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Influence of Credit Risk of Financial Performance of Deposit Taking Savings And Credit Co-Operatives in Kenya

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Abstract: *The purpose of this study was to empirically examine the influence of credit risk on financial performance of deposit taking savings and credit co-operatives in Kenya. The econometrics methods used in the study involves assessing the influence of the selected independent variables; Loan Delinquency and Loan Loss Provisions on financial performance of DT Saccos in Kenya. 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. 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 credit risk has a negative and significant influence on financial performance. 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.*

Keywords: *Kenya, Deposit Taking Saccos, Credit Risk, Financial Performance*

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I. Introduction

The studies which discuss the relationship between credit risk and financial performance have frequently contradicted their findings. Some studies have concluded the a positive relationship between credit risk and financial performance for instance 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. 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. Afriyie and Akotey (2015) Carried as study on the impact of credit risk management on the profitability of rural and community banks in the BrongAhafo Region of Ghana. 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. Nyambere (2013) carried a study todetermine the effectofcreditriskmanagementonfinancialperformance ofdeposittaking SavingsandCredit Co-operative SocietiesinKenya. The finding revealed that there waspositive relationshipbetweenfinancialperformance (ROE) andallthe tested independent variables at 0.179, 0.063, 0.240, 0.003 and 0.160 for CapitalAdequacy ,AssetQuality,ManagementEfficiency andEarningsLiquidity respectively.

However other studies found out that credit risk is negatively related to financial performance, for example Rasika and Sampath (2015) carried out a study toinvestigatein to the effectof Credit Risk on the FinancialPerformance of ommercial BanksinSriLanka with special reference to Systemically ImportantBanks from2011to 2015usingquarterlyfinancialreports. ResultsoftheanalysisstatesthatbothNPLRandCARhave negativeandrelativelysignificanteffectonROE,withNPLRhavinghighersignificanteffectonROEin comparison toCAR.Creditriskstillremainsamajorconcernforthecommercial banks inSriLankabecauseand itisanimportantpredictorofbankfinancialperformance. Olawale (2016) did a study to examine the effectofcreditriskoncommercialbanks performance in Nigeria. 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 toprofitabilityat5%levelofsignificant. Muriithi, Waweru and Muturi (2016) carried out a study with the objective to assesstheeffectofcreditriskonfinancialperformance ofcommercial banksinKenya. Fromtheresultscredit risk hasanegativeandsignificantrelationshipwith bankprofitability.Poorassetqualityorhighnon-performing loanstototalassetisrelatedtopoorbank performancebothin shortrunandlongrun.

Statement of the problem

Credit risk is one of significant risks of Deposit taking Saccos by the nature of their activities of granting credit facilities as they accept deposits. Through effective management of credit risk exposure Saccos not only support the viability and profitability of their own business but also contribute to systemic stability and to an efficient allocation of capital in the economy. Deposit Taking Saccosconsciouslytakeriskastheyperformtheirroleoffinancial intermediationinthe economy.Consequently,theyassume variousrisks,whichinclude credit risk, interest raterisk,liquidityrisk,andoperationalrisk.Managingthese risksisessentialfortheirsurvivalandprosperity.Lossesfromasingleloanora material breakdownin controlscaneliminatethegainonmanyothertransactions (Psillaki, Tsolas & Margaritis, 2010). Sacco Supervision Report (2016) indicated that 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. The increasing level of non- performing loan rates in Deposit Taking Saccos poor loan processing, inadequate or absence of loan collaterals among other things are linked with poor and ineffective credit risk management that negatively impact on DT Saccos financial performance. This therefore necessitates a study on influence of credit risk on financial performance of DT Sacco in Kenya.

Research Objectives

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

The specific objectives included:

1. To establish the effect of loan delinquency on financial performance of Deposit Taking Saccos in Kenya
2. To examine the effect of loan loss provisions on financial performance of Deposit Taking Saccos in Kenya

II. Theoretical Review

This study was anchored on Information Asymmetry Theory which is explained below.

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) and 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.

