



LOAN PORTFOLIO ALLOCATION AND LIQUIDITY OF DEPOSIT TAKING SAVINGS AND CREDIT CO-OPERATIVES IN KENYA: MODERATING EFFECT OF CAPITAL ADEQUACY

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Abstract: Savings and credit Co-operatives (SACCOs) play a crucial role in Kenya's economic development by mobilizing savings and providing affordable credit to members. Lending accounts for approximately 78 percent of their asset allocation. However, the high concentration of financial resources to loan portfolio has increasingly exposed them to liquidity challenges, with 39 percent reported to be illiquid, a situation attributed to loan portfolio allocation and lending decisions. This has contributed to the delicensing of 52 deposit taking SACCOs over a ten-year period, highlighting the financial risks associated with excessive loan concentration despite investments in SASRA aimed at strengthening regulation, enhancing financial stability and safeguarding members' funds. Thus, the persistence of liquidity challenges despite these regulatory efforts necessitated the current study to investigate the extent to which capital adequacy moderates the relationship between loan portfolio allocation and liquidity of DT-SACCOs in Kenya. Anchored on financial intermediation theory, the study employed longitudinal panel research design within a positivist research philosophy. The target population comprised 162 DT-SACCOs licensed between 2015 and 2024, of which 12 were excluded for being delicensed during the study period. Applying inclusion and exclusion criteria, 150 DT-SACCOs that remained licensed and active and had complete audited financial data for the study period were included. A census approach was adopted, with secondary data collected from all 150 DT-SACCOs using a data collection sheet and analyzed using STATA. Prior to panel regression analysis, the Hausman specification test confirmed that the random-effects model was appropriate for estimating the relationship among the study variables. The panel regression model established a statistically significant relationship between loan portfolio allocation and liquidity with p value of 0.000. The study further established that capital adequacy significantly weakened the positive relationship between loan portfolio allocation and liquidity, such that the effect of loan portfolio allocation on liquidity diminished as capital adequacy increased. The study therefore concluded that higher levels of capital adequacy moderated the relationship by reducing the extent to which loan portfolio allocation improved liquidity, suggesting that well-capitalized DT-SACCOs may rely less on loan portfolio allocation as a source of liquidity resilience. The study recommends SACCOs management to incorporate capital adequacy thresholds into loan portfolio allocation decisions and regularly assess how changes in lending patterns may affect liquidity positions. In particular, DT-SACCOs should strengthen liquidity forecasting and stress-testing mechanisms by incorporating loan portfolio allocation indicators to anticipate potential liquidity pressures.

Keywords: loan portfolio allocation, capital adequacy, liquidity, DT-SACCOs

1. Introduction

Liquidity remains a fundamental concern within the financial sector, particularly for deposit-taking institutions whose operational sustainability depends on their ability to meet short-term obligations promptly (Ghosh, 2022). It reflects the fundamental ability of an institution to meet its short-term financial obligations as they fall due while maintaining adequate funds to support the financial needs and service commitments of its members. The liquidity position of SACCOs depends largely on the quality and management of their loan portfolio, since loans constitute a significant proportion of their assets and directly influence the availability of funds for meeting members' withdrawals and other operational obligations (Changamu, Ndegwa & Muthoni, 2023). A well-managed loan portfolio can enhance liquidity by ensuring timely loan repayments and maintaining a steady flow of funds, whereas poor loan portfolio management may expose SACCOs to liquidity constraints and financial distress. To strengthen their liquidity position, SACCOs have expanded their common bond to include non-members, thereby enhancing their capacity to mobilize savings and deposits, thereby strengthening their role of financial intermediation and financial inclusion. This expansion has contributed to the mobilization of \$3.8 trillion in assets, of which 71% is allocated to lending, underscoring the centrality of credit provision within SACCO operations and its pivotal role in promoting socio-economic development, while the remaining resources are directed toward financial investments and other investment activities (World Council of Credit Unions [WOCCU], 2024). However, loan portfolio allocation has emerged as a critical concern, as excessive concentration of SACCO resources in lending can constrain liquidity and increase exposure to ineffective lending decisions and non-performing loans. Consequently, the concentration of resources within loan portfolios has contributed to liquidity challenges, with 22 percent of SACCOs reported to be illiquid, resulting in the delicensing and undermining their stability (Gachenga, Muthoni & Metto, 2025).

In Africa, SACCOs have emerged as important vehicles for addressing financial access constraints among low-income, rural and informal-sector populations. The expansion of SACCOs membership beyond narrowly defined common-bond groups has enhanced their capacity to extend financial services to a broader segment of the population, reaching 41 million members, with 11.5 percent of new members gaining access financial to services (WOCCU, 2023; WOCCU, 2024; Finaccess, 2024). This broader access to SACCOs financial services has been accompanied by a corresponding expansion in lending activities, with the value of loans increasing from \$10.3 billion in 2023 to \$13 billion in 2024 (ACCOSCA, 2024). However, the rapid expansion of loan portfolios has also heightened SACCOs exposure to credit-related risks arising from information asymmetry between SACCOs and borrowers, weakness in credit assessment and borrower's repayment difficulties. This vulnerability is reflected in Tanzania, where the proportion of non-performing loans increased from 5.78 percent in 2023 to 8.79 percent in 2024 (TCDC, 2023). The challenge is particularly pronounced among agricultural and member-based SACCOs in Uganda, Kenya and Tanzania, where borrowers often depend on irregular and seasonal income streams, thereby increasing the likelihood of delayed repayments and loan defaults.

In Kenya, deposit-taking Savings and Credit Co-operatives (DT-SACCOs) occupy a critical position within the financial sector, serving as major intermediaries for mobilizing member savings and extending affordable credit. As of 2023, DT-SACCOs had mobilized over KSh 682.2 billion in member deposits and advanced loans amounting to KSh 706.2 billion, underscoring their substantial contribution to financial intermediation and financial inclusion (SASRA, 2023; SASRA, 2024). However, the increasing concentration of resources in lending has heightened their exposure to credit risk, which has increasingly undermined their financial stability

