure of the moderating variable, the natural logarithms of the total assets was used as the moderator. Upon introduction of the moderating variable and the interactions between the moderator and the financial risks to the joint model, a prediction power improvement was realized. The BIC of the model with the interaction variables was found to be 1016.645 which was lower than the BIC of the joint model without moderation which was found to be 1173.443. The lower BIC implies that the model with moderation had higher likelihood estimates compared to the previous model. The interaction variables between financial risks were found to have significant coefficients implying that firm characteristics have a significant moderating effect on the relationship between financial risks and financial performance.

5.3 Conclusions

The study sought to determine the influence of financial risk (Credit risks, Liquidity risks, Interest rate risks and Operational risks) on financial performance of deposit taking Saccos in Kenya. The study deduced that all the financial risks have negative influence on performance of deposit taking Saccos in Kenya, however, operational risks is the most predictor of financial performance with the highest coefficient.

The first objective of the study was to determine influence of credit risk on financial performance of deposit taking Saccos in Kenya. From the results of the analysis conducted by the study and hypothesis tested, the coefficient of credit risks on the joint effect model of financial risks on performance was found to be significant based on the p-value. The researcher therefore concluded at 0.05 level of significance that credit risk has a significant influence on financial performance of deposit taking Saccos in Kenya.

The study also sought to determine the influence of liquidity risk on financial performance of deposit taking Saccos in Kenya. From the analyses conducted, the study tested hypothesis and drew conclusions from the joint effect model. Liquidity risks also had a negative significant coefficient estimate at 0.05 level of significance. It was therefore concluded that liquidity risks also have a significant effect on the performance of deposit taking Saccos in Kenya.

To conclude on the third objective, the researcher used the results joint effect model from the analyses of the study. This objective was to establish the influence of interest rate risk on financial performance of deposits taking Saccos in Kenya. The results from the joint effect model showed that interest rates risks also had a significant coefficient. Based on the p-value of this coefficient, the study concluded at 0.05 level of significance that interest rates risks have a significant influence on the financial performance of deposits taking Saccos in Kenya.

The study also drew a conclusion that operational risk has an influence on the financial performance of deposits taking Saccos in Kenya. This was based on the objective of the study to determine the influence of operational risk on financial performance of deposit taking Saccos in Kenya. An operational risk was also found to have a significant coefficient based on the results of the joint effect model. Based on the p-value of this coefficient estimate, the study concluded that operational risk has a significant influence on the financial performance of deposit taking Saccos in Kenya.

The last objective of the study was to determine the moderating effect of firm size on the relationship between financial risk and financial performance of deposit taking Saccos in Kenya. The conclusion to this objective was based on the moderating effect model that included the joint effect of the financial risks, the moderating variable and the interaction variables between the moderator and financial risks. The coefficients of the interaction variables were found to be significant thus the researcher concluded that firm size have a moderating effect on the relationship between financial risks and financial performance of deposit taking Saccos in Kenya.

5.4 Recommendations

Based on the findings and conclusion of the study on the influence financial risk on financial performance of DT Saccos in Kenya, the study gives the following recommendations.

The Management of the DT Saccos need to be cautious in setting up a clear credit policy that will not negatively affects profitability and also they need to know how credit policy affects the operation of their DT Saccos to ensure judicious utilization of deposits and maximization of profit. The management of the DT Sacco should also ensure that the terms and conditions set out in the credit policy are adhered to minimize loan delinquency. This would ensure that the level of nonperforming loans is kept at minimum levels at all times.

The Government, Management of the DT Saccos, Policy makers and regulators should pay close attention to liquidity risk since it decreases significantly the DT Sacco financial performance. DT Sacco activities are based on liquidity therefore DT Saccos should manage this risk by reinforcing its own resources since depositors could at any time and under unexpected reasons, withdraw their deposits to seek investment elsewhere with higher returns. Liquidity situation should be periodically monitored by the management of a DT Saccos and there should be continuous and consistent mobilization of deposit from members to meet the credit needs.

The study recommends that DT Sacco's management should judiciously manage their interest rate to improve their financial performance since it has a positive effect on their financial performance and also recommends for income source diversification.

Operational risk in inherent in all financial products, activities and processes and systems and the effective management of operational risk is paramount importance for every DT Sacco board and senior management. This implies that DT Saccos board and management should take keen interest in managing operational risks since if they don't the DT Sacco tend to perform poorly. The study also recommends that management of the DT Saccos in Kenya should ensure that they adopt and implement of sound operational risk management practices.