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.From the analysis of the literature presented the conceptual framework of the study can be presented as shown in figure 1

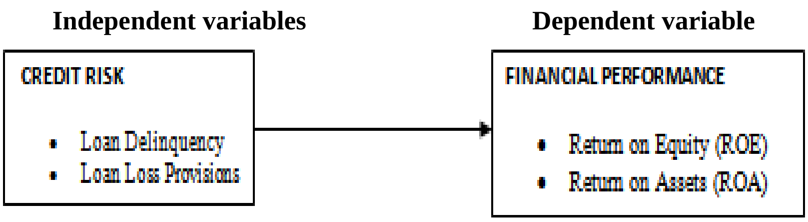

Figure 1: Conceptual Framework

III. Research Methodology

Research Design

This study adopted descriptive researchdesign.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 Paneldatawas collectedbecauseit will helptostudy thebehaviorofeachDT Saccoovertime and across space(Baltagi, 2005 & Gujarati, 2003).

Data Processing

The data wasorganizedandfinancialratioscomputedusingExcelprogram in ordertoobtainthestudyvariables.Thebalancedpaneldatacollectedwas analyzed quantitatively usingregression equations, with the help of astatisticaltool known as STATA.

Data Analysis

Credit risk was 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)

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 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 Loan Loss Provisions. By factor analysis, the latent variables financial performance and credit risk 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 Risk)
The model was as follows
$Y_{it} = \beta + \beta_1 X_{it} + \varepsilon_{it}$
Y_{it} Financial performance
X_{it} Credit risk

IV. 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; Credit 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 measure of central tendency considering the mean and standard deviation as a measure of dispersion for all. The measurements of this variable based on the 2 credit ratios that were observed and collected over the 6 year period from 2010 to 2015 by the Saccos.

Univariate analysis of Credit Risk

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 1. 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 1: 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 outside the required maximum of 5% and is attributed to the high mean and high variation in the earlier years. As shown in table 2, 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 banks but the year's exhibit heterogeneity.

Table2: 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 3 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 banks 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 3: 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 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: 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 risk 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 5: Unit-root test for panel stationarity of credit risks

	Statistic	p-value
Unadjusted t	-36.304	
Adjusted t*	-39.425	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 6. Table 7 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 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.

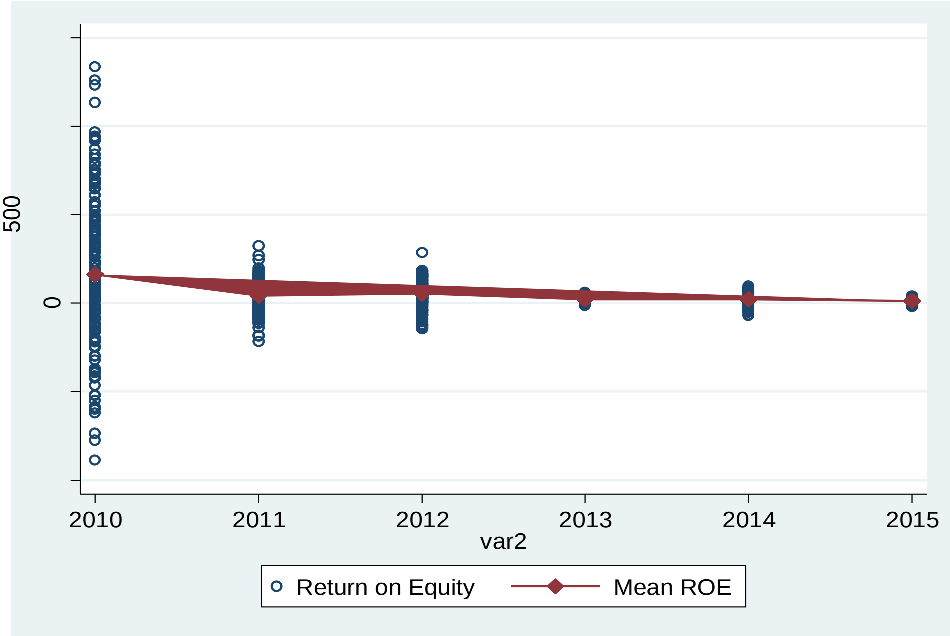

Figure 2: Return on Equity against time

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.