and performance. According to SASRA (2024), non-performing loans (NPLs) increased to 13.26% of total loans in 2024, with 62% of DT-SACCOs recording NPL ratios above the recommended prudential threshold of 5%, signaling widespread deterioration in asset quality and heightened vulnerability to financial distress. Consequently, deteriorating loan quality not only erodes SACCOs' earnings through increased provisioning and loan losses but also constrains liquidity, weakens capital adequacy, reduces lending capacity, and threatens their ability to meet members' withdrawal and other financial obligations. The deterioration in loan quality, coupled with the high concentration of financial resources in loan portfolios, has intensified liquidity pressures with 39% of DT-SACCOs reported to be financially unstable in 2024, up from 35% in 2022 and 2023 (SASRA, 2024). This growing liquidity vulnerability has contributed to the delicensing of 52 DT-SACCOs over a ten-year period 2014 to 2024, reflecting a deepening financial stability concern that, if left unaddressed, could undermine members confidence and trigger withdrawals across other vulnerable SACCOs (Muriithi, 2023). Moreover, the loan-to-deposit ratio, reported at 114% affecting 35% of DT-SACCOs, indicates that lending exceeded members' deposits, increasing reliance on external financing to meet credit demand and further exposing SACCOs to liquidity and funding risks (SASRA, 2024). The challenge is further compounded unremitted funds, which increased to Kshs 3.49 billion and affected 85-regulated SACCOs, further constraining their available liquidity. The foregoing situation raises an important empirical question regarding the extent to which loan portfolio allocation influences the liquidity of DT-SACCOs in Kenya. Existing studies by (Gachenga et al., 2025; Maina et al., 2020) has largely focused on credit management, non-performing loans, loan recovery and financial sustainability, with comparatively limited attention to the specific relationship between loan portfolio allocation and liquidity. Loan portfolio allocation encompasses decisions concerning the proportion of available financial resources committed to lending, the distribution of loans across different categories and the balance between loan investments, liquid assets and other investments. Understanding this relationship is particularly important because DT-SACCOs have a dual responsibility of generating sufficient returns from lending while preserving adequate liquidity to protect members' deposits and sustain operations. Therefore, this study seeks to examine the effect of loan portfolio allocation on the liquidity of DT-SACCOs in Kenya. The study is expected to provide empirical evidence that can guide SACCO managers, regulators and policymakers in developing appropriate lending and portfolio allocation strategies that enhance liquidity without undermining the core credit-intermediation role of DT-SACCOs.

1.1 Statement of the Problem

SACCOs play a crucial role in Kenya's economic development by mobilizing savings and providing affordable credit, with lending activities accounting for approximately 78% of their asset allocation (SASRA, 2025). However, despite the high concentration of financial resources to loan portfolio, it has exposed the SACCOs to liquidity challenges, with 39 percent reported to be illiquid, a situation attributed to loan portfolio allocation and lending decisions. This has contributed to the delicensing of 52 deposit taking SACCOs over a ten-year period, highlighting the financial risks associated with excessive loan concentration despite investments in SASRA aimed at strengthening regulation, enhancing financial stability and safeguarding members' funds (SASRA, 2024). Consequently, 69 of the 176 DT-SACCOs operated with inadequate liquidity buffers, constraining their capacity to meet short-term financial obligations and raising concerns about their financial resilience and sector stability. The liquidity challenge was further exacerbated in 2024 when 82 SACCOs were owed KSh 3.5 billion in unremitted statutory deductions by employer institutions, placing additional strain on their liquidity position despite the implementation of credit policies by SASRA and individual SACCOs to

mitigate non-performing loans. This further threatens the SACCOs ability to meet members' financial obligations, particularly timely withdrawals and the provision of loans and other credit facilities, potentially undermining members confidence and contributing to membership withdrawals reported as 131,347 in 2024 (Gachenga et al, 2025). This has left SACCOs using their capital to finance loans, which has led to erosion of capital, weakening their ability to absorb financial shocks, exposes them to liquidity risk and threatens their ability to meet members' withdrawal requests. Moreover, 62% of DT-SACCOs have consequently reported high loan-to-deposit ratios to 114%, indicating increasing dependence on external borrowing to finance members' credit demand (SASRA, 2024). This jeopardize their core role of improving members welfare as well as playing their key role in Kenya's Bottom-up economic transformation agenda (BeTA) which recognizes SACCOs as an important institution for expanding financial inclusion, mobilizing savings and increasing access to affordable credit and supporting grassroots economic empowerment.

Despite the growing body of literature examining the relationship between loan portfolio allocation, capital adequacy and liquidity in financial institutions, empirical evidence remains inconclusive, particularly within the Savings and Credit Cooperative Society sector. Existing studies indicate that effective loan portfolio allocation enhances liquidity management by optimizing asset utilization, improving loan performance and reducing excessive exposure to specific lending segments that may increase credit risk and liquidity constraints (Mwanzia & Makori, 2023; Gathigia & Karanja, 2020). However, Ben et al. (2024) argue that loan portfolio diversification does not always result in improved liquidity outcomes, especially where lending decisions are not supported by adequate capital buffers, effective risk management frameworks and prudent credit allocation mechanisms. Similarly, the influence of capital adequacy on liquidity remains contested in the existing literature. Some studies establish that adequate capital levels strengthen liquidity positions by enhancing financial resilience, absorbing unexpected losses and increasing stakeholders' confidence in financial institutions (Muriithi et al., 2022; Karanja et al., 2023). Conversely, Ndubiri et al. (2021) found that capital adequacy has no statistically significant effect on liquidity, suggesting that higher capital levels alone may not necessarily guarantee improved liquidity management. These divergent findings highlight an empirical gap regarding the extent to which loan portfolio allocation and capital adequacy jointly influence liquidity outcomes.

A conceptual gap also exists, as previous studies have largely examined loan portfolio allocation and capital adequacy as separate predictors of liquidity, with limited attention given to the moderating role of capital adequacy in the relationship between loan portfolio allocation and liquidity. These limits understanding of whether adequate capitalization strengthens the ability of SACCOs to translate effective loan portfolio allocation into improved liquidity performance. Furthermore, a contextual gap is evident due to the limited focus on deposit-taking SACCOs in Kenya, despite their significant contribution to financial inclusion, savings mobilization and provision of affordable credit under the country's financial development agenda. Moreover, existing studies have paid limited attention to specific dimensions of loan portfolio allocation and how it affects liquidity. Consequently, insufficient empirical evidence exists on how capital adequacy influences the relationship between loan portfolio allocation and liquidity among Kenyan deposit-taking SACCOs. Therefore, this study seeks to examine the effect of loan portfolio allocation on liquidity of deposit-taking SACCOs in Kenya and to determine the moderating effect of capital adequacy on this relationship. The findings are expected to provide context-specific evidence that will support regulatory decisions, enhance SACCO risk management practices, and contribute to the long-term financial sustainability of the SACCO sector.

1.2 Objectives of the Study

The general objective of this study was to examine the effect of loan portfolio allocation on the liquidity of deposit-taking SACCOs in Kenya, and to establish the moderating effect of capital adequacy on this relationship. Specifically, the study sought to:

- i. Determine the effect of loan portfolio allocation on the liquidity of deposit-taking SACCOs in Kenya.
- ii. Establish the moderating effect of capital adequacy on the relationship between loan portfolio allocation and the liquidity of deposit-taking SACCOs in Kenya.