The study recommends to SASRA to classify the DT Saccos according to the Asset Base. A Recommendation of 3 tiers i.e. Tier 1(Above 5 billion), Tier 2 (Between 1 billion to below 5 billion) and Tier 3 (Below 1 billion)

5.5 Areas of Further Research

The study investigated the influence of financial risk on financial performance of DT Saccos in Kenya. Future study may focus on incorporation of other financial risk which were not covered since the current study only focused on (Credit risk, liquidity risk, interest rate risk and operational risk). It may result to an improved R square. The study focused on DT Sacco, future study should be carried out for other financial intermediaries such as

non-DT Saccos, Insurance companies and micro-finance institutions. The current study only focused on the secondary data obtained from the audited financial statement of the Deposit taking Sacco for the six year period (2010-2015), hence the findings incorporated the limitations of financial statements therefore a further study should be carried out to incorporating primary data to interrogate the justification of a particular policy by the management.

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APPENDICES

Appendix I: Data Collection Sheet

Name of the DT Sacco Ltd: …….

Category of the DT Sacco Ltd……...

			Years					
Variable	**Proxy**	**Formulae**	2010	2011	2012	2013	2014	2015
Financial Performance	FP1	= PBT/Equity*100						
	FP2	= PBT/ Total Asset*100						
Firm Size	FS	= Total Assets						
Credit Risk	CR1	= Total Loan Delinquent Loan/ Total Loan*100						
	CR2	= Allowances of Loan Losses/ Total Loan of all Delinquent Loan*100						
Liquidity Risk	LR1	= Total Liquidity Investments/Total Saving Deposits*100						
	LR2	= Total Liquidity Reserve/Total Saving Deposits*100						
Interest Rate Risk	IRR1	= Total Loan Income/ Net Loan Portfolio*100						
	IRR2	= Total Paid on Saving Deposits/Total Saving Deposits*100						
Operational Risk	OR1	= Operating Expenses/ Total Assets*100						
	OR2	= Gross Interest/ Networth *100						

Appendix II: List of Licensed Deposit Taking SACCOS

List of Sacco societies licensed to undertake deposit-taking Sacco business in Kenya for the financial year ending December 2016

NO.	NAME OF SOCIETY	POSTAL ADDRESS
1	2NK SACCO SOCIETY LTD	P.O BOX 12196-10100 NYERI
2	AFYA SACCO SOCIETY	P.O.BOX 11607 – 00400, NAIROBI.
3	AGRO-CHEM SACCO	P.O BOX 94-40107, MUHORONI.
4	ALL CHURCHES SACCO	P.O BOX 2036-01000, THIKA.
5	ARDHI SACCO SOCIETY	P.O. BOX 28782-00200, NAIROBI.
6	ASILI SACCO SOCIETY LTD	P.O.BOX 49064 – 00100, NAIROBI.
7	BANDARI SACCO SOCIETY	P.O.BOX95011 –80104, MOMBASA.
8	BARAKA SACCO SOCIETY	P.O.BOX 1548 – 10101, KARATINA.
9	BARATON UNIVERSITY	P.O BOX 2500-30100, ELDORET.
10	BIASHARA SACCO	P.O.BOX 1895 – 10100, NYERI.
11	BINGWA SACCO SOCIETY	P.O.BOX 434 – 10300, KERUGOYA.
12	BORESHA SACCO SOCIETY	P.O.BOX80–20103, ELDAMA
13	CAPITAL SACCO SOCIETY	P.O BOX 1479-60200, MERU.
14	CENTENARY SACCO	P.O.BOX 1207 – 60200, MERU.
15	CHAI SACCO SOCIETY LTD	P.O.BOX 47815 – 00100, NAIROBI.
16	CHUNA SACCO SOCIETY	P.O.BOX 30197 – 00100, NAIROBI.
17	COSMOPOLITAN SACCO	P.O.BOX 1931 – 20100, NAKURU.
18	COUNTY SACCO SOCIETY	P.O.BOX 21 – 60103, RUNYENJES.
19	DAIMA SACCO SOCIETY	P.O.BOX 2032 – 60100, EMBU.
20	DHABITI SACCO SOCIETY	P.O.BOX 353 – 60600, MAUA.
21	DIMKES SACCO SOCIETY	P.O.BOX 886 – 00900, KIAMBU.
22	DUMISHA SACCO SOCIETY	P.O BOX 84-20600, MARARAL.
23	EGERTON SACCO SOCIETY	P.O.BOX 178 – 20115, EGERTON.
24	ELGON TEACHERS SACCO	P.O BOX 27-50203, KAPSOKWONY.
25	ELIMU SACCO SOCIETY	P.O BOX 10073-00100, NAIROBI.
26	ENEA SACCO SOCIETY LTD	P.O.BOX 1836 – 10101, KARATINA.
27	FARIDI SACCO SOCIETY	P.O. BOX 448-50400, BUSIA.
28	FARIJI SACCO SOCIETY	P.O.BOX 589 –00216, GITHUNGURI.
29	FORTUNE SACCO SOCIETY	P.O.BOX 559 – 10300, KERUGOYA.
30	FUNDILIMA SACCO	P.O.BOX 62000 – 00200, NAIROBI.
31	GASTAMECO SACCO	P.O BOX 189-60101, MANYATTA.
32	GITHUNGURI DAIRY &	P.O.BOX896–00216, GUTHUNGURI.
33	GOODWAY SACCO	P.O BOX 626-10300, KERUGOYA.
34	GUSII MWALIMU SACCO	P.O.BOX 1335 – 40200, KISII.
35	HARAMBEE SACCO	P.O.BOX 47815 – 00100, NAIROBI.
36	HAZINA SACCO SOCIETY	P.O.BOX 59877 – 00200, NAIROBI.

