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EFFECT OF LIQUIDITY RISK ON FINANCIAL PERFORMANCE OF DEPOSIT TAKING SAVINGS AND CREDIT SOCIETIES IN KENYA

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Abstract

The purpose of this study was to determine the influence of Liquidity risk on financial performance of deposit taking savings and credit co-operatives (DT Saccos) in Kenya. 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 31st December 2016. The study adopted census and considered all the Deposit Taking Saccos for study. Secondary data was collected from 135 deposit taking Sacco's audited financial statement which represented 82.32% success rate. Data was analyzed using both descriptive and inferential statistics. The result indicates liquidity risk has a negative and significant influence on financial performance. The study gives recommendations that Deposit Taking 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. This paper is addressing liquidity risk by the Deposit Taking Saccos in Kenya. Past researcher have not given the *proper attention to liquidity risk. This paper helps one to get a deeper understanding of liquidity risk and its effect on the Deposit taking Saccos. To mitigate liquidity risk the manager must ensure that they have sufficient cash resources.*

Keywords: Kenya, Deposit Taking Saccos, Liquidity Risk, Financial Performance

INTRODUCTION

"Liquidity risk is a risk arising from a bank's inability to meet its obligations when they come due without incurring unacceptable losses" (Comptroller of the Currency, 2011). This risk can adversely affect both Deposit Taking Sacco's earnings and the capital. Therefore, it becomes the top priority of a DT Sacco's management to ensure the availability of sufficient funds to meet future demands of customers and borrowers. Liquidity risk can be defined as the risk of being unable to liquidate a position timely at a reasonable price (Muranaga and Ohsawa, 2002).

Liquidity risk has attracted significant attention of researchers and risk professionals alike, after the leading banking crises in recent times. Liquidity risk may have a shattering impact on a bank that may also cause a bank run (Diamond and Rajan, 2005). It can affect the overall capital and earnings of the DT Saccos adversely and it may face serious consequences if it is not properly managed. A number of empirical studies have been carried out relating liquidity risk and on financial performance of firms. They include; Khan & Syed (2013), Hakimi &Zaghdoudi (2017), Marozva (2015), Song'e (2015), Mwangi (2014), Kamau & Njeru (2016), Muriithi & Waweru (2017), Otieno, Nyagol & Onditi (2016) and Maaka & Ondigo (2013). Some studies found that there is a positive relationship between liquidity and financial performance. For Instance Song'e (2015) conducted a study on the effect of liquidity management on the financial performance of deposit taking Saccos in Nairobi County. Asampleofthe27Deposittaking 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. 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. Mwangi (2014) carried a study on the effects of liquidity on 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 underexamination. The results revealed that there is a positive relationship between liquidity and financial performance.

However other studies found out that liquidity risk is negatively related to financial performance. For example Khan & Syed (2013) conducted a study on liquidity risk and performance of the banking system in Pakistan. Data was collected from the income statements and balancesheet of 15 Pakistani banks during 2006-2011. 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.Marozva (2015) carried a study on Liquidity and bank performance in South Africa 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. The findings revealed that there is a negative significant deterministic relationship between net interest margin and funding liquidity risk. Muriithi & Waweru (2017) conducted a study to examine the effect of liquidity risk on financial performance of commercial banks in Kenya between year 2005 and 2014 for all the 43 registered commercial banks in Kenya. Panel data techniques of random effects estimation and generalized method of moments(GMM) were used to purge time-invariant un observed firm specific effects and to mitigate potential endogeneity problems. Findings indicate the overall effect was that liquidity risk has a negative effect on financial performance.

Statement of the problem

The overall performance of DT Saccos has been declining drastically as measured by ROE and interest margin to gross income. Liquid assets to total assets reduced from 10.3 percent in 2013 to 9.95 percent in 2014, indicating the decline in liquidity thereby posing liquidity risk (Sacco Supervision Report, 2016).