1.3 Research Hypotheses

The study tested the following null hypotheses at the 95% confidence level:

H01: Loan portfolio allocation has no statistically significant effect on the liquidity of deposit-taking SACCOs in Kenya.

H02: Capital adequacy has no statistically significant moderating effect on the relationship between loan portfolio allocation and the liquidity of deposit-taking SACCOs in Kenya.

2. Literature Review

The study was anchored on financial intermediation theory, pioneered by Gurley and Shaw (1960) in their seminal work money in a theory of finance. The theory was subsequently developed and extended by Diamond (1984), Dybvig (1983) and Bernanke (1983). The theory posits that financial institutions perform a critical intermediation role by mobilizing savings from surplus economic units and channeling these funds to deficit units for productive investment. In performing this function, financial intermediaries reduce information and transaction costs, manage risks and facilitate the efficient allocation of financial resources within the economy. Within the banking sector, loan portfolio allocation represents one of the principal forms of investment and is also associated with significant risk arising from information asymmetry between lenders and borrowers. Thus, to effectively manage the credit risk and enhance financial stability financial institutions ensures that the financial resources are allocated prudently across different borrowers and economic sectors rather than concentrating their exposure in a single segment. This reduces the likelihood of large losses from sector-specific downturns or default clusters, thereby enhancing overall risk management of their loan portfolios. (Gurley & Shaw, 1960). The theory assumes that financial markets are imperfect and that direct lending between savers and borrowers is constrained by information asymmetry, transaction costs and uncertainty. Consequently, financial intermediaries possess superior expertise in screening borrowers, monitoring loan performance, pooling risks and mobilizing savings more efficiently than individual investors. These capabilities enables the financial institutions to make informed lending decisions while managing the risks associated their loan portfolios (Kithandi, 2025)

Despite its significant contribution to banking theory, financial intermediation theory has been criticized by several alternative theoretical perspectives and developments in financial markets. One major criticism originates from the efficient market hypothesis (EMH) developed by Eugene Fama (1970), which argues that if financial markets are efficient and information is freely available, financial intermediaries become less necessary because borrowers and lenders can transact directly without incurring substantial information or

transaction costs. Similarly, transaction cost economics, advanced by Beck and Levine, (2000), contends that technological advancements and institutional innovations substantially reduce transaction costs, thereby weakening the primary justifications for financial intermediation. Furthermore, developments in financial technology (FinTech), digital lending platforms, peer-to-peer (P2P) lending, crowdfunding and blockchain-based financial services have increasingly enabled borrowers and savers to interact directly without relying on traditional financial intermediaries revealing that the information asymmetry created by borrowers advancing wrong information about their credit history can be mitigated helping the SACCOs make prudent decisions. Moreover, Maina et al. (2020) and Gachenga et al. (2025) argue that financial institutions employing competent personnel are better able to mitigate information asymmetry through rigorous credit appraisal, borrower screening, monitoring and loan recovery practices. These capabilities enable financial intermediaries to allocate credit more efficiently, minimize credit risk and enhance the quality of their loan portfolios, thereby supporting financial stability.

Despite the criticisms, financial intermediation theory remains relevant in explaining how financial institutions allocate mobilized funds between lending and holding liquid assets to achieve an optimal balance between liquidity and financial stability. The theory is particularly relevant to SACCOs which are member-owned financial co-operatives with a primary mandate of mobilizing funds from members and extend credit back to those same members. Unlike investor-owned commercial banks, SACCO members are simultaneously the owners, depositors and borrowers of the institution (WOCCU, 2022). Consequently, member loans constitute the largest proportion of SACCO assets and the principal source of interest income. Therefore, the theory depicts that while lending enhances profitability, excessive concentration of funds in loan portfolios may reduce liquidity because loans are relatively illiquid compared to cash and short-term investments. Therefore, SACCOs are required to maintain an appropriate balance between lending activities and liquid asset holdings to ensure they can meet members' withdrawal requests and comply with set regulatory liquidity requirements.

In the study, financial intermediation theory provides a strong theoretical foundation for explaining the relationship between loan portfolio allocation and liquidity in deposit-taking SACCOs. The theory posits that financial institutions mitigate credit risk and enhance financial stability by diversifying their loan portfolios across different borrowers, sectors and economic activities rather than concentrating lending in a single segment. This diversification reduces credit risk exposure by ensuring that default risk is not concentrated within a single borrower group or economic sector, thereby limiting the likelihood of simultaneous loan losses that could impair liquidity positions. In addition, the theory emphasizes that sound lending decisions, supported by effective credit appraisal and monitoring systems, reduce information asymmetry between borrowers and lenders. Where information asymmetry is not adequately addressed, it may result in adverse selection and moral hazard, ultimately contributing to the accumulation of non-performing loans over time.

The study's objective was examined through an empirical review. Gachenga, Kinyariro, Wambu and Maina (2023) did a study with aim to determine the relationship between lending decision, SACCO size and liquidity of farmers-based deposit-taking SACCOs in Kenya. The study employed natural lending, institutional lending and group lending as the predictor variables with the response variable liquidity measured through liquidity ratio. Informational asymmetry theory guided the study where the study target population consisted of 49 finance managers and 49 credit managers from the 49 farmers-based DT-SACCOs. The study employed an explanatory research design and utilized self-administered questionnaires. The secondary data collection sheet collected data for the year 2019 from the audited financial report of the SACCOs. Hierarchical regression model was employed for moderation analysis. The study findings indicate that SACCO size significantly

moderates the relationship between lending decisions and liquidity of farmers-based DT-SACCOs recommending, DT-SACCOs to consider their size when making lending decisions, with larger SACCOs managing greater lending risks while smaller SACCOs

Etenyi, Nelima and Maingi (2024) studied the effect of credit risk management techniques on financial performance of deposit taking SACCOs in Kenya. Credit risk management techniques was measured through credit limit, risk-based pricing and use of collateral. Credit risk theory and descriptive survey design were adopted. The target population comprised of 175 risk managers from the 175 DT-SACCOs in Kenya as of 31st December 2022. Due to the relative population nature census study was considered with data collected by the help of a structured questionnaire. The regression analysis by help of SPSS revealed a significant relationship between credit risk management techniques and financial performance of DT-SACCOs in Kenya. Credit risk management techniques were found to have a positive and significant effect on financial performance. The study recommended DT-SACCOs to implement tailored risk management practices to address credit risk that can enhance SACCOs stability, profitability and resilience in a dynamic operating environment.