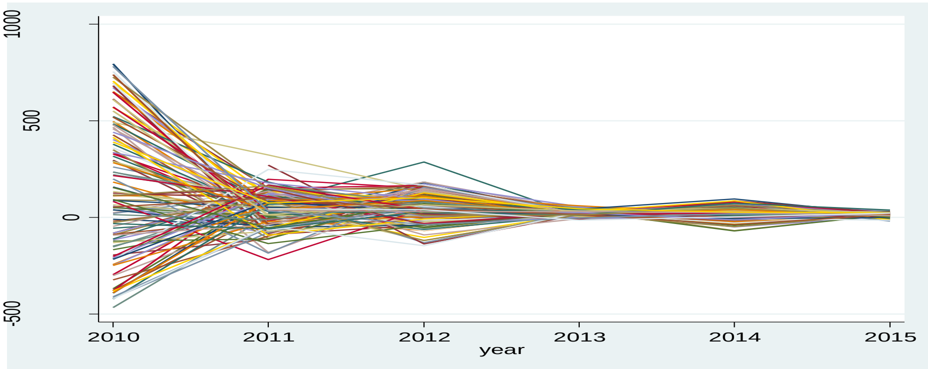

Figure 4: ROE Spaghetti plot

Further to the spaghetti plot, the box plots in figure 5 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.

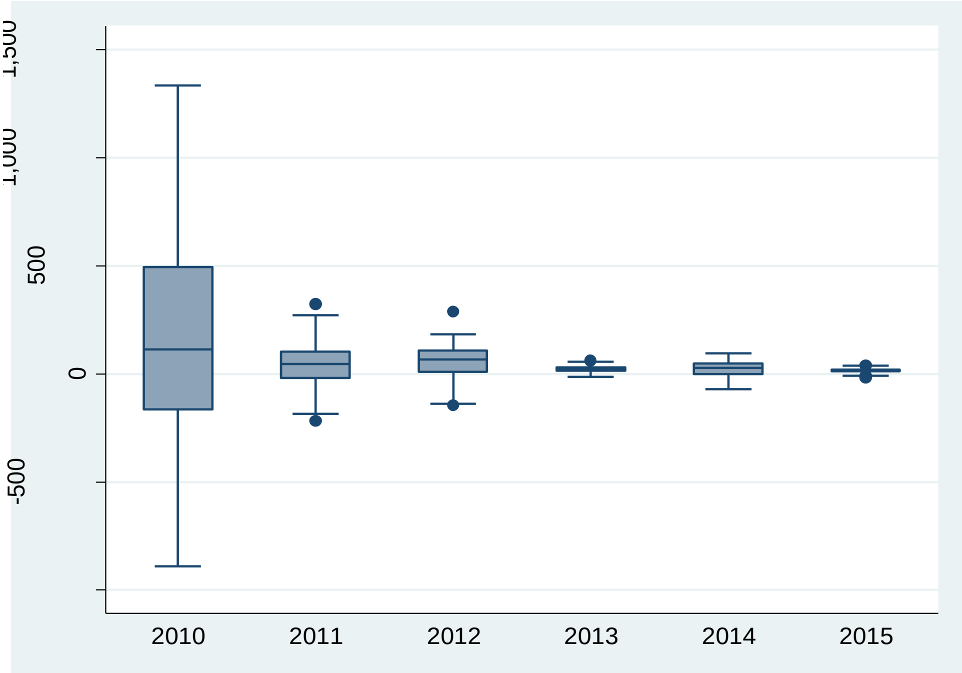

Figure 5: Box plot over time

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.