This research is intended to fill the gap of inadequate information and understanding that exists in relation to Liquidity risk and financial performance of deposit taking Saccos in Kenya. As reflected by the presented empirical literature there is an inconsistency of research findings on whether liquidity risk leads to the financial performance. Studies by (Song'e, 2015; Mwangi, 2014; Otieno, Nyagol & Onditi, 2016) established that there is a positive relationship between liquidity risk and financial performance. However, studies by Khan& Syed (2013), Hakimi &Zaghdoudi (2017), Marozva (2015),Kamau & Njeru (2016), Muriithi & Waweru (2017) and Maaka & Ondigo (2013) on Liquidity risk and financial performance revealed that liquidity risk have a negative and significant statistical impact on financial performance. Therefore, there is no consensus as to whether proper liquidity risk management leads to financial performance; this contradicting finding necessitates a study on influence of liquidity risk on financial performance of DT Sacco.

Research Objectives

The general objective of the study was to investigate the effect of liquidity risk on financial performance of Deposit Taking Saccos in Kenya

The specific objectives included:

1. To establish the effect of liquid investment on financial performance of Deposit Taking Saccos in Kenya
2. To examine the effect of liquidity reserves on financial performance of Deposit Taking Saccos in Kenya

THEORETICAL REVIEW

Shiftability Theory

This study was anchored on Shiftability theory. Shiftability theory was developed by Moulton (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.

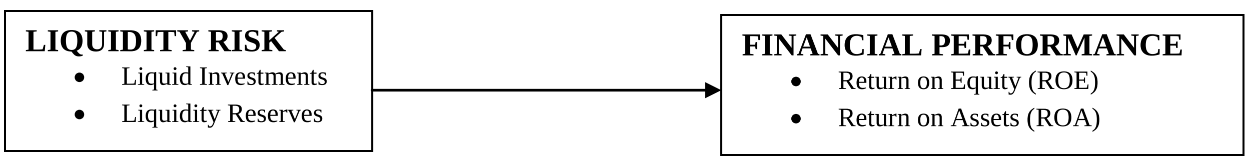
This theory has certain elements of truth. Banks now accept sound assets which can be shifted on to other banks. Shares and debentures of large companies are accepted as liquid assets along with treasury bills and bills of exchange. This has encouraged term lending by banks. The Shiftability theory has 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. Shiftability theory argues that liquidity of a SACCO is guaranteed when it has assets which can be shifted to other banks before maturity when needed. Shiftability is this sense implies transfer of assets to the central bank and not to other banks. The central bank here is the lender of last resort (Acharya&Naqvi, 2012).

Conceptual Framework

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). 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 1

Figure 1: Conceptual Framework



RESEARCH METHODOLOGY

Research Design

This study adopted descriptive research design. 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).

Target Population

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 (Sacco Supervision Report, 2016)

Data Collection

The Secondary data was extracted from audited financial statement submitted to SASRA by the DT Saccos after they have been registered by the commissioner of Co-operative. The data is for 6-year period from 2010-2015. The Panel data was collected because it will help to study the behavior of each DT Sacco overtime and across space (Baltagi, 2005 & Gujarati, 2003).

Data Processing

The data was organized and financial ratios computed using Excel program in order to obtain the study variables. The balanced panel data collected was analyzed quantitatively using regression equations, with the help of a statistical tool known as STATA.

Data Analysis

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)
The study tested the data so as to know which model will be adopted either fixed effect or random effect model. The main objective was 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 liquidity risks were 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)

The model was as follows

$$Y_{it} = \beta + \beta_1 X_{it} + \varepsilon_{it}$$

Where: Y_{it} Financial performance, X_{it} Liquidity risks

ANALYSIS AND FINDINGS

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 variable; liquidity risks 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. 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 DT Saccos.

Univariate analysis of Liquidity Risk

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 1. 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 1. 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 this is an overall mean that is above the minimum 15% for all firms across all the years. 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 banks at different times of the year. As shown in table 2, this is a contribution of both variations between groups and within group, however there is a higher variation within groups than between groups.

Table 2: 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 3, 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 3, 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 3: 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 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: 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 5. 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 5: Unit-root test for panel stationarity of liquidity risks

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

Univariate analysis of Financial Performance

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 6, 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 6: 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 7 which 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 6.