Scott and Muhire (2024) carried out a study on impact of loan portfolio management strategies on financial performance of commercial banks in Rwanda; a case of I&M bank PLC Rwanda (2019 – 2022). The study employed loan diversification, credit risk management, loan monitoring and reporting, loan loss provision, collection and recovery and diversification strategy as measures of loan portfolio management strategies. The study employed mixed methods approach combining qualitative and quantitative design where structured questionnaires were used to collect data. The study revealed that long-term loans have a high rate of non-performance in comparison to short-term loans due to unforeseen eventualities. Moreover, the model revealed that loan portfolio management strategies has a positive relationship on financial performance of commercial banks. The study recommended commercial banks were advised to diversify loans in different products to reduce non-performance.

Muratenyi and Olando, (2022) in the study employed banking theory of shiftability, anticipated income theory banking and pecking order theory on the assessment of loan portfolio quality on financial performance of commercial banks in Kenya. Measurements for loan portfolio quality comprised of provision for loan loss, allowance for loan loss, gross impaired loans on advances. Descriptive research design and secondary data for seven years were collected by help of data collection sheet. Census method was employed with data collected analyzed using inferential and descriptive statistics. Multiple regression analysis revealed that provision for loan loss, allowance for loan loss, gross impaired loans on advances were statistically significant and concluded that commercial banks with sound lending procedures have low credit risk and advised financial institutions to have loan insurance to reduce loss of members' funds due to loan defaults. Additionally, the study was carried out in commercial banks. The current study will be on DT-SACCOs in Kenya.

Maina, Gichaiya, Mburu and Njururi (2025) investigated the effect of loan portfolio risk on capital adequacy in DT-SACCOs in Kenya, where the independent variable was loan portfolio risk. The study was anchored on a positivist research philosophy and employed a descriptive cross-sectional research design. Secondary data were extracted from the audited financial statements of licensed DT-SACCOs using a structured data collection instrument, achieving a 96.5% response rate and analyzed using linear regression techniques. The findings established a positive and significant relationship between loan portfolio risk and capital adequacy, indicating that DT-SACCOs facing higher credit risk tend to strengthen their capital buffers to comply with prudential requirements and enhance financial resilience. The study concluded that effective management of loan portfolio risk is essential for maintaining adequate capital levels and promoting the stability of DT-SACCOs.

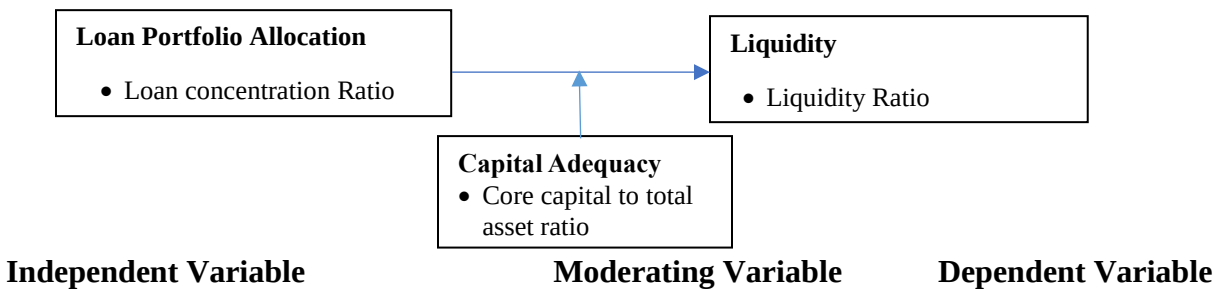
The study recommended that DT-SACCOs enhance their credit risk management systems by adopting technology-driven credit assessment tools, predictive risk monitoring mechanisms and forward-looking provisioning approaches, while regulators should reinforce supervisory support and institutional capacity to strengthen capital adequacy and ensure long-term financial stability.

Kirui, Atandi and Fwamba (2026) investigated the loan portfolio management and financial performance of Deposit-Taking Savings and Credit Cooperative Societies (DT-SACCOs) in Kenya, where loan portfolio management was the independent variable. The study was anchored on information asymmetry theory, transaction cost theory and the 5 c’s model of client appraisal. Guided by a pragmatism philosophy, the researchers employed a convergent mixed-methods design involving a census of CEOs and CFOs from 176 licensed DT-SACCOs, complemented by interviews, while quantitative data were analyzed using descriptive statistics, Pearson correlation and linear regression and qualitative data through thematic analysis. The findings established a positive and statistically significant relationship between loan portfolio management and the financial performance of DT-SACCOs, indicating that institutions with stronger loan portfolio management practices achieved superior financial outcomes. The study concluded that prudent management of loan portfolios constitutes a key internal determinant of sustainable financial performance among DT-SACCOs. The authors recommended that SACCOs should reinforce their credit appraisal, loan monitoring, debt recovery and provisioning processes through comprehensive policies approved and consistently enforced by their boards to enhance financial performance and institutional stability.

2.1 Conceptual Framework

The conceptual framework illustrated in Figure 1 presents the hypothesized nexus between loan portfolio allocation and liquidity of deposit-taking SACCOs in Kenya. Loan portfolio allocation, measured through the loan concentration ratio, constitutes the independent variable and is expected to significantly influence the liquidity position of DT-SACCOs, which in this study is measured using the liquidity ratio as the dependent variable. In addition, the framework introduces capital adequacy, measured by the core capital to total assets ratio, as a moderating variable that may either strengthen or weaken the relationship between loan portfolio allocation and liquidity. The framework is anchored on the financial intermediation theory, which conceptualizes financial institutions as intermediaries that mobilize funds from surplus units and allocate them to deficit units through lending and other financial activities, thereby highlighting the importance of prudent loan portfolio allocation in maintaining adequate liquidity. This nexus demonstrates how the concentration of loan portfolios, moderated by the level of capital adequacy, determines the ability of DT-SACCOs to meet their financial obligations as they fall due while maintaining financial stability and sustainable intermediation in Kenya.