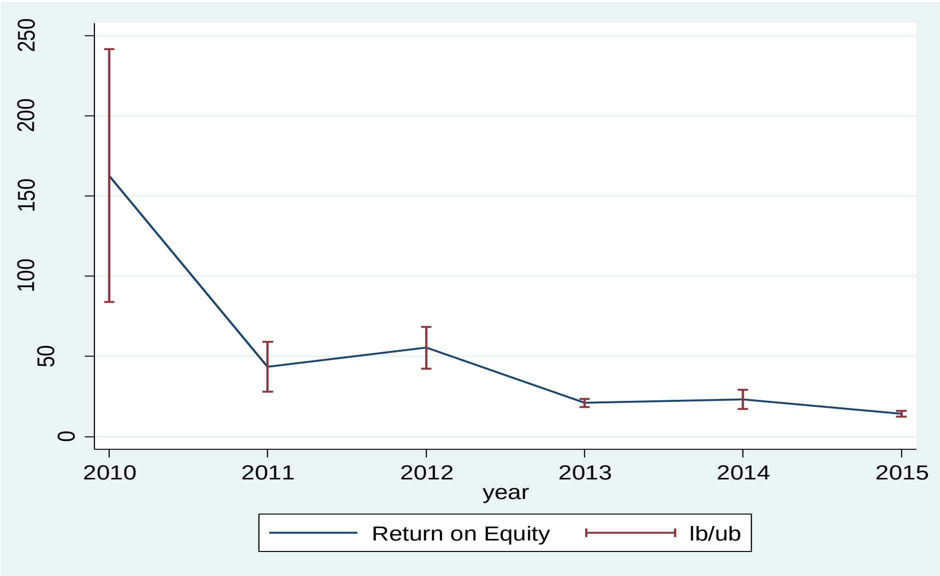

Figure 6: Roe over time (mean, CI) plot

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

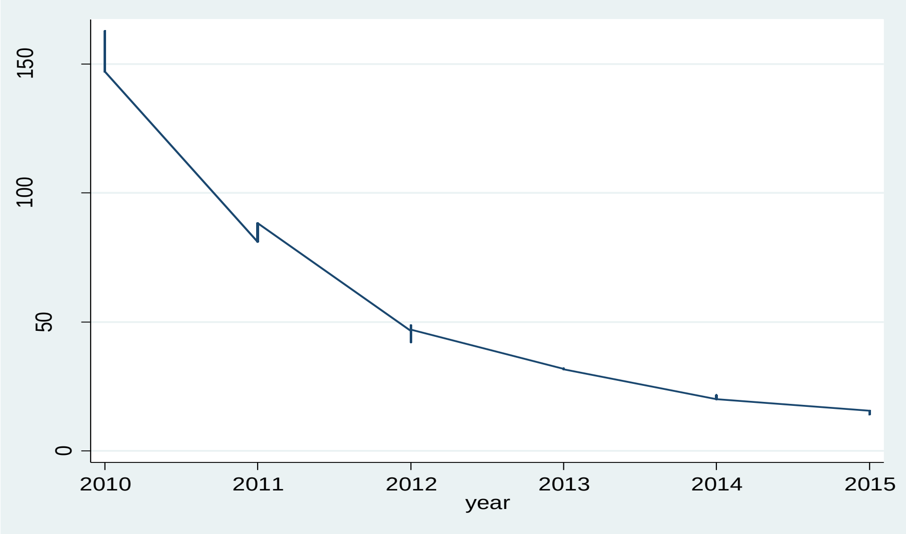

Figure 7: Lowess smoothened curve

Being that ROE is an observed measure of performance which is the dependent variable, it is important to know the behavior 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 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 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 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 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 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 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.

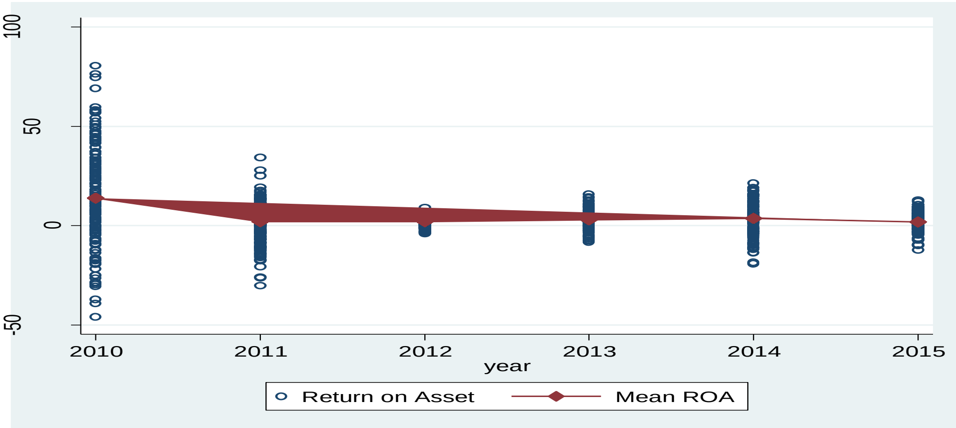

Figure 1: Return on Assets against time

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.