37	IG SACCO SOCIETY LTD	P.O.BOX 1150 –50100, KAKAMEGA.
38	ILKISONKO SACCO	P.O BOX 91-00209, LOITOKITOK.
39	IMARIKA SACCO SOCIETY	P.O.BOX 712 – 80108, KILIFI.
40	IMARISHA SACCO	P.O.BOX 682 – 20200, KERICHO.
41	IMENTI SACCO SOCIETY	P.O.BOX 3192 – 60200, MERU.
42	JACARANDA SACCO	P.O. BOX 176744-00232, RUIRU
43	JAMII SACCO SOCIETY LTD	P.O.BOX 57929 – 00200, NAIROBI.
44	JITEGEMEE SACCO	P.O. BOX 86937-80100, MOMBASA.
45	JUMUIKA SACCO SOCIETY	P.O. BOX 14-40112, AWASI.
46	KAIMOSI SACCO SOCIETY	P.O BOX 153-50305, SIRWA.
47	KATHERA RURAL SACCO	P.O BOX 251-60202, NKUBU.
48	KENPIPE SACCO SOCIETY	P.O.BOX 314 – 00507, NAIROBI.
49	KENVERSITY SACCO	P.O.BOX 10263 – 00100, NAIROBI.
50	KENYA ACHIEVAS SACCO	P.O. BOX 3080-40200, KISII.
51	KENYA BANKERS SACCO	P.O.BOX 73236 – 00200, NAIROBI.
52	KENYA CANNERS SACCO	P.O.BOX 1124 – 01000, THIKA.
53	KENYA HIGHLANDS	P.O.BOX 2085 – 002000, KERICHO.
54	KENYA MIDLAND SACCO	P.O BOX 287-20400, BOMET.
55	KENYA POLICE SACCO	P.O.BOX 51042 – 00200, NAIROBI.
56	JOINAS SACCO SOCIETY	P.O.BOX 669 – 00219, KARURI.
57	KIMBILIO DAIMA SACCO	P.O. BOX 81-20225, KIMULOT.
58	KINGDOM SACCO SOCIETY	P.O.BOX 8017 – 00300, NAIROBI.
59	KIPSIGIS EDIS SACCO	P.O BOX 228-20400, BOMET.
60	KITE SACCO SOCIETY LTD	P.O.BOX 2073 – 40100, KISUMU.
61	KITUI TEACHERS SACCO	P.O.BOX 254 – 90200, KITUI.
62	KMFRI SACCO SOCIETY	P.O.BOX 80862, 80100 MOMBASA.
63	KOLENGE TEA SACCO	P.O BOX 291-30301, NANDI HILLS.
64	KONOIN SACCO SOCIETY	P.O.BOX 83 –20403, MOGOGOSIEK.
65	KORU SACCO SOCIETY	P.O. BOX PRIVATE BAG-40100,
66	KWALE TEACHERS SACCO	P.O. BOX 123-80403, KWALE.
67	KWETU SACCO SOCIETY	P.O BOX 818-90100, MACHAKOS.
68	K-UNITY SACCO SOCIETY	P.O.BOX 268 – 00900, KIAMBU.
69	LAMU TEACHERS SACCO	P.O. BOX 110-80500, LAMU.
70	LAINISHA SACCO SOCIETY	P.O. BOX 272-10303, WANG'URU.
71	LENGO SACCO SOCIETY	P.O.BOX 1005 – 80200, MALINDI.
72	MAFANIKIO SACCO	P.O BOX 86515-80100, MOMBASA.
73	MAGADI SACCO SOCIETY	P.O.BOX 13 – 00205, MAGADI.
74	MAGEREZA SACCO	P.O.BOX 53131 – 00200, NAIROBI.
75	MAISHA BORA SACCO	P.O.BOX 30062 – 00100, NAIROBI.
76	MARSABIT TEACHERS	P.O.BOX 90 – 60500, MARSABIT.
77	MENTOR SACCO SOCIETY	P.O.BOX 789 – 10200, MURANG'A.