Table 7: 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 2 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.

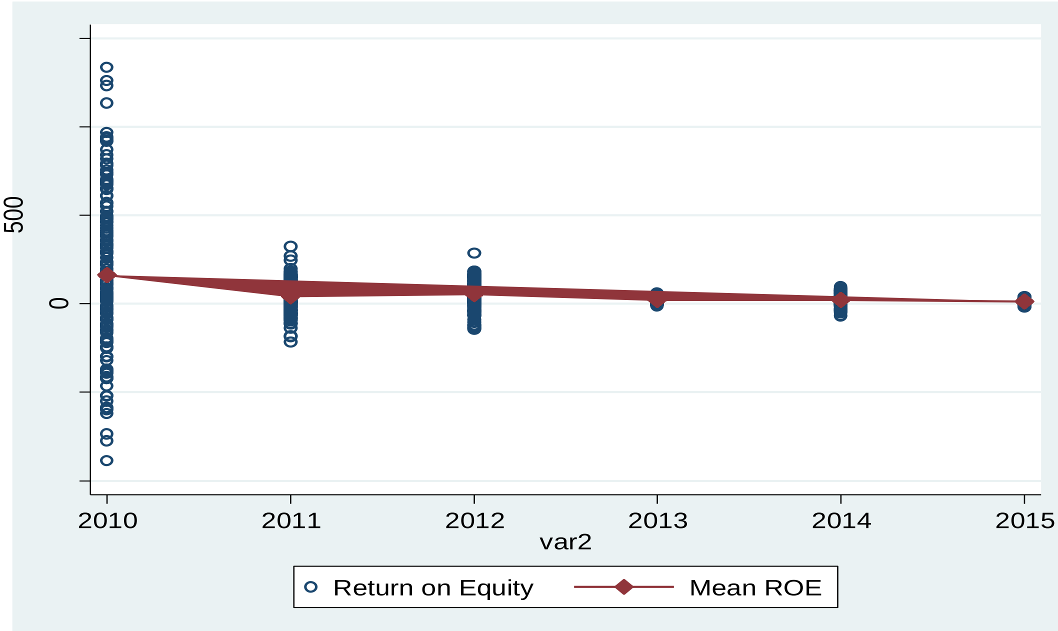


Figure 2: Return on Equity against time

Figure 3 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.

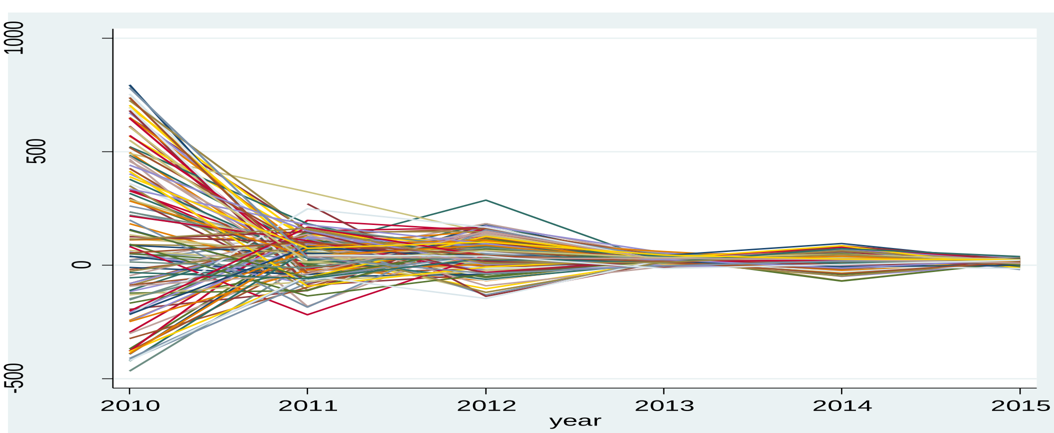


Figure 3: ROE Spaghetti plot

Further to the spaghetti plot, the box plots in figure 4 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.

