Journal of Accounting, Finance and Auditing Studies
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Loan Portfolio Risk and Capital Adequacy in Kenya's Deposit-Taking Savings and Credit Cooperative Societies: Implications for Financial Stability and Inclusive Growth

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Received: 05-01-2025 **Revised:** 06-05-2025 **Accepted:** 06-09-2025

Citation: Maina, J. N., Gichaiya, M. W., Mburu, F. M., & Njururi, A. N. (2025). Loan portfolio risk and capital adequacy in Kenya's deposit-taking savings and credit cooperative societies: Implications for financial stability and inclusive growth. *J. Account. Fin. Audit. Stud.*, *11*(2), 106–115. https://doi.org/10.56578/jafas110204.

Abstract: Deposit-Taking Savings and Credit Cooperative Societies (DT-SACCOs) constitute a pivotal segment of Kenya's financial system by fostering domestic savings, facilitating affordable credit access, and advancing financial inclusion, particularly among underserved populations. Despite this critical role, concerns have intensified over the sector's financial resilience due to escalating levels of loan portfolio risk, persistent regulatory non-compliance, and eroding capital adequacy ratios (CAR). These vulnerabilities have been exacerbated by the absence of a lender of last resort, thereby exposing member deposits to elevated systemic risk and constraining the flow of credit to key productive sectors—including micro, small, and medium enterprises (MSMEs), agriculture, and affordable housing. Such constraints are increasingly viewed as impediments to the Bottom-Up Economic Transformation Agenda and to Kenya's broader commitments under the Sustainable Development Goals, particularly those concerning poverty eradication, decent employment, and industrial development. To investigate the interplay between loan portfolio risk and capital adequacy, a positivist research philosophy and a descriptive cross-sectional design were employed. The target population comprised all 174 licensed DT-SACCOs in Kenya. A simple random sampling technique was used, and a 96.5% response rate was achieved. Data were extracted from audited financial statements through a structured collection instrument and analysed using linear regression techniques. Empirical results indicated a statistically significant positive association between loan portfolio risk and capital adequacy ($\beta = 0.0569$, $p = 0.012$), suggesting that increased risk exposure may prompt DT-SACCOs to strengthen capital buffers, either through regulatory compulsion or institutional prudence. It is recommended that DT-SACCOs adopt advanced credit risk mitigation strategies, including AI-enabled credit scoring systems, predictive early warning indicators, and operational automation via chatbots to enhance real-time monitoring and reduce manual error. Emphasis is also placed on the adoption of forward-looking metrics such as expected credit losses (ECL) and scenario-based stress testing under the IFRS 9 framework. Regulatory bodies are urged to enhance supervisory guidance and support financial literacy initiatives among members. Furthermore, capacity building, the promotion of digital loan syndication models, and collaborative risk-sharing frameworks are proposed to fortify capital adequacy, enhance institutional resilience, and ensure long-term sectoral stability.

Keywords: Financial resilience; Capital adequacy; Credit risk; Financial inclusion; Savings and Credit Cooperative Societies (SACCOs); Regulatory compliance; Financial stability; Kenya

JEL Classification: G23; G32; G3

1. Introduction

Capital adequacy is a fundamental measure of financial stability for financial institutions, including SACCOs, as it serves as a buffer against financial shocks, protects depositors' funds, and supports sustainable operations. It also enhances resilience to losses and helps maintain confidence in the financial system (Kakai & Ambrose, 2024).

Adequate capital levels are necessary for risk mitigation and compliance with regulatory requirements and withstanding economic uncertainty (Scott et al., 2024). Financial institutions with sufficient capital buffers are also better positioned to expand lending while maintaining financial discipline (Andersen & Juelsrud, 2024). One major threat to capital adequacy is loan portfolio risk, which arises from borrower defaults. A well-managed loan portfolio reduces this risk and helps preserve capital levels (Atichasari et al., 2023). Conversely, poor management can increase provisions for Non-Performing Loans (NPL), weakening capital adequacy and overall financial stability, especially during economic downturns when defaults rise (Naili & Lahrichi, 2022).