78	METROPOLITAN	P.O.BOX 871 – 00900, KIAMBU.
79	MILIKI SACCO SOCIETY	P.O.BOX 43582 – 10100 NAIROBI
80	MMH SACCO SOCIETY LTD	P.O.BOX 469 – 60600, MAUA.
81	MOMBASA PORT SACCO	P.O.BOX 95372–80104, MOMBASA.
82	MUDETE TEA GROWERS	P.O.BOX 221 – 41053, KHAYEGA.
83	OLLIN SACCO SOCIETY	P.O BOX 83-10300, KERUGOYA.
84	MURATA SACCO SOCIETY	P.O.BOX 816 – 10200, MURANG'A.
85	MWALIMU NATIONAL	P.O.BOX 62641 – 00200, NAIROBI.
86	MWIETHERI SACCO	P.O. BOX 2445-060100, EMBU.
87	MWINGI MWALIMU SACCO	P.O BOX 489-90400, MWINGI.
88	MUKI SACCO SOCIETY LTD	P.O BOX 398-20318, NORTH
89	MWITO SACCO SOCIETY	P.O.BOX 56763 – 00200, NAIROBI.
90	NACICO SACCO SOCIETY	P.O.BOX 34525 – 00100, NAIROBI.
91	NAFAKA SACCO SOCIETY	P.O.BOX 30586 – 00100, NAIROBI.
92	NANDI FARMERS SACCO	P.O BOX 333-30301, NANDI HILLS
93	NANYUKI EQUATOR	P.O BOX 1098-CX10400, NANYUKI
94	NAROK TEACHERS SACCO	P.O.BOX 158 – 20500, NAROK.
95	NASSEFU SACCO SOCIETY	P.O.BOX 43338 – 00100, NAROBI.
96	NATION SACCO SOCIETY	P.O.BOX 22022 – 00400, NAIROBI.
97	NAWIRI SACCO SOCIETY	P.O BOX 400-16100, EMBU.
98	NDEGE CHAI SACCO	P.O.BOX 857 – 20200, KERICHO.
99	NDOSHA SACCO SOCIETY	P.O.BOX 532– 60401, CHOGORIA –
100	NG'ARISHA SACCO	P.O.BOX 1199 – 50200, BUNGOMA.
101	NOBLE SACCO SOCIETY	P.O.BOX 3466 – 30100, ELDORET.
102	NRS SACCO SOCIETY LTD	P. O BOX 575-00902, KIKUYU.
103	NUFAIKA SACCO SOCIETY	P.O BOX 735-10300, KERUGOYA.
104	NYAHURURU UMOJA	P.O BOX 2183-20300, NYAHURURU.
105	NYALA VISION SACCO	P.O BOX 27-20306, NDARAGWA.
106	NYAMBENE ARIMI SACCO	P.O.BOX 493 – 60600, MAUA.
107	NYATI SACCO SOCIETY	P.O. BOX 7601 – 00200, NAIROBI
108	NEW FORTIES SACCO	P.O.BOX 1939 – 10100, NYERI.
109	ORIENT SACCO SOCIETY	P.O.BOX 1842 – 01000, THIKA.
110	PATNAS SACCO SOCIETY	P.O BOX 601-20210, LITEIN.
111	PRIME TIME SACCO	P.O. BOX 512 – 30700, ITEN
112	PUAN SACCO SOCIETY	P.O BOX 404-20500, NAROK.
113	QWETU SACCO SOCIETY	P.O BOX 1186-80304, WUNDANYI
114	RACHUONYO TEACHERS	P.O. BOX 147-40332, KOSELE.
115	SAFARICOM SACCO	P.O.BOX 66827 – 00800, NAIROBI.
116	SHERIA SACCO SOCIETY	P.O.BOX 34390 – 00100, NAIROBI.
117	SHIRIKA SACCO SOCIETY	P.O BOX 43429-00100, NAIROBI.
118	SIMBA CHAI SACCO	P.O.BOX 977 – 20200, KERICHO.