Figure 1: Conceptual framework



3. Research Methodology

The study adopted a longitudinal panel research design guided by a positivist philosophical paradigm. The target population comprised 162 DT-SACCOs licensed between 2015 and 2024. Inclusion and exclusion criteria were applied, whereby only DT-SACCOs that remained licensed and active throughout the study period and had complete audited financial data for all study years were included. Twelve DT-SACCOs that were delicensed during the period were excluded, resulting in 150 eligible DT-SACCOs. A census approach was therefore adopted, with secondary data obtained from audited annual financial reports covering the ten-year period (2015–2024) and collected using a data collection sheet. The data were analyzed using STATA and presented through descriptive and inferential statistics. Prior to panel regression analysis, the Hausman specification test was conducted to determine the appropriate panel-data model and established that the random-effects model was suitable for estimation. Panel regression models were used to test the moderation effect, where equation (1) examined the direct nexus between loan portfolio allocation and liquidity. Equations (2) and (3) explored the moderation and interaction effect:

$L = \beta_0 + \beta_1LPD + \varepsilon$ Equation 1

$L = \beta_0 + \beta_1LPD + \beta_2CA + \varepsilon$Equation 2

$L = \beta_0 + \beta_1LPD + \beta_2CA + \beta_3LPD * CA + \varepsilon$ Equation 3

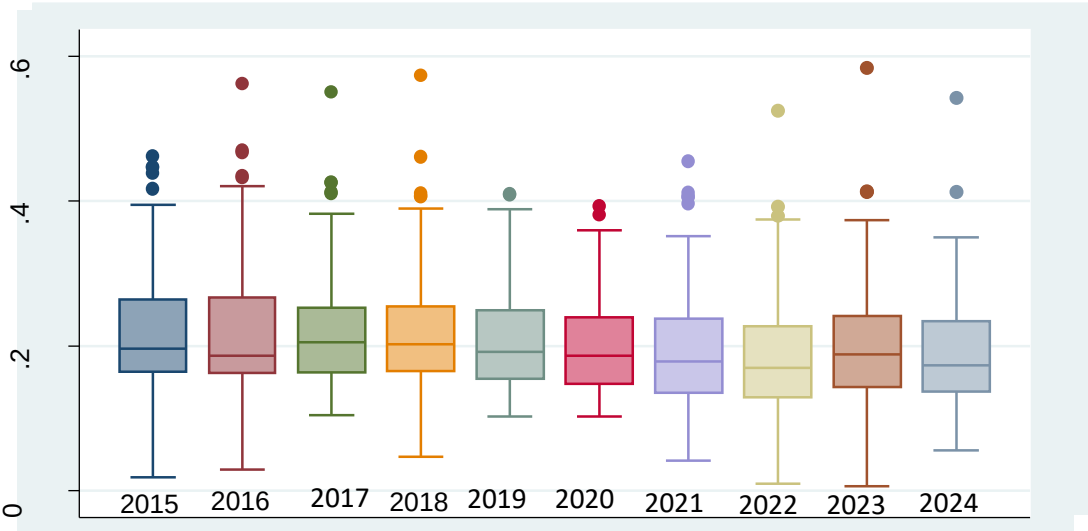
Where: L = represents Liquidity of deposit-taking SACCOs; LPD = Loan portfolio allocation, CA= Capital Adequacy (moderating variable); LPD* CA = Loan portfolio allocation * Capital Adequacy; $\beta_1, \beta_2, \beta_3$ = the Coefficient

4. Results and Discussion

4.1 Liquidity Descriptive statistics

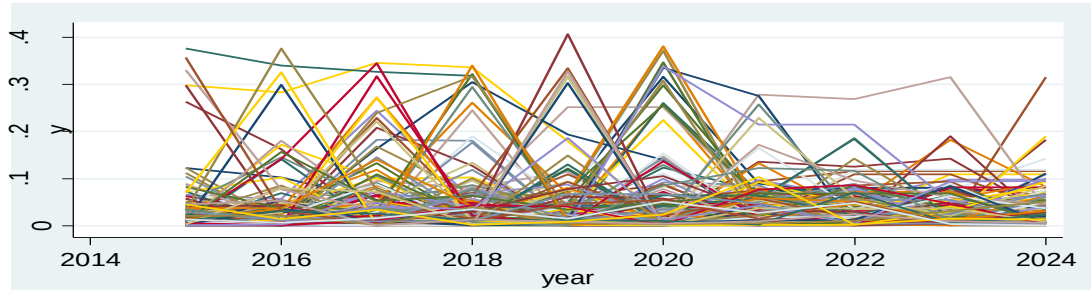
To determine the liquidity position of the DT-SACCOs, the study employed the liquid assets-to-short-term liabilities ratio. SASRA requires DT-SACCOs to maintain a minimum liquidity ratio of 15% to cushion against liquidity shocks, safeguard members’ deposits and promote financial stability. As shown in figure 1, liquidity ratios remained above the statutory minimum throughout 2015-2024, generally ranging between approximately 17% and 21 % indicating adequate liquidity buffers and prudent liquidity management. However, several SACCOs recorded exceptionally high ratios, with upper outliers exceeding 40% and approaching 60% suggesting conservative liquidity strategies aimed at mitigating risks arising from member withdrawals, loan defaults and macroeconomic shocks. This is particularly important because, unlike commercial banks, SACCOs lack a central liquidity facility and a lender-of-last-resort mechanism to provide emergency liquidity support during financial crises. The finding is consistent with SASRA (2024), which reported that 61.34% of DT-SACCOs maintained liquidity levels above the statutory requirement. However, the 38.66% that remained below the threshold point to continuing liquidity pressures within part of the sector, which may constrain the affected SACCOs’ ability to meet short-term obligations and withstand financial shocks. These vulnerabilities are further reflected in the delicensing of three SACCOs and the reported exit of 131,347 members to more stable financial institutions.

Figure 2: Box Plot for Liquidity



The study further examined the stability and variation in DT-SACCOs’ liquidity performance over 2015–2024 using a spaghetti plot, as presented in Figure 2. The close clustering of the trend lines and limited divergence across SACCOs indicate a high degree of homogeneity in liquidity performance over the study period. This suggests that liquidity management practices across the sector followed broadly similar patterns, potentially reflecting the influence of standardized prudential requirements and supervisory oversight by SASRA. The mildly right-skewed distribution indicates that while liquidity performance was concentrated within a relatively narrow range, a small number of SACCOs consistently maintained comparatively larger liquidity buffers. This finding is consistent with Wambua and Kiprop (2022), who attributed relatively homogeneous liquidity trends among DT-SACCOs to SASRA’s standardized prudential requirements, which encourage institutions to maintain sufficient liquid assets relative to members’ deposits and short-term liabilities.