SACCOs worldwide face unique challenges in maintaining capital adequacy due to their cooperative structure, which prioritizes profit distribution among members over capital retention (Waithaka & Odollo, 2024). This unique operational model often limits the ability to build strong capital buffers, increasing vulnerability to financial shocks (Duho, 2023). To remain financially sound while serving members, SACCOs must implement robust loan portfolio risk management strategies such as prudent loan underwriting practices, rigorous stress testing, and effective credit risk assessment. Strong risk frameworks help detect high-risk loans early and support timely interventions, while risk-based pricing ensures interest rates reflect borrower risk and institutional appetite (Nabiba & Miroga, 2024). With growing market complexity, technology and data analytics have become crucial in enhancing credit scoring, identifying early signs of default, and improving risk evaluation. Digital tools also support loan automation, real-time monitoring, and financial risk forecasting (Addy et al., 2024). Following the 2007/08 financial crisis, regulators have enforced stricter capital adequacy standards for SACCOs: the National Credit Union Administrati.

(NCUA) requires a 6 percent capital-to-assets ratio, and Australia and European countries mandates an 8 percent risk-weighted capital ratio, all aimed at bolstering financial resilience (World Council of Credit Unions, 2003).

In Africa, most countries, including Kenya, Tanzania, and Ghana, enforce a 10% CAR to ensure SACCOs remain financially sound, while Rwanda sets a slightly lower requirement of 8% (Wanjiru et al., 2024). Capital adequacy regulations aim to protect SACCOs from financial distress, promote sound governance and enhance resilience. Adequate capital not only ensures financial stability but also boosts member and investor confidence. Regulatory frameworks in countries like Kenya have evolved in response to economic changes, with a growing emphasis on risk-based supervision (Wanjiru et al., 2024). However, Kenyan deposit-taking SACCOs still face challenges in maintaining capital adequacy due to rising loan defaults and credit risk exposure, with NPL reportedly increasing by 9 percent (The Sacco Societies Regulatory Authority, 2024). While some SACCOs have adopted risk-based supervision, the extent to which loan portfolio risk influences capital adequacy remains unclear. This study therefore examined the relationship between loan portfolio risk and capital adequacy in Kenyan deposit taking SACCOs to inform risk management practices and guide regulators, policymakers, and SACCO managers in strengthening financial soundness.

2. Problem Statement

DT-SACCOs are vital to promoting savings, affordable credit, and financial inclusion in Kenya (Kakai & Ambrose, 2024). However, their financial soundness is under threat from regulatory non-compliance and declining capital adequacy. Approximately 8 percent risk delicensing for failing to meet the 10 percent core capital-to-total assets ratio and the Kshs 10 million capital threshold, while even compliant SACCOs saw a 1 percent decline in capital adequacy in 2023 (The Sacco Societies Regulatory Authority, 2024). Rising portfolio risk, evidenced by a 9 percent increase in NPL, is a key factor in the decline and, without intervention, puts members' savings at risk since DT SACCOs lack a lender of last resort (Central Bank of Kenya, 2024). This situation limits credit access to MSMEs, agriculture, and housing sectors, hindering Kenya's Bottom-Up Economic Transformation Agenda, and slowing progress on Sustainable Development Goals one, eight, and nine by limiting credit access, weakening job creation, and reducing economic resilience (Republic of Kenya, 2024). Resolving this issue is vital for safeguarding financial stability and promoting sustainable economic progress.

Existing literature demonstrates inconsistencies in the context, and findings regarding the relationship between loan portfolio risk and capital adequacy. For instance, Arifaj & Baruti (2023), using longitudinal panel data, found that loan risk has an inverse relationship with bank performance indicators such as return on assets (ROA) and return on equity (ROE) in commercial banks across the Balkan countries. Similar results were reported by Wahyuni & Umam (2023) in a study conducted on the Indonesia Stock Exchange. However, Kwashie et al. (2022), while examining the same variables in commercial banks in Ghana, found a weak and statistically insignificant relationship. These conflicts highlight a gap in understanding the dynamics of loan risk and capital adequacy, particularly in DT-SACCOs in Kenya. This study therefore investigated the relationship between loan portfolio risk and capital adequacy in DT-SACCOs, addressing gaps in the existing literature. The findings aimed to inform policy interventions to strengthen DT-SACCO resilience, ensure sustainability, and enhance their role in financial inclusion and economic development in Kenya.

