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Cash Management Practices, Firm Size, and Financial Sustainability of Deposit-Taking Savings and Credit Co-operative Societies in Kenya

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Abstract: Deposit-taking Savings and Credit Co-operative Societies (DT-SACCOs) have been recognized globally as pivotal financial institutions that facilitate economic development and financial inclusion. Despite this significance, 35.55% of DT-SACCOs in Kenya have been reported as financially unsustainable, a condition attributed primarily to deficient cash management practices. On average, four Savings and Credit Co-operative Societies (SACCOs) are delicensed annually due to financial distress, raising substantive concerns regarding the sector's sustainability. This study was undertaken to investigate the extent to which firm size moderates the relationship between cash management practices and financial sustainability within Kenyan DT-SACCOs. Grounded in cash management theory, the research adopted a positivist paradigm and employed a cross-sectional survey design. A total of 176 finance managers representing 176 licensed DT-SACCOs constituted the study population. Using Yamane's formula, a sample of 122 respondents was determined, with data collected through structured questionnaires yielding a 98% response rate. Descriptive and inferential statistical techniques were applied in the data analysis. A statistically significant positive relationship between cash management practices and financial sustainability was identified ($p = 0.001$). Moreover, an increase in the Nagelkerke R^2 statistic indicated that firm size exerted a moderating effect on this relationship. It is recommended that DT-SACCOs prioritize the adoption of integrated digital treasury management systems to centralize and automate cash operations, including collections, disbursements, reconciliation, and liquidity monitoring, thereby enhancing financial resilience and long-term sustainability.

Keywords: Cash control; Cash flow management; Cash budgeting; Total assets; Financial self-sufficiency

1. Introduction

Financial sustainability is the ability of institutions to meet their financial obligations, provide services without interruption and maintain long-term growth without relying heavily on external support. For DT-SACCOs, sustainability is closely linked to how well they manage their cash, ensuring that they collect revenues on time, control expenditures and maintain sufficient liquidity to handle both expected and unexpected financial needs. Effective cash management not only supports daily operations but also builds the trust of members and regulators, both of whom expect the SACCO to remain stable and dependable.

Globally, financial institutions, including co-operatives, are placing greater emphasis on improving cash management practices as a strategy to remain financially sustainable in an increasingly uncertain economic environment. The International Cooperative Alliance (ICA, 2022) reported that an average of 6,640 SACCOs between 2021 and 2023 faced financial pressure due to poor liquidity planning, leading to service disruptions and weakened confidence among members (WOCCU, 2021; WOCCU, 2023). In some cases, SACCOs with weak cash control mechanisms have failed to meet their short-term obligations, resulting in 10% in financial distress and eventual closure (WOCCU, 2022; WOCCU, 2023). Furthermore, international financial regulators now

require institutions to adopt proper cash flow planning and liquidity risk management frameworks to safeguard the continuity of services during economic downturns or member withdrawal shocks (World Bank, 2021).

SACCOs in sub-Saharan and West Africa are also facing significant challenges in maintaining financial sustainability, largely due to weak cash management systems. The African Development Bank (AfDB, 2022) reported that 40% of SACCOs in countries like Uganda, Tanzania and Rwanda struggle with delayed loan repayments, irregular income patterns and poor expenditure planning, which undermine their ability to remain financially sound (AMFIU, 2020). Additionally, limited technical capacity and outdated financial systems have made it difficult for these SACCOs to monitor and project cash flows accurately. This often leads to a mismatch between available cash and operational needs, increasing the risk of financial instability. The East African Community (EAC) has acknowledged these challenges and is encouraging SACCOs across the region to invest in modern financial management systems and training to enhance liquidity planning and control (EAC, 2021).

In Kenya, DT-SACCOs play a vital role in mobilizing savings and extending credit to 6.84 million members, yet 64 of the 176 DT-SACCOs continue to struggle with financial sustainability due to inadequate cash management practices. The Sacco Societies Regulatory Authority (SASRA, 2023) has raised concerns over the inability of 35.55% of DT-SACCOs to meet their short-term liabilities, especially during periods of high loan demand or economic uncertainty. Poor cash flow forecasting, weak internal controls and delays in recovering loan repayments are among the key issues affecting the sector (KUSCCO, 2022). SASRA's regulatory framework emphasizes liquidity monitoring, capital adequacy and risk management, which has created pressure on SACCOs to adopt more structured and transparent cash management systems. However, compliance has been inconsistent, especially among smaller and rural-based SACCOs that lack the capacity and systems to meet these regulatory standards (SASRA, 2023).