Figure 3: Liquidity Spaghetti Plot



4.2 Loan Portfolio Allocation Descriptive statistics

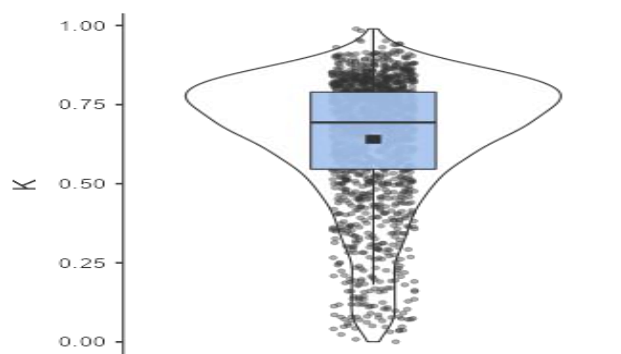
Loan portfolio allocation was measured using the loan concentration ratio (LCR), representing the proportion of SACCO assets allocated to lending activities. As presented in table 1, the mean LCR increased from 0.6083 in 2015 to 0.6499 in 2024, indicating that DT-SACCOs consistently allocated approximately 60.83%–64.99% of their total assets to lending throughout the study period. The ratio remained relatively stable at around 0.61

between 2015 and 2018, before rising from 0.6458 in 2019 to a peak of 0.6833 in 2021, suggesting increased lending intensity and a stronger focus on credit provision. This level of loan concentration is consistent with Bwire, Onyango and Odunga (2021), who associate LCR levels of 60%–80% with relatively aggressive lending strategies. The increase in LCR may reflect growing member demand for credit, competition in the financial services sector and SACCOs' pursuit of higher interest income from loan portfolios. However, the mean LCR subsequently declined to 0.6499 by 2024, suggesting a modest shift towards greater asset diversification and a relatively more conservative lending position. The standard deviation, which was relatively high in the earlier years, declined from 0.23392 in 2017 to 0.17336 in 2022, indicating reduced variation and greater convergence in lending practices across DT-SACCOs, although it increased slightly to 0.18327 in 2024. This pattern is consistent with Omwansa, Nyamute, and Memba (2026), who reported significant variation in loan portfolio allocation among Kenyan DT-SACCOs and with Muriuki (2020), who linked increased regulatory oversight to greater uniformity in risk management and asset allocation.

Table 1: Loan Portfolio Allocation

Year	Obs	Mean	Std. Deviation	Minimum	Maximum
2015	150	.6083	.22157	.02	.90
2016	150	.6069	.21862	.04	.92
2017	150	.6054	.23392	.01	.99
2018	150	.6079	.22327	.04	.94
2019	150	.6458	.19974	.04	.94
2020	150	.6482	.20736	.03	.91
2021	150	.6833	.17983	.09	.96
2022	150	.6769	.17336	.16	.98
2023	150	.6728	.17687	.13	.94
2024	150	.6499	.18327	.04	.95

The violin plot further supports the descriptive findings by illustrating the distribution of loan concentration among the 150 DT-SACCOs in the balanced panel for 2015–2024. The plot complements the annual mean LCR range of 0.6054–0.6833 by showing the distribution, dispersion, and skewness of lending practices across institutions. Most observations are concentrated between 0.60 and 0.80, with the median around the upper 0.60s to low 0.70s, indicating that lending accounted for a substantial share of SACCO assets. The density around 0.70–0.80 further suggests that some SACCOs maintained relatively high lending exposure. This finding is consistent with Gachenga et al. (2025) and Muratenyi and Olando (2022), who found that members' loans constitute the principal earning assets of DT-SACCOs.

Figure 4: Violin Plot for Loan Allocation

The Levin–Lin–Chu (LLC) panel unit root test was further conducted to assess the stationarity of the loan concentration ratio. As presented in table 2, the analysis established that the adjusted t-statistic was -23.9315 with a p-value of $0.000 < 0.05$, leading to acceptance of alternative hypothesis that loan concentration ratio did not exhibit a unit-root process over the study period and was therefore appropriate for subsequent panel-data analysis. The stationarity result provided a basis for proceeding with model specification and selection between the fixed-effects and random-effects models using the Hausman test.

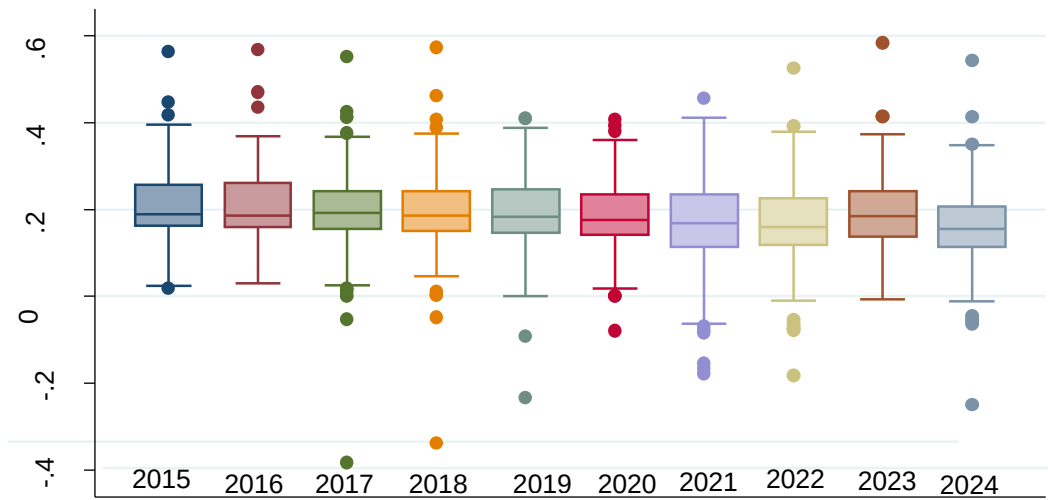
Table 2: Unit-root test for Panel Stationarity of Loan Concentration Ratio

	Statistic	p-value
Unadjusted t	-34.1701	
Adjusted t	-23.9315	0.000 **

4.3 Descriptive Statistics for Capital Adequacy

assets financed by core capital (fully paid-up members' shares, capital issued, disclosed reserves, retained earnings, grants and donations all of which are not meant to be expended unless on liquidation of the SACCO society) (SASRA, 2023). The findings indicate that DT-SACCOs remained adequately capitalized on average throughout the study period, with the mean ratio consistently above the regulatory minimum of 10%. However, the decline from 0.2109 in 2015 to 0.1638 in 2024 indicates a gradual weakening of capital buffers and increasing pressure on the financial resilience of DT-SACCOs. The decline from 0.1930 in 2017 to 0.1696 in 2022, followed by a temporary recovery to 0.1956 in 2023 and a sharp decline in 2024, further suggests persistent capital adequacy pressures. Moreover, the negative minimum ratios recorded in the seven years indicate that some SACCOs experienced severe capital impairment, limiting their capacity to absorb losses and withstand financial shocks. This finding is consistent with SASRA (2024), which linked declining capital adequacy to rapid loan growth, rising non-performing loans and pressure on retained earnings, thereby weakening SACCOs' financial resilience. It also aligns with Birisi, Omagwa and Musau (2024), who found that adequate capitalization provides DT-SACCOs with a buffer against credit and other financial risks. These studies support the present finding that negative core capital is not merely an accounting deficiency; it can constrain a SACCO's ability to absorb losses, increase dependence on available liquidity during periods of withdrawal pressure, weaken members' confidence and ultimately threaten institutional stability.