3. Literature Review

The study is anchored on the Risk-Based Capital (RBC) Theory as outlined by the Basel Committee on Banking Supervision (1988), which posits that capital requirements should reflect the underlying risk of a financial institution's assets. RBC theory emphasizes the importance of maintaining capital levels that are commensurate with an institution's risk profile, serving as a buffer against potential losses and a means of enhancing solvency (Basel Committee on Banking Supervision, 1988). SACCOs play a vital role in promoting financial inclusion, particularly in economies with underserved populations. However, they are often characterized by high default rates and the extension of credit to risk-prone sectors, leading to increased loan portfolio risk. This heightened risk threatens financial stability and necessitates larger capital buffers to sustain a feasible CAR, a critical indicator of financial resilience (Basel Committee on Banking Supervision, 2010). According to RBC theory, the capital adequacy framework should evolve in response to a dynamic risk environment, ensuring that financial institutions adopt strategic, rational, and risk-sensitive capital management approaches (Basel Committee on Banking Supervision, 2010). In Kenya, the SACCO Societies Regulatory Authority (SASRA) mandates minimum capital adequacy thresholds, calibrated in accordance with each institution's asset risk profile (The Sacco Societies Regulatory Authority, 2024). Given that loan portfolios typically constitute the bulk of SACCOs' total assets, rising loan risk may prompt these institutions to boost their capital, whether through retained earnings or increased member contributions, to comply with regulatory standards and signal financial strength. SASRA also advocates for the adoption of IFRS 9 – Financial Instruments, which introduces a forward-looking risk assessment framework through the ECL model. This model requires SACCOs to recognize credit losses earlier by incorporating historical data, current conditions, and future forecasts (Central Bank of Kenya, 2020). As a result, higher ECL provisions can reduce net income and retained earnings, thereby weakening the capital base and affecting capital adequacy. Consequently, IFRS 9 complements the RBC theory by offering a real-time approach to aligning capital levels with the underlying risk of loan portfolios.

Despite its relevance, RBC theory has limitations that may restrict its applicability in certain financial contexts. It tends to overemphasize regulatory capital buffers and market failure, often overlooking informal corrective mechanisms such as borrower reputation, peer monitoring, and member guarantees, features that are especially salient in cooperative financial institutions like SACCOs (Lee et al., 2019). Furthermore, the theory assumes rational behavior among financial actors, thereby neglecting behavioral biases such as overconfidence and risk underestimation, which may affect both borrowers and lending officers. In addition, RBC theory does not adequately incorporate the role of modern financial technologies, such as real-time credit scoring and mobile-based repayment tracking, in mitigating credit risk and uncertainty (Maina et al., 2020). These limitations suggest that while RBC theory provides a valuable regulatory framework for understanding capital adequacy, its practical application in SACCOs must be complemented with robust risk assessment tools, enhanced transparency, and context-sensitive regulatory approaches.

Several empirical studies examining the relationship between study variables were reviewed. Yen et al. (2024) studied how loan risk affects the financial performance of commercial banks in Vietnam. The research covered 30 commercial banks from 2017 to 2022, with a total of 180 observations in a balanced panel. A Fixed-Effects Model with adjusted standard errors was used to control for differences among banks. Financial performance was measured using ROE, ROA, and Net Interest Margin, while loan risk was measured by the NPL ratio. The study also included control variables such as the cost-to-income ratio, equity to assets, loans to assets, GDP growth, and the impact of Covid-19. The findings showed that higher loan risk reduced profitability. This was because rising NPLs led to higher loan loss provisions and lower profits, caused by weak risk management, information gaps, and moral hazard issues. However, the study was not based on any guiding theory, which weakens its foundation. Further, considering capital adequacy, which is a key factor in a bank's ability to absorb losses, would have added an important dimension to understanding the banks' financial resilience.