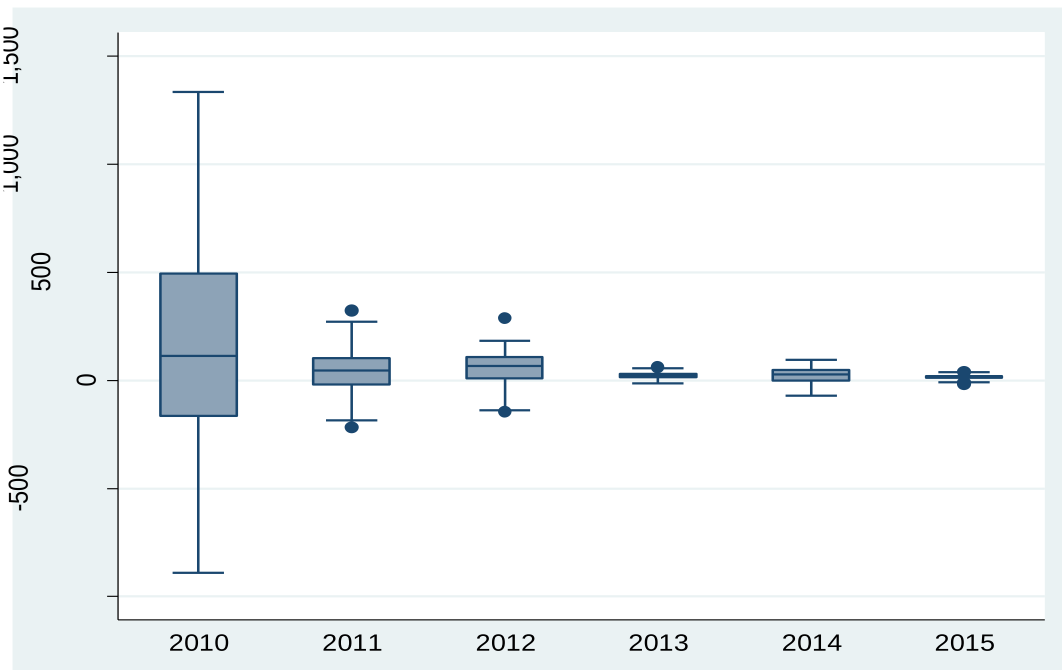


Figure 4: Box plot over time

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.

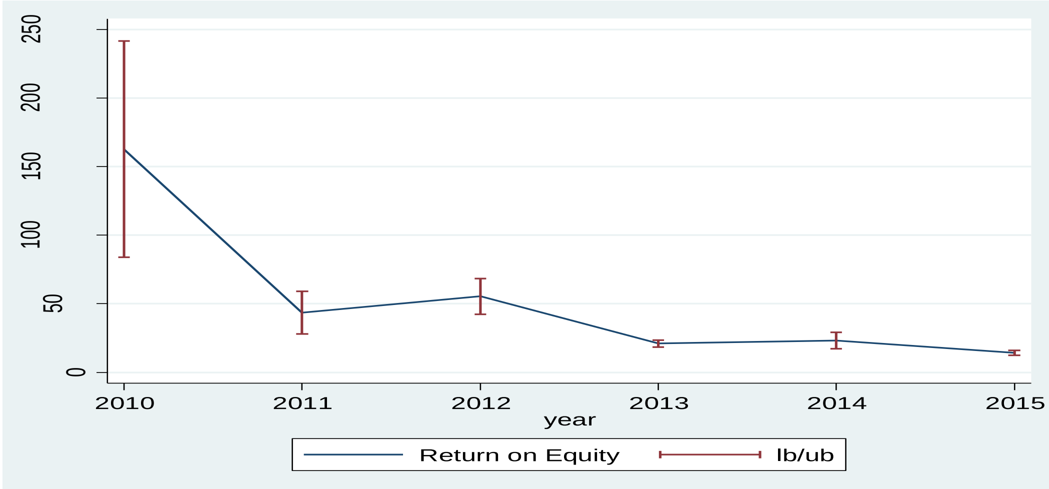


Figure 5: Roe over time (mean, CI) plot

The scatter plots in Figure 6 showed a rather seemingly horizontal line implying no virtual trend despite the seemingly trended data on mean ROE. The figure 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.