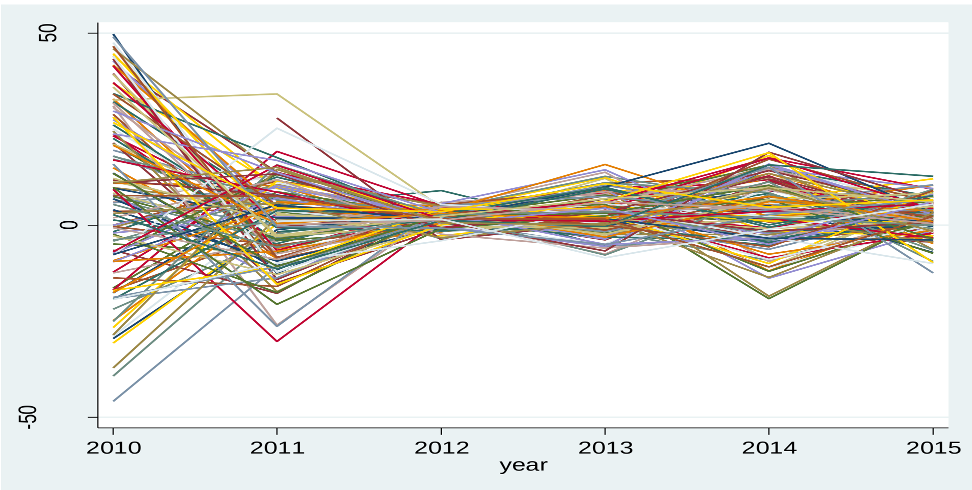

Figure 2: ROA Spaghetti plot

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.

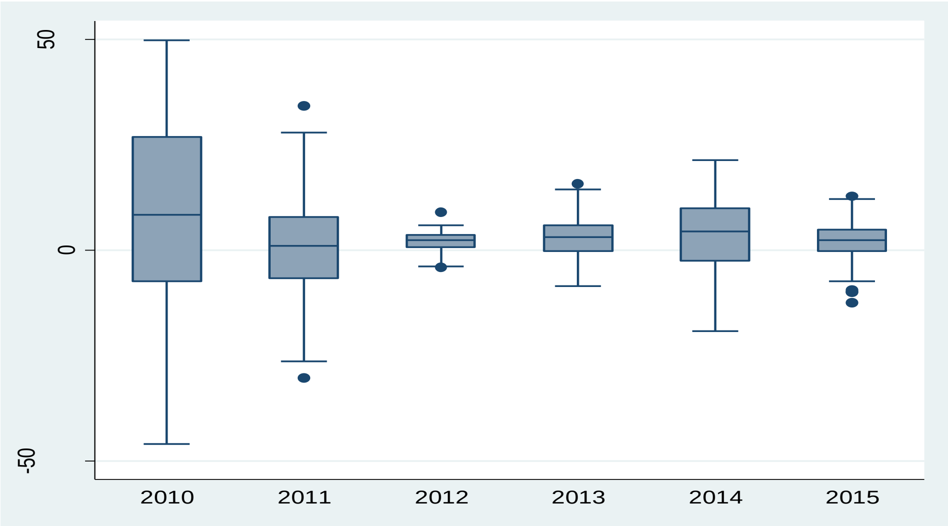

Figure 4.3 ROA Box plots over time.