Arifaj & Baruti (2023) conducted research on the effect of loan risk on the profitability of commercial banks within the Western Balkan states, namely Kosovo, Albania, North Macedonia, Serbia, Croatia, Montenegro, and Bosnia and Herzegovina. They used secondary data from 26 commercial banks covering the years 2010 to 2022. The banks were grouped by ownership: state-owned, private, and multinational. Profitability was measured using ROA and ROE, while loan risk was represented by the ratio of NPL to total loans. The results showed a strong negative relationship between credit risk and profitability—higher bad loans led to lower ROA and ROE. However, the study's exclusive reliance on secondary data and its use of NPL as the sole proxy for loan risk may limit the comprehensiveness of its conclusions, as it overlooks other important dimensions such as loan concentration, provisioning policies, and borrower characteristics. Additionally, the absence of a guiding theoretical framework, the omission of critical moderating variables like capital adequacy, and the lack of macroeconomic and bank-specific factors undermine the robustness and contextual relevance of the findings.

Wahyuni & Umam (2023) investigated the effect of credit risk on the financial performance of conventional banking institutions in Indonesia using a profitability approach. The study was grounded in agency theory and employed panel data regression for analysis. The sample consisted of conventional banks listed on the Indonesia

Stock Exchange between 2019 and 2021, selected through purposive sampling based on specific criteria. The rationale for focusing on the banking sector was its essential role in supporting Indonesia's economic growth and serving community financial needs. Credit risk was measured using the NPL ratio, while financial performance was assessed through ROA. The findings revealed that credit risk had a negative but statistically insignificant effect on ROA. However, the use of purposive sampling, which is a qualitative approach, in a quantitative regression analysis presents a methodological inconsistency. Since purposive sampling lacks randomness, it may limit the generalizability of the results and weaken the validity of the statistical conclusions drawn from the regression model.

Kwashie et al. (2022) explored how loan risk, specifically NPL, impacts the financial performance of commercial banks in Ghana. Using data from 15 banks between 2013 and 2018, the study measured performance with ROA and Economic Value Added (EVA). It also considered internal factors like bank size and age, along with macroeconomic variables such as GDP, inflation, and the monetary policy rate. The random effects estimation showed that higher NPLs negatively affected both ROA and EVA. Additionally, the monetary policy rate had a negative but insignificant impact on EVA. Bank size, age, and GDP positively influenced performance, particularly ROA. The study recommended improved loan risk management and regular collateral value reviews. Nevertheless, the small sample size of 15 banks may limit the generalizability of the findings to other banks in Ghana or regions with different economic conditions.

4. Conceptual Framework

The conceptual framework illustrated in Figure 1 depicts the hypothesized relationship between loan portfolio risk and the capital adequacy of deposit-taking SACCOs. In this framework, loan portfolio risk measured through non-performing loans, is expected to influence capital adequacy, which is assessed using the regulatory measure of core capital to total assets ratio. Guided by the Risk-Based Capital Theory as outlined by the Basel Committee on Banking Supervision (1988) & Basel Committee on Banking Supervision (2010), the framework assumes that as loan portfolio risk increases, SACCOs may be required to maintain higher capital buffers to sustain financial resilience and comply with regulatory thresholds (The Sacco Societies Regulatory Authority, 2024). This relationship emphasizes the importance of effective credit risk management in safeguarding the capital position of SACCOs and ensuring long-term financial sustainability.