The Sacco Societies Regulatory Authority (SASRA, 2023) further revealed that 26% of DT-SACCOs reported liquidity shortfalls, largely stemming from delayed loan repayments, poor cash flow forecasting and misalignment between short-term liabilities and available cash. Moreover, FinAccess (2024) noted that 58% of SACCOs in Kenya still rely on manual cash handling systems, which increases the risk of inefficiencies and financial mismanagement. Research by Mbabu et al. (2024) highlighted that the lack of structured cash management frameworks reduces the financial resilience of SACCOs and threatens their long-term sustainability. Although some DT-SACCOs have started investing in automated cash monitoring systems and staff training, the progress is uneven, particularly among rural-based SACCOs. Kenya's regulatory environment, through SASRA, plays a central role in shaping SACCOs' cash management behaviors by setting compliance requirements that demand improved liquidity planning, financial reporting and internal controls. However, limited technological adoption and resource constraints continue to hinder full alignment with regulatory expectations.

1.1 Statement of the Problem

DT-SACCOs play a vital role in promoting financial inclusion and access to credit across Kenya's economy. However, financial sustainability in these SACCOs remains a growing concern, as they continue to face challenges in maintaining stable operations and long-term viability (FinAccess, 2024). This has seen 35.55% of DT-SACCOs declared financially unsustainable, with 26% recording a loan-to-deposit ratio at 113.5%. This raises concerns over the sector's long-term viability, as the problem persists even to SACCOs that meet regulatory requirements (SASRA, 2023). This poses a threat to the going concern of SACCOs, as an average of 80 SACCOs faced constrained operating cash flows, delayed loan disbursements and membership withdrawals totaling 131,347 in 2023, leaving them vulnerable to cash shortages and limiting their ability to deliver timely services to members (SASRA, 2023). This further weakens their capacity to generate consistent surpluses, maintain capital adequacy and absorb financial shocks as well as exposes them to missed investment opportunities. A solution is therefore needed because if the issue remains unsolved, members may end up losing their hard-earned savings amounting to Kshs 682.2 billion since SACCOs lack deposit guarantee fund, a central liquidity facility and a lender of last resort mechanism. This further poses a threat to the achievement of the Kenyan government agenda on the bottom-up economic transformation (BETA) in improving the economic development and expanding access to financial services for the underserved populations (PSC, 2023). Thus, the vision 2030 economic pillar aimed to create a vibrant and competitive financial sector that can impact business operations and influence savings may not be fully achieved as well as achieving an average annual economic growth rate of 10%.

The existing body of literature on cash management practices and financial sustainability within SACCOs reveals inconsistencies in conceptualization, context and findings across different institutional and regulatory contexts. Hoque (2023) observed that in Bangladesh, effective cash budgeting and liquidity monitoring significantly enhanced the financial resilience of microfinance institutions. Similarly, Wildan et al. (2023), after studying Islamic co-operatives in Indonesia, found that structured cash planning and real-time cash flow tracking were positively associated with institutional stability. In contrast, Dibie (2022) argued that while cash control mechanisms reduced operational inefficiencies in Nigerian credit unions, they had limited influence on long-term financial sustainability without complementary investment strategies. In Africa, Jonah et al. (2023) emphasized

the need for integrated cash management systems, noting that weak forecasting and poor cash handling processes were major contributors to financial instability among rural co-operatives in Ghana. Locally, Mbabu et al. (2024) reported that despite increased adoption of digital cash handling systems in Kenya, DT-SACCOs are still experiencing liquidity gaps due to ineffective cash flow planning. Mutai (2023) further noted that SACCOs with strong cash budgeting and cash reserve policies exhibited better sustainability indicators compared to those without structured cash frameworks.

These inconsistencies suggest a lack of consensus on how specific cash management practices influence financial sustainability, particularly in co-operative institutions that face fluctuating liquidity demands and irregular income flows. Moreover, the role of institutional strategies, member behavior and regulatory compliance in shaping cash management effectiveness remains underexplored. In Kenya, where DT-SACCOs are central to financial inclusion yet face growing concerns over delayed disbursements and unmet financial obligations, a focused investigation is warranted. Accordingly, this study seeks to bridge this knowledge gap by examining the effect of cash management practices on the financial sustainability of DT-SACCOs in Kenya. The research aims to contribute to both theoretical advancement and policy refinement by evaluating how specific components of cash management such as cash budgeting, cash flow forecasting and liquidity controls affect SACCOs' long-term financial health.

2. Literature Review

Cash management theory, first developed by Miller & Orr (1966) and Baumol (1952) and later expanded by Maina et al. (2020), emphasizes the need for firms to maintain optimal cash balances to minimize both transaction costs and the opportunity cost of holding idle cash. The theory assumes that firms operate in stable environments where the timing and amount of cash inflows and outflows can be estimated with reasonable accuracy. This helps firms plan daily operations, maintain liquidity and invest surplus funds to earn a return. By applying this structured approach, organizations are better positioned to meet short-term obligations while avoiding excessive cash holdings that could otherwise be invested for growth (Baumol, 1952; Mwangi, 2024).