Figure 5: Box Plot for Capital Adequacy



4.4 Inferential Statistics

To assess the relationship between loan portfolio allocation, capital adequacy and liquidity of DT-SACCOs in Kenya panel regression model was employed. Prior to panel regression model, bivariate panel regression analysis was conducted to establish the relationship between the variables, followed by appropriate panel-data specification procedures to identify the most suitable estimation technique. The analysis was based on a balanced panel of 150 DT-SACCOs observed annually over the ten-year period from 2015 to 2024, yielding 1,500 observations. The fixed-effects and random-effects models were specified as follows:

$Y_{it} = \beta_0 + \beta_1 X_{it} + \varepsilon_{it}$ Fixed effect.....equation 4

$Y_{it} = \beta_0 + \beta_1 X_{it} + \mu_{it} + \varepsilon_{it}$ Random effect.....equation 5

Where Y_{it} present liquidity; X_{it} the predictor variable (loan concentration ratio)

4.5 Bivariate analysis of Loan portfolio allocation and liquidity of DT-SACCOs

The Hausman specification test was first conducted to determine the appropriate panel-data model. As presented in table 3, the coefficient for loan portfolio allocation was 0.5302694 under the fixed-effects model and 0.5314554 under the random-effects model, with a difference of -0.001186. The Hausman test yielded a chi-square statistic of 0.03 and a p-value of 0.8650 > 0.05. Therefore, the null hypothesis was not rejected, indicating that the coefficient differences were not systematic and supporting the use of the random-effects model for the analysis. This paved way for panel regression analysis to establish the relationship.

Table 3: Haussmann specification; bivariate model with Loan Portfolio Allocation

		(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
Loan allocation	portfolio	.5302694	.5314554	-.001186	.0069736
$\chi^2(1) = (b-B)'[(V_b-V_B)^{-1}](b-B) = 0.03 \quad \text{Prob} > \chi^2 = 0.8650$					

4.6 Moderated Panel regression model for Loan Portfolio Allocation, Capital Adequacy and Liquidity

A moderated panel regression model was employed to examine the moderating effect of capital adequacy on the relationship between loan portfolio allocation and liquidity of deposit taking SACCOs in Kenya. Specifically, the analysis sought to establish whether capital adequacy strengthens or weakens the relationship between loan portfolio allocation and liquidity. The moderating effect was evaluated based on changes in the R^2 across the regression models. Model I examined the direct relationship between loan portfolio allocation on liquidity, while model 2 and 3 assessed the moderating and interaction effects of capital adequacy respectively. The findings are summarized in table 4.

Table 4: Model Summary of the Moderated Random-effects for Loan Portfolio Allocation

Model I	Model II	Model III	Panel Observations
R-sq.: within = 0.3082	R-sq.: within = 0.3088	R-sq.: within = 0.3142	Number of obs = 1500
Between = 0.3283	Between = 0.3224	Between = 0.3190	Number of groups = 150
Overall = 0.3115	Overall = 0.3111	Overall = 0.3150	
Wald chi = 601.08	Wald chi = 301.16	Wald chi = 205.68	Obs per group: min = 10
Prob > F = 0.0000	Prob > F = 0.0000	Prob > F = 0.0000	avg = 10.0
corr(u_i, Xb) = 0.0061	corr(u_i, Xb) = 0.0040	corr(u_i, Xb) = 0.0021	Max = 10

Table 4 presents the results of the moderated random-effects panel regression analysis based on 1,500 observations obtained from 150 DT-SACCOs over the period 2015–2024. Model I examined the relationship between loan portfolio allocation and liquidity. The model established a statistically significant (Wald $\chi^2 = 601.08$, $p < 0.001$), indicating that loan portfolio allocation has a statistically significant association on SACCOs liquidity. The model recorded within, between, and overall R^2 values of 0.3082, 0.3283, and 0.3115, respectively, indicating that loan portfolio allocation explained 31.15% of the overall variation in liquidity. In model II, capital adequacy was introduced as an additional explanatory variable before the interaction term was incorporated to establish the moderating effect. The analysis established that the overall R^2 decreased marginally by 0.0004 from 0.3115 to 0.3111, revealing that the inclusion of capital adequacy as a direct predictor did not meaningfully improve the explanatory power of the model. This modest change, on its own, indicates only that capital adequacy has little direct effect on liquidity; it does not yet establish whether capital adequacy moderates the relationship, since moderation can only be confirmed by testing the significance of the interaction term, examined next in Model III. In model III, interaction term between loan portfolio allocation and capital adequacy was introduced to determine whether the effect of loan portfolio allocation on liquidity depended on the level of capital adequacy. The overall R^2 improved from 0.3111 in model II to 0.3150, in model III revealing that inclusion of interaction term resulted to improved explanatory power of the model.

The regression model co-efficient in table 5, Model I established a positive and statistically significant nexus between loan portfolio allocation and liquidity, with a statistically significant p-value of $0.000 < 0.05$. The

findings were further supported by a t-statistic of 24.52, which exceeded the critical threshold of 1.96 at 95% confidence level, confirming the existence of a significant relationship between loan portfolio allocation and liquidity. Moreover, the analysis established a coefficient of 0.5302694, revealing that an increase in loan portfolio allocation would lead to a corresponding improvement in liquidity levels of DT-SACCOs in Kenya. The model generated the equation:

$$L = 0.023 + 0.5302LPD + \varepsilon \dots \dots \dots \text{Equation 6}$$

In model II, the study examined the moderating effect of capital adequacy on the relationship between loan portfolio allocation and DT-SACCOs liquidity. The model revealed that loan portfolio allocation had statistically significant relationship on liquidity with a P-value of .000. This was supported by t-statistics value of $24.52 > 1.96$ at 95% confidence level, indicating a positive nexus between loan portfolio allocation and liquidity. However, the analysis established insignificant relationship between capital adequacy and liquidity with a p-value of 0.282, generating the following equation.

$$L = 0.0057 + 0.5287LPD - .0174CA + \varepsilon \dots \dots \dots \text{Equation 7}$$