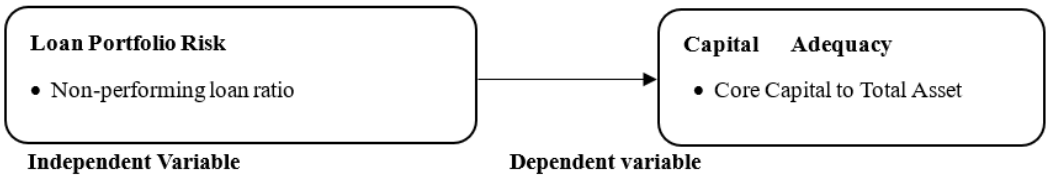

Figure 1. Conceptual framework

5. Research Methodology

The study was guided by a positivist philosophy and employed a descriptive cross-sectional survey design. A census approach was applied, targeting all 174 deposit-taking SACCOs in Kenya (The Sacco Societies Regulatory Authority, 2024) to ensure complete representation of the sector. Simple random sampling was used to select respondents, achieving a 96.5% response rate. The potential impact of the 3.5% non-response was evaluated through comparative analyses of key SACCO characteristics between respondents and non-respondents. Independent samples t-tests were conducted on total assets and membership size, yielding non-significant differences ($p > 0.05$). Furthermore, a chi-square test of independence indicated no significant association between response status and geographic location ($p > 0.05$). These statistical tests collectively indicate that non-response bias is unlikely to have materially affected the study's representativeness or validity. Secondary data was gathered from the audited annual reports of SACCOs using a structured data collection sheet, ensuring reliability and consistency. The audited reports analyzed covered the year 2024, and data was accessed through SASRA's public repository and direct requests to individual SACCOs. Simple linear regression was used to analyze the numerical data and assess relationships between variables. To ensure the validity of the regression model, key assumptions, including normality, collinearity, multicollinearity, and heteroscedasticity, were tested. This rigorous approach ensured the study's findings were robust and reflective of the sector's financial realities. The predictor and outcome variables were measured based on the ratios R_1 and R_2, respectively:

$$\boldsymbol{R_1}: Non\ Performing\ Loan\ Ratio = \left(\frac{Non\ Performing\ Loans\ [NPLs]}{Total\ Gross\ Loans}\right) x\ 100$$

$$\boldsymbol{R_2}: Core\ Capital\ to\ Total\ Assets = \left(\frac{Core\ Capital}{Risk\ Weighted\ Assets}\right) x\ 100$$

6. Results and Discussion

This section outlined the analysis and discussion of the descriptive results, and hypothesis testing.

6.1 Loan Portfolio Risk Descriptive Statistics

Loan portfolio risk was evaluated using the NPL ratio, and log transformation was applied to improve normality and meet regression assumptions. The descriptive statistics derived from the transformed data offer valuable insights into the distribution and variability of loan portfolio risk among SACCOs. The mean of the log-transformed NPL ratio was −1.19, which corresponds to original ratios below one and should not be interpreted as negative risk. This transformation helps stabilize variance and reduce skewness in the data. The standard deviation was 0.490, indicating a moderate level of dispersion around the mean. This suggests that although variations in loan portfolio risk exist, the values are relatively consistent across the sample. The moderate variability reflects a reasonably stable risk profile among the observed institutions (Kakai & Ambrose, 2024).

6.2 Capital Adequacy Descriptive Statistics

Capital adequacy was evaluated using the core capital-to-total asset ratio and also log-transformed for statistical validity. The descriptive statistics provide insights into the distribution and variability of capital adequacy within the sample. The mean of the log-transformed CAR was −0.682, reflecting that, on average, SACCOs maintain a core capital ratio of less than one relative to their total assets. This outcome is expected, as CAR typically falls within the 0–1 range. Therefore, the negative mean in logarithmic terms does not imply a negative capital position, but rather indicates that the average capital-to-asset ratio is below unity. The key concern lies in whether these levels meet or exceed the regulatory minimums set by the SACCO Societies Regulatory Authority. The standard deviation of 0.144 indicates relatively low variability across SACCOs, suggesting that capital adequacy levels are generally consistent across the institutions studied, with only moderate fluctuations (Duho, 2023; Wanjiru et al., 2024).

6.3 Linear Regression Diagnostics

6.3.1 Normality

To evaluate whether the residuals follow a normal distribution, the Shapiro-Wilk test was conducted, and a Q-Q plot was examined. The Shapiro-Wilk test statistic of 0.992 and the p-value of 0.434 indicate that the residuals do not significantly deviate from normality. Since the p-value was greater than the conventional threshold of 0.05, the null hypothesis was not rejected, indicating that the residuals are normally distributed. Additionally, the Q-Q plot (Figure 2) provided a graphical assessment of normality. The standardized residuals aligned closely with the diagonal reference line, further supporting the assumption of normality. Therefore, the normality assumption for the residuals was satisfied, ensuring that the regression estimates remain valid and interpretable.