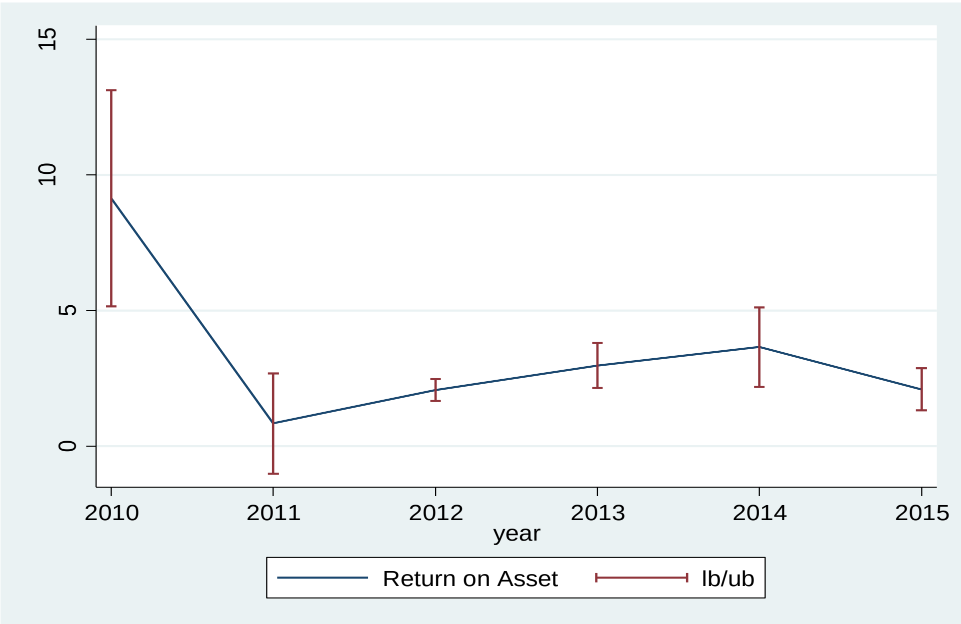

Figure 4: ROA over time (mean, CI) plot

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.

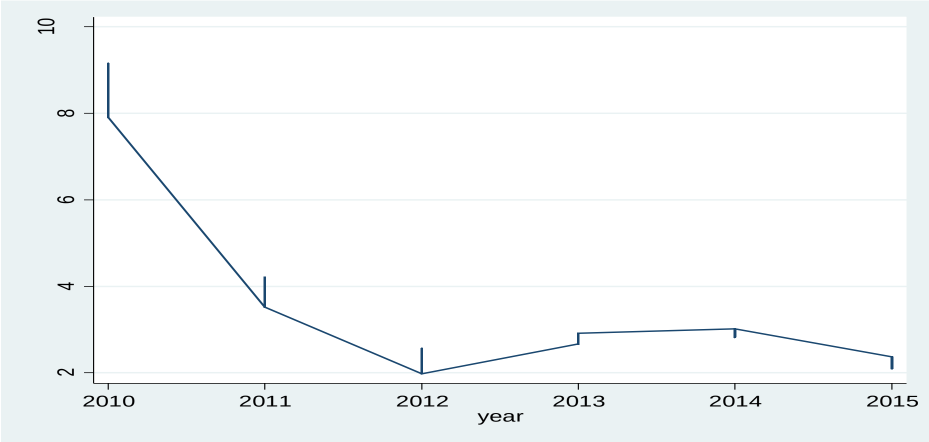

Figure 5: Lowess smoothened curve

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 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 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 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;

$\mathbf{Y_{it} = \beta + \beta_1 X_{it} + \varepsilon_{it}}$ …….... Fixed effect
Or
$\mathbf{Y_{it} = \beta + \beta_1 X_{it} + \mu_{it} + \varepsilon_{it}}$ ..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 credit risk and financial performance of deposit taking Saccos

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 risks 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 14: 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 performance that is explained by the variation of the predictors in the model. The R^2s within, between and the overall R^2 are 0.176, 0.148 and 0.167 respectively. The R^2within 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 15: 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 infraclass 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 & Sampath (2015), Hosna, Manzura & Juanjuan (2009), Olawale (2016), Bizuayehu (2015), Kaaya & Pastory (2013), Muriithi, Waweru & Muturi (2016) that credit risk negatively affects financial performance of banks. However, Li & Zou (2015), Afriyie & 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 16: 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			

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 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 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 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.

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.

Summary, Conclusion And Recommendation

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 delinquentloans. 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 delinquentloans 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.

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 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 study investigated the influence of credit risk on financial performance of DT Saccos in Kenya. It is therefore recommended that future studies be carried out on the effect of financial performance on credit risk of DT Saccos in Kenya

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