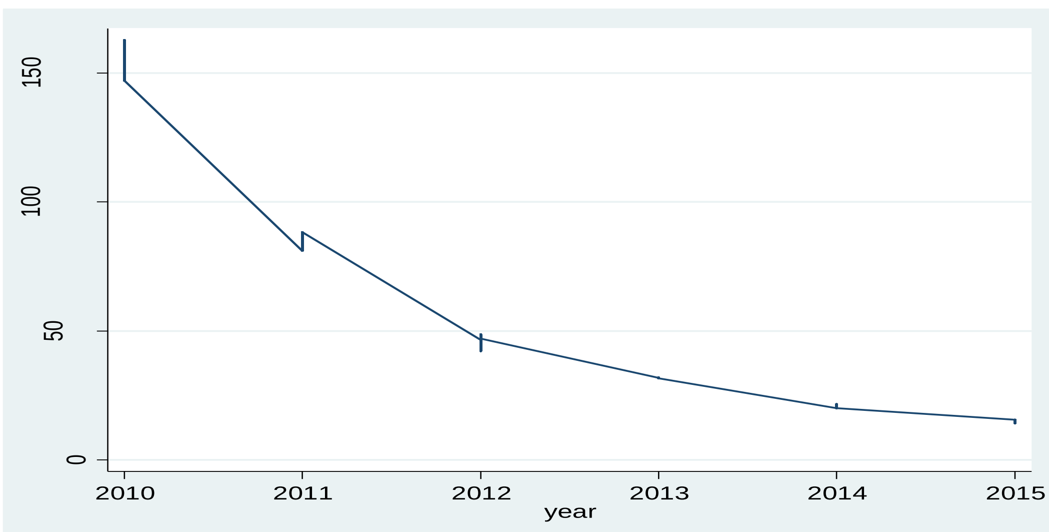


Figure 6: Lowess smoothened curve

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 7 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 8. 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 8: 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 9 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 9: 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 in line 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 10.

Table 10: 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 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 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.

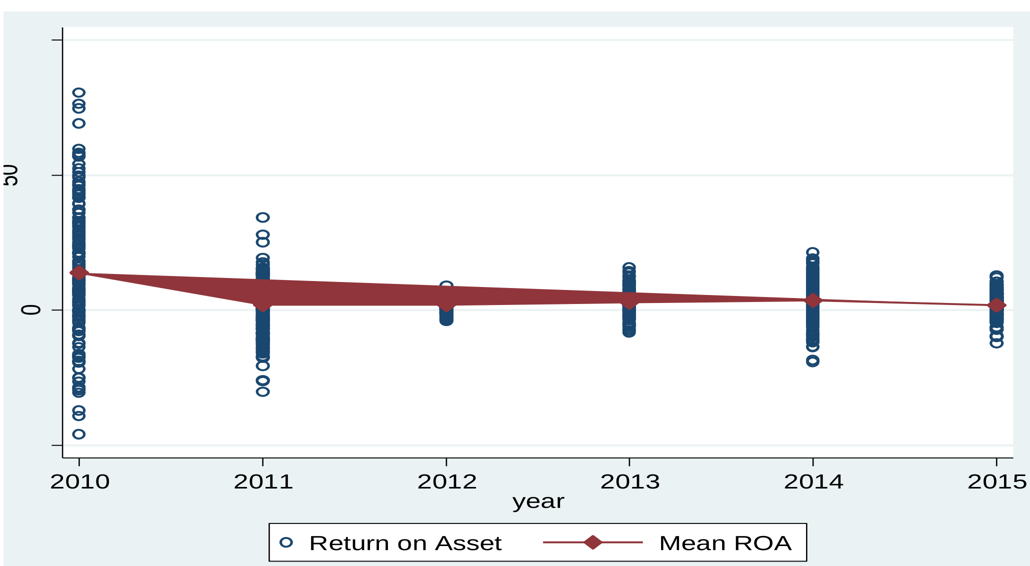


Figure 7: Return on Assets against time

Figure 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.