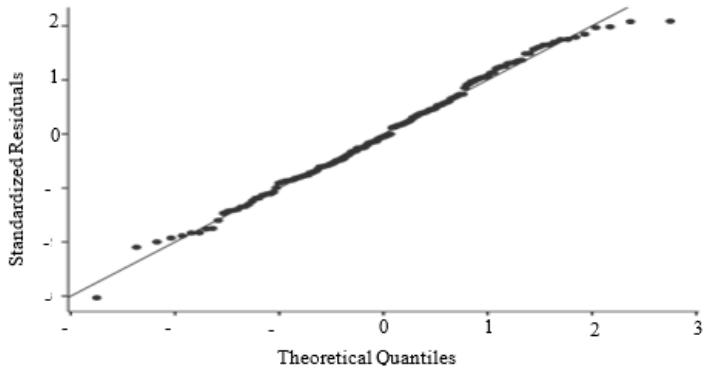

Figure 2. Q-Q plot

6.3.2 Autocorrelation

To assess the presence of autocorrelation in the residuals, the Durbin–Watson test was conducted. The Durbin–Watson statistic (2.23, p = 0.124) indicated that there was no significant autocorrelation in the residuals. Given that the Durbin–Watson statistic is close to 2, it indicated that the residuals are approximately independent, satisfying the assumption of no serial correlation. Additionally, the non-significant p-value ($p > 0.05$) further confirmed that autocorrelation was not a concern in this model. These results indicated that the regression model did not violate the assumption of independent errors, supporting the reliability of the estimated coefficients.

6.3.3 Multicollinearity

To evaluate the presence of multicollinearity in the regression model, Variance Inflation Factor (VIF) and Tolerance values were computed. The VIF value of 1.00 and the Tolerance value of 1.00 indicated the absence of multicollinearity. Generally, a VIF below 10 and a Tolerance above 0.1 suggested no significant multicollinearity issues. Since the obtained values were at their ideal thresholds, it was concluded that loan portfolio risk did not exhibit collinearity with other variables in the model. Thus, multicollinearity was not a concern in this analysis, and the model's estimates remained valid for interpretation.

6.3.4 Heteroscedasticity

To check for heteroscedasticity, a scatterplot of residuals versus fitted values was analyzed. As shown in Figure 3, the points were randomly spread out, with no clear pattern, suggesting that the variability of residuals remained fairly constant across different predicted values. Since there was no funnel shape or systematic trend, heteroscedasticity did not appear to be a problem. This indicated that the model met the assumption of homoscedasticity, ensuring the reliability of the regression results.

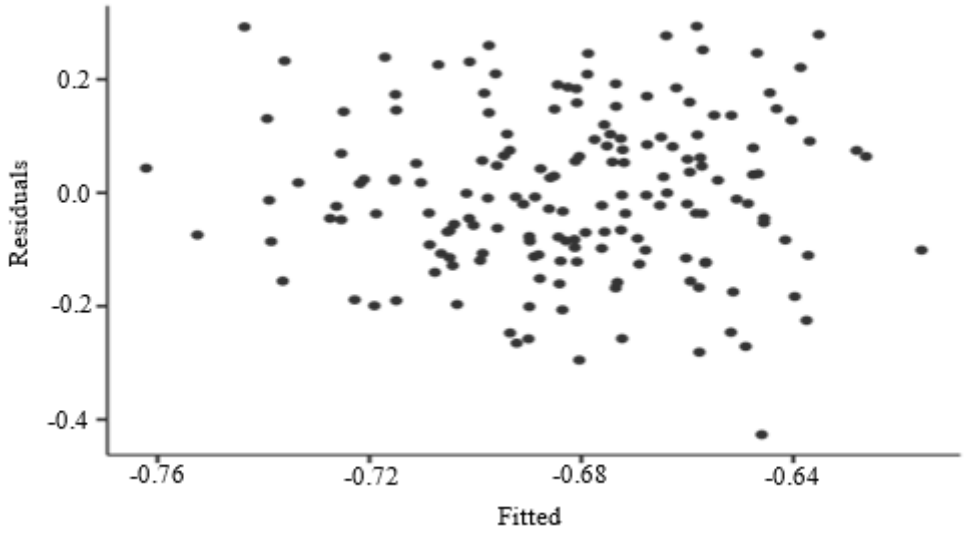

Figure 3. Residuals vs. fitted values plot

6.4 Simple Linear Regression

A simple linear regression analysis was conducted to examine the relationship between loan portfolio risk and capital adequacy. The correlation coefficient (r) was 0.194, indicating a weak positive relationship between loan portfolio risk and capital adequacy. The results suggest that loan portfolio risk is a statistically significant predictor of capital adequacy.