Model III incorporated the interaction term between loan portfolio allocation and capital adequacy to establish whether capital adequacy altered the relationship between loan portfolio allocation and liquidity. The results established that loan portfolio remained positive and statistically significant with p-value of 0.000, indicating that its positive association with liquidity persisted even after accounting for the moderating variable and interaction effect. The findings were further supported by t-statistics value of 15.34, revealing a positive and statistically significant relationship between loan portfolio and liquidity. The study further established that the interaction between loan portfolio and capital adequacy and capital adequacy was negative and statistically significant with ($\beta = -6627$; $t = -3.24$; $p = 0.001$), indicating that capital adequacy weakened the positive relationship between loan portfolio allocation and liquidity. Thus, although greater allocation to loan portfolio is associated with improved liquidity, the positive effect diminishes as capital adequacy increases. These findings depict that capital adequacy alters the extent to which loan portfolio expansion translates into improved liquidity among DT-SACCOs. The findings are consistent with Gachenga et al, (2025) who established that although lending was positively associated with liquidity, the strength of the positive relationship declined as capital adequacy increased. Thus, liquidity benefits derived from loan portfolio allocation are conditional on the capital position of the SACCO. While lending generates interest income and provides a major avenue for deploying members' funds, higher capital adequacy may reduce the marginal contribution of additional lending to liquidity because well-capitalized SACCOs have greater capacity to absorb financial risks without relying extensively on the cash flows generated from their loan portfolios. Similarly, SASRA (2023) reports that high loan delinquency and delays in the remittance of member contributions disrupt cash-flow planning and liquidity management among SACCOs. These conditions are particularly relevant to the moderating relationship identified in the present study because a larger loan portfolio does not automatically imply greater liquidity. The liquidity effect of lending depends on the timely conversion of loans into cash through repayments. Where delinquency delays these inflows, the SACCO may need to rely on internally available capital and other liquid resources to sustain its operations. Therefore, higher capital adequacy may cushion the SACCO against liquidity pressures arising from delayed loan repayments, reducing the extent to which increases in the loan portfolio translate into additional liquidity. Moreover, the analysis established that capital adequacy was statistically insignificant with a p-value of 0.103 and a t-statistics value of 1.63, depicting that its principal contribution in model III was through its interaction with loan portfolio allocation rather than through direct effect on liquidity. The model generated the equation:

$$L = -.0045 + .6458LPD + .0386CA - .6627LPD * CA + \varepsilon \dots \dots \dots \text{Equation 8}$$

Table 5: Coefficients table; random effect model with Loan Portfolio Allocation

Predictors	Model I			Model II			Model III		
	Beta	t-value	P-value	Beta	t-value	P-value	Beta	t-value	P-value
Constant	0.002	1.13	0.257	0.006	1.52	0.128	-.004	-0.91	0.361
LPA	0.530	24.52	0.000	.529	24.39	0.000	.645	15.34	0.000
CA				-.017	-1.08	0.282	.039	1.63	0.103
LPA*CA							-.663	-3.24	0.001

4.7 Dumitrescu–Hurlin Panel Granger Non-Causality of Loan Portfolio Allocation and Liquidity

The study further conducted Dumitrescu and Hurlin (2012) panel Granger non-causality test to determine the direction of causality between loan portfolio allocation and liquidity of deposit-taking SACCOs. The results, as shown in table 6 and 7, based on one lag, established that loan portfolio allocation Granger-causes liquidity, with significant W-bar statistic of 2.7213 and the Z-bar statistic of 14.9070 ($p < 0.001$). The findings were further supported by significant Z-bar tilde statistic of 4.4596 ($p < 0.001$). Therefore, the null hypothesis was rejected, indicating that loan portfolio allocation provides useful information for predicting liquidity. In contrast, the reverse test showed no significant causality from liquidity to loan portfolio allocation, with Z-bar tilde statistic of 0.2523 ($p = 0.8008$). Thus, the null hypothesis that liquidity does not Granger-cause loan portfolio allocation was not rejected, revealing unidirectional Granger-causal relationship from loan portfolio allocation to liquidity.

Table 6: Dumitrescu & Hurlin (2012) Granger non-causality test results

Lag order: 1

W-bar = 2.7213

Z-bar = 14.9070 (p-value = 0.0000)

Z-bar tilde = 4.4596 (p-value = 0.0000)

H0: x1 does not Granger-cause y.

H1: x1 does Granger-cause y for at least one panel (id).

Table 7: Dumitrescu & Hurlin (2012) Granger non-causality test results

Lag order: 1

W-bar = 1.5691

Z-bar = 4.9286 (p-value = 0.0000)

Z-bar tilde = 0.2523 (p-value = 0.8008)

H0: y does not Granger-cause x1.

H1: y does Granger-cause x1 for at least one panel (id).

5.0 Conclusion and Recommendations

The study examined the relationship between loan portfolio allocation, capital adequacy and liquidity of DT-SACCOs in Kenya. The panel regression model established that loan portfolio allocation has a positive and significant association on liquidity of DT-SACCOs in Kenya, indicating that effective allocation of lending resources is associated with improved liquidity positions. The findings further establish that this relationship is significantly moderated by capital adequacy, with capital adequacy weakening the positive effect of loan portfolio allocation on liquidity. This implies that the liquidity benefits associated with loan portfolio allocation are contingent on the capital position of DT-SACCOs and should therefore be assessed within the broader context of capital management. The study further established a unidirectional Granger-causal relationship from loan portfolio allocation to liquidity, indicating that changes in loan portfolio allocation provide useful information for predicting subsequent liquidity conditions, whereas the reverse relationship is not supported. Thus, the central implication of the study is that liquidity management in DT-SACCOs should not be viewed independently of lending and capital-management decisions. DT-SACCOs can therefore enhance financial stability by adopting an integrated framework that simultaneously considers loan portfolio allocation, capital adequacy and liquidity when making lending and financial-management decisions.

The study recommends SACCOs should to regularly review loan portfolio performance and redirect funds from low-performing or illiquid segments to more productive lending opportunities. The study further recommends SASRA to develop practical guidelines for responsible digital and innovative lending and establish an innovation sandbox to allow DT-SACCOs to test new credit products under controlled conditions before wider implementation. These measures would promote innovation while strengthening credit quality, portfolio efficiency and liquidity management. Moreover, the study recommends management to incorporate capital adequacy thresholds into loan portfolio allocation decisions and regularly assess how changes in lending patterns may affect liquidity positions. In particular, DT-SACCOs should strengthen liquidity forecasting and stress-testing mechanisms by incorporating loan portfolio allocation indicators to anticipate potential liquidity pressures.

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