119	SIRAJI SACCO SOCIETY	P.O.BOX PRIVATE BAG, TIMAU.
120	SKYLINE SACCO SOCIETY	P.O.BOX 660 – 20103, ELDAMA
121	SMART CHAMPIONS	P.O BOX 64-60205, GITHINGO
122	SMART LIFE SACCO	P.O BOX 118-30705, KAPSOWAR.
123	SOLUTION SACCO	P.O.BOX 1694 – 60200, MERU.
124	SOTICO SACCO SOCIETY	P.O.BOX 959 – 20406, SOTIK.
125	SOUTHERN STAR SACCO	P.O BOX 514-60400, CHUKA
126	SHOPPERS SACCO	P.O. BOX 16 – 00507, NAIROBI
127	STAKE KENYA SACCO	P.O.BOX 208 – 40413, KEHANCHA.
128	STIMA SACCO SOCIETY	P.O.BOX 75629 – 00100, NAIROBI.
129	SUKARI SACCO SOCIETY	P.O BOX 841-50102, MUMIAS
130	SUBA TEACHERS SACCO	P.O. BOX 237-40305, MBITA.
131	SUPA SACCO SOCIETY LTD	P.O.BOX 271 – 20600, MARALAL.
132	TAI SACCO SOCIETY LTD	P.O.BOX 718 –00216, GITHUNGURI.
133	TAIFA SACCO SOCIETY	P.O.BOX 1649 – 10100, NYERI.
134	TARAJI SACCO SOCIETY	P.O.BOX 605 – 40600, SIAYA.
135	TEMBO SACCO SOCIETY	P.O.BOX 91 – 00618, RUARAKA
136	TENHOS SACCO SOCIETY	P.O.BOX 391 – 20400, BOMET.
137	THAMANI SACCO SOCIETY	P.O.BOX 467 – 60400, CHUKA.
138	TRANSCOUNTIES SACCO	P.O. BOX 2965-30200, KITALE.
139	TRANS NATION SACCO	P.O.BOX 15 – 60400, CHUKA.
140	TIMES U SACCO SOCIETY LTD	P.O.BOX 310 – 60202, NKUBU.
141	TOWER SACCO SOCIETY	P.O.BOX 259 – 20303, OL'KALOU.
142	TRANS- ELITE COUNTY	P.O BOX 547-30300, KAPSABET.
143	UFANISI SACCO SOCIETY	P.O BOX 2973-00200, NAIROBI.
144	UCHONGAJI SACCO	P.O. BOX 92503-80102, MOMBASA.
145	UKRISTO NA UFANISI WA	P.O BOX 872-00605, NAIROBI.
146	UKULIMA SACO SOCIETY	P.O.BOX 44071 – 00100, NAIROBI.
147	UNAITAS SACCO SOCIETY	P.O.BOX 38791– 00100, NAIROBI.
148	UNI-COUNTY SACCO	P.O BOX 10132-20100, NAKURU
149	UNITED NATIONS SACCO	P.O.BOX 30552 – 00100, NAIROBI.
150	UNISON SACCO SOCIETY	P.O BOX 414-10400, NANYUKI.
151	UNIVERSAL TRADERS	P.O.BOX 2119– 90100, MACHAKOS.
152	VIHIGA COUNTY FARMERS	P.O BOX 309-50317, CHAVAKALI.
153	VISION POINT SACCO	P.O.BOX 42 – 40502, NYANSIONGO.
154	VISION AFRICA SACCO	P.O BOX 18263-20100, NAKURU.
155	WAKENYA PAMOJA	P.O.BOX 829 – 40200, KISII.
156	WAKULIMA COMMERCIAL	P.O.BOX 232 – 10103,
157	WANAANGA SACCO	P.O.BOX 34680 – 00501, NAIROBI.
158	WANANCHI SACCO	P.O.BOX 910 – 10106, OTHAYA.
159	WANANDEGE SACCO	P.O.BOX 19074 -00501, NAIROBI.

160	WASHA SACCO SOCIETY	P.O.BOX 83256–80100, MOMBASA.
161	WAUMINI SACCO SOCIETY	P.O.BOX 66121 – 00800, NAIROBI.
162	WEVARSITY SACCO	P.O BOX 873-50100, KAKAMEGA
163	WINAS SACCO SOCIETY	P.O.BOX 696 – 60100, EMBU.
164	YETU SACCO SOCIETY LTD	P.O.BOX 511 – 60202, NKUBU.

Source: SASRA, 2015