The model accounted for approximately 3.77% of the variance in capital adequacy, as indicated by an R^2 value of 0.0377. After adjusting for the number of predictors, the adjusted R^2 value was 0.0319, suggesting that the model explains only a limited proportion of the variation in capital adequacy. Despite this, the overall model was statistically significant, $F(1,166)=6.50$, $p=0.012$, indicating that loan portfolio risk contributes meaningfully to the prediction of capital adequacy. Although the model shows a low R^2, this is common in cross-sectional data and does not imply the model is ineffective. What matters more is the statistical significance of coefficients, quality of data and alignment with theoretical expectations. A low R^2 may indicate omitted variables, but it does not invalidate the significance or direction of the identified relationship (Wooldridge, 2016). The model fit statistics are presented in Table 1.

Table 1. Model fit measures

Model	R	R^2	Adjusted R^2	F	df1	df2	p
1	0.194	0.0377	0.0319	6.50	1	166	0.012

Note: Models estimated using sample size of N=168

Furthermore, the study examined the variables to calculate the coefficients (β) and the p-values for both the constant and independent variables, as presented in Table 1. The coefficients were as follows: 0.0569 for loan portfolio risk and -0.6141 for the intercept. The corresponding P-values were 0.012 for loan portfolio risk <0.001 for the intercept.

The simple linear regression equation was employed in describing the link between the predictor variables and the response variable. The simple linear regression test established a prediction equation as highlighted below:

$$Capital\ Adequacy = -0.6141 + 0.0569\ loan\ portfolio\ risk$$

The regression analysis results presented in Table 2 provided insights into the relationship between loan portfolio risk and capital adequacy. The intercept (β = -0.6141) indicated that, when all independent variables were held constant, the expected value of capital adequacy was -0.6141. The coefficient for loan portfolio risk (β = 0.0569) was positive, suggesting that an increase in loan portfolio risk was associated with a corresponding increase in capital adequacy. Specifically, a one-unit increase in loan portfolio risk was predicted to result in a 0.0569-unit increase in capital adequacy, holding other factors constant. This positive association is consistent with the principles of the RBC theory, which underpins this study. RBC theory asserts that financial institutions are required to hold capital in proportion to the risks in their asset portfolios to protect against potential losses and maintain financial stability. Accordingly, SACCOs experiencing higher loan portfolio risk tend to increase their capital buffers as a precautionary measure to comply with regulatory capital requirements and absorb ECL. Rather than reflecting operational efficiency or profitability, the increase in capital adequacy observed here likely reflects regulatory pressures prompting SACCOs to strengthen their capital positions in response to heightened risk. Additionally, SACCOs may enhance their capital adequacy by making strategic investments in real and financial assets, which create alternative income streams and help sustain capital levels even during periods of increased credit stress (Atichasari et al., 2023). Additionally, strategic investments in real and financial assets help SACCOs build alternative income streams, which can further enhance capital adequacy, even during periods of credit stress (The Sacco Societies Regulatory Authority, 2024).

Table 2. Regression coefficients

Predictor	B	SE	T	p
Intercept	-0.6141	0.0288	-21.36	<.001
Loan Portfolio Risk	0.0569	0.0223	2.55	0.012

Moreover, the nature of capital adequacy as a backward-looking measure, while loan portfolio risk indicators such as NPL are more current, can create a mismatch that distorts the actual risk profile of SACCOs (Lee et al., 2019). This temporal gap between the two measures means that capital adequacy may not fully reflect the current state of credit risk. Similarly, under IFRS 9, SACCOs recognize potential losses early and increase provisions as loan risk rises. While this reduces profits, it boosts capital reserves, stabilizing capital adequacy in the short term (Central Bank of Kenya, 2024). Consequently, this accounting practice may create the illusion of improved capital adequacy despite underlying credit risk, which helps explain the positive relationship observed in the regression results.

In addition, the analysis also tested the null hypothesis which posited that there was no statistically significant relationship between loan portfolio risk and capital adequacy of deposit-taking SACCOs. The results revealed that the p-value for the intercept (< 0.001) indicated its significant contribution to the model, suggesting the presence of underlying factors influencing capital adequacy beyond the variables directly observed. Moreover, the p-value for loan portfolio risk (0.012) confirmed a statistically significant relationship with capital adequacy at the 5% significance level ($p < 0.05$), thereby rejecting the null hypothesis. These findings diverged from those of Yen et al. (2024), who reported a significant inverse relationship between the two variables, and Wahyuni & Umam (2023), who found the relationship to be statistically insignificant.