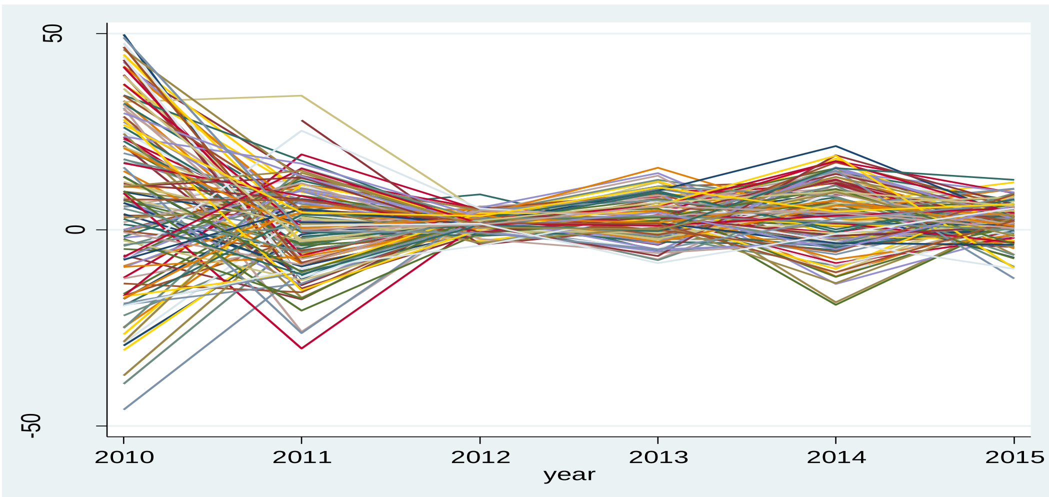


Figure 8: ROA Spaghetti plot

Figure 9 show the box plots of ROA over time. This 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.

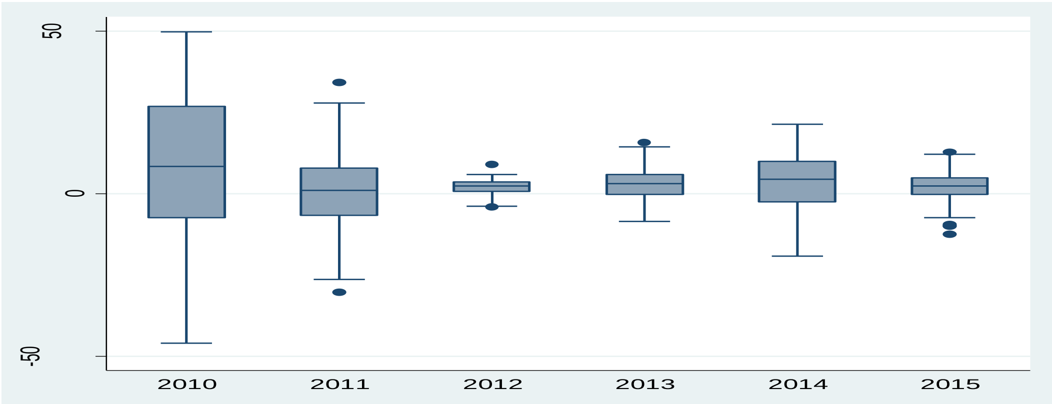


Figure 9: ROA Box plots over time

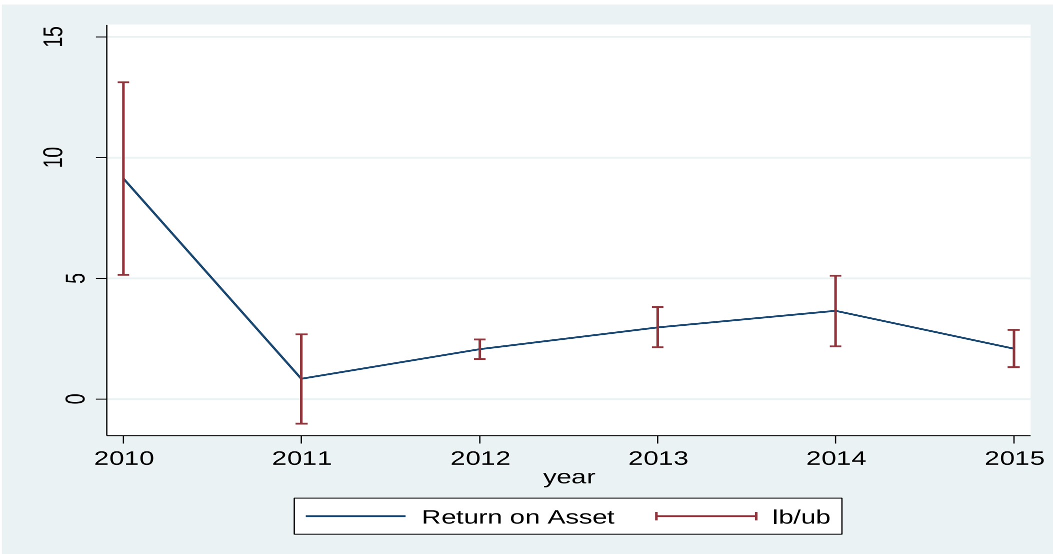


Figure 10: ROA over time (mean, CI) plot

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.

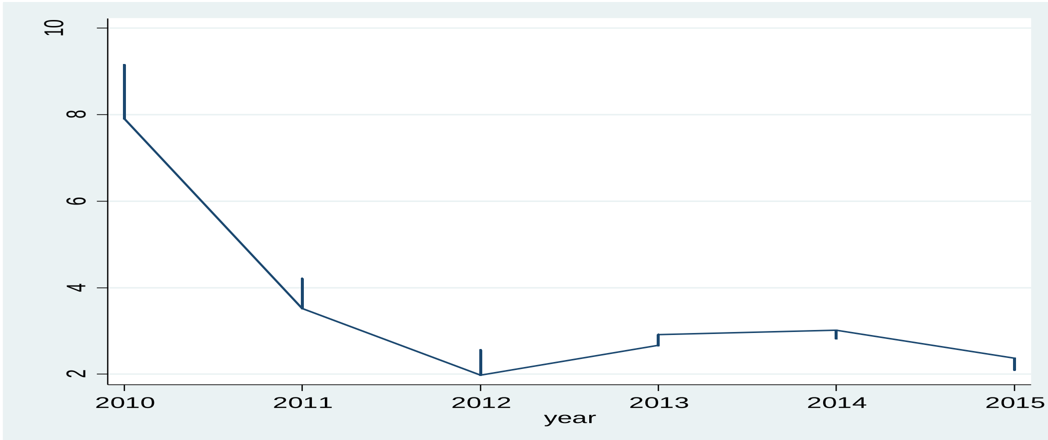


Figure 11: Lowess smoothened curve

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 11, 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 11: 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 12 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 12: 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 13: Unit-root test for panel stationarity

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

Inferential Analysis

The aim of the study was to determine the influence of Liquidity risk on financial performance of deposit taking Saccos in Kenya. Inferential analysis techniques were used to determine the influence liquidity risk on the dependent variable performance. 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

Or

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

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.

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

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 14. 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 14: 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 15. 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 R^2 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 Saccos.

Table 15: 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 16. 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 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 & Syed (2013), Hakimi &Zaghdoudi (2017), Marozva (2015), Kamau & Njeru (2016), Muriithi & Waweru (2017) and Maaka & Ondigo (2013) but contradict the finding by (Song'e, 2015; Mwangi, 2014; Otieno, Nyagol & 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 16: 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			

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 17 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 error 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 Wooldrige 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 error 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 17: 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 Heteroskedasticity (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

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.

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.

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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.

SUMMARY, CONCLUSION AND RECOMMENDATION

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.

The study 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 risk 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. 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.

The current study has focused primarily on ROE and ROA of the Deposit taking Saccos as measure of the financial performance. Further research may take a broader view of the performance and can also include economic factors.

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