7. Conclusion and Recommendations

The study concluded that there is a statistically significant relationship between loan portfolio risk and the capital adequacy of deposit-taking SACCOs in Kenya. Several recommendations were proposed. SACCOs should

enhance their credit risk management frameworks by adopting more proactive and forward-looking approaches. This includes implementing robust internal controls, conducting regular risk assessments, and investing in early warning systems capable of detecting deteriorating loan performance before it significantly impacts capital. Specifically, AI-driven credit scoring models that analyze diverse data sources, such as transaction histories, payment behavior, and economic indicators, should be explored to provide real-time risk assessments and enable early intervention.

Additionally, SACCOs can integrate AI-powered chatbots into their customer service platforms to improve efficiency and reduce human errors in loan processing. These tools can facilitate real-time responses to loan inquiries, streamline application processes, and monitor repayments, thereby reducing loan portfolio risk and enhancing capital adequacy through timely intervention.

Moreover, it is important for SACCOs and their regulators to complement backward-looking indicators such as historical data measures of non-performing loan and capital adequacy, which rely on past events, with forward-looking metrics like ECL and stress testing. These tools, aligned with the principles of IFRS 9, can offer a more realistic and timely evaluation of financial health, thereby minimizing the risk of capital adequacy figures misrepresenting the actual credit risk exposure.

Regulatory authorities such as SASRA are also urged to provide more comprehensive guidance on interpreting capital adequacy metrics in the context of IFRS 9. They should promote transparency in financial reporting and help SACCOs avoid the pitfall of presenting an overstated capital position due to conservative provisioning practices, which can mask underlying credit risk.

Another crucial step in enhancing capital adequacy is investing in continuous capacity building for both staff and members. SACCOs should implement regular, targeted training programs for employees to enhance their knowledge in risk management, regulatory compliance, and financial reporting. This ensures that staff are well-equipped to monitor and manage loan portfolios effectively. For members, financial literacy programs should promote responsible borrowing and loan repayment with mobile-friendly tutorials, quizzes, and mini-courses. A gamified reward system could incentivize participation, offering points or discounts for completing modules or repaying loans. By fostering financial responsibility, SACCOs can reduce loan defaults and strengthen long-term financial stability.

Finally, DT-SACCOs should consider adopting collaborative financing models such as digital loan portfolio syndication. By partnering with other SACCOs or financial institutions, they can jointly finance large-scale development initiatives—such as affordable housing or SME lending—while sharing the associated credit risks. This model not only safeguards individual SACCOs' capital buffers and reduces concentration risk but also enhances portfolio diversification and resilience. Additionally, it aligns SACCOs with national development priorities, strengthening their relevance in the financial ecosystem. For successful implementation, SACCOs may leverage emerging digital lending platforms and work closely with regulators to ensure appropriate governance, transparency, and compliance.

8. Limitations of the Study

This study employs a cross-sectional research design and simple linear regression analysis, which inherently limits the ability to infer causal relationships between loan portfolio risk and capital adequacy. While the analysis identifies statistically significant associations, it does not establish temporal precedence or rule out potential reverse causality. Consequently, the directionality of the observed relationship remains unverified. Future research should consider longitudinal or experimental methodologies to rigorously examine causality and strengthen the evidential basis for policy and managerial interventions. Nonetheless, the current findings offer important empirical insights into the linkage between loan portfolio risk and capital adequacy within deposit-taking SACCOs in Kenya.

While the current study's primary analysis focused on a single predictor, it is important to recognize that future models incorporating multiple variables may face an increased risk of Type I error due to multiple hypothesis testing. To mitigate this risk, the study recommends the application of appropriate correction procedures such as the Bonferroni or Holm adjustments in subsequent research. These methods help control the overall error rate, ensuring the robustness and reliability of statistical inferences when testing multiple relationships simultaneously.

Data Availability

The data used to support the research findings are available from the corresponding author upon request.

Conflicts of Interest

The authors declare no conflict of interest.

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