Cash management is crucial for any organization aiming to achieve sustained financial success and growth. The theory's main aim was to provide a structured approach to how organizations manage their cash balances to ensure they can meet their financial commitments while avoiding idle funds (Nguyen, 2023). Effective cash management enables firms to stay liquid, reduce financial risk and take advantage of investment opportunities (Basweti, 2022). However, SACCOs present a unique operational context that differentiates them from typical profit-driven firms. Their cash inflows are largely dependent on member contributions and loan repayments, which are often irregular and susceptible to member income variability or seasonal fluctuations. Unlike commercial banks with broader access to diversified income streams, SACCOs rely heavily on internally generated funds. This member-driven liquidity poses a challenge in predicting cash flows accurately. Therefore, applying the cash management theory to SACCOs requires adjusting for the unpredictability in cash patterns. The theory is still relevant, as it supports the establishment of frameworks for forecasting cash needs, creating contingency reserves and improving the timing of investments and disbursements based on historical member behavior and operational cycles (Kamau & Mutiso, 2020).

In reference to prior studies, cash management theory has played an important role in helping financial institutions manage surplus cash effectively. According to Garcia-Herrero (2022), the theory guides institutions in making informed decisions on where and when to invest extra funds while still keeping enough cash for daily operations. Cash management theory is especially appropriate for this study because it directly addresses the operational realities and liquidity needs of DT-SACCOs. These institutions primarily deal with short-term cash flows derived from member deposits and loan repayments, which can be highly unpredictable due to member-based financial behavior. Cash management theory offers a structured approach to handling this volatility by guiding SACCOs on how to forecast inflows and outflows, determine minimum and maximum cash balances and make decisions on when to invest surplus funds or hold liquidity. This is critical for SACCOs, whose sustainability depends on their ability to meet member withdrawal demands, process loan applications promptly and maintain uninterrupted services. The theory's emphasis on balancing liquidity with investment efficiency which makes it particularly relevant for SACCOs seeking to optimize operational cash use, reduce idle funds and strengthen financial sustainability.

The study's objective was examined through an empirical review. Hoque (2023) carried out a study on the impact of cash management on bank profitability of selected commercial banks in Bangladesh and established a significant effect. Cash flow was measured using cash flow from operating activities to total assets, cash flow from investing activities to total assets and cash flow from financing activities to total assets. Secondary data for a period of six years between 2016 and 2021 was collected from a population sample of 25 banks. The panel data collected was analyzed using EViews 12 and revealed that cash balance to total assets has an insignificant nexus on profitability. The analysis further reveals that cash flow from financing activities to total assets has a significant nexus. The study recommends banks prudently manage their cash flow in order to improve banks' liquidity as well

as profitability. Wildan et al. (2023) did a study on the effect of firm profitability, free cash flow and cash holding on overinvestment in Indonesia. The study employed agency theory. Secondary data for five years (2017-2021) were considered for 315 manufacturing companies. To determine the nexus, multiple regression was employed and revealed a significant nexus between free cash flow and cash holding on firm performance. The study concludes that high cash flow increases overinvestment appetite. The study recommends manufacturing companies balance the cash flow to mitigate idle assets, which could negatively affect liquidity and returns of the firm.

Dibie (2022) carried out a study on cash management and profitability of listed manufacturing firms in Nigeria. The study considered ex post facto research design and simple random sampling technique. Secondary data from 2010 to 2018 was collected from 14 food and beverage firms. Multiple linear regression was employed and revealed a significant nexus between cash conversion cycle, creditors' payment period and cash flow margin on profitability. The study concludes that firms should pursue long-term financing arrangements with extended payback periods, allowing them to utilize these funds effectively within convenient investment timelines. The study recommends firms minimize their reliance on debt, especially considering macroeconomic instability and interest rate volatility, and instead focus on developing strategies to shorten their cash conversion cycles.

Jonah et al. (2023) carried out a study with an aim to assess the effect of cash management practices and profitability of listed brewery companies in Nigeria. Cash management practices were assessed through the cash conversion cycle and creditors' payment period where profitability was measured using indicators such as net profit margin and capital employed. The study adopted cost trade-off theory and utilized ex post facto research design. Secondary data for ten years (2012-2021) was analyzed by the help of SPSS. The results from the regression model revealed a significant correlation between cash management practices and profitability. Notably, the study unearthed an inverse nexus between creditor payment period and profitability. The analysis further revealed that the cash conversion cycle has a significant nexus on profitability. The study recommended managers enhance shareholder wealth by minimizing the cash conversion cycle ratio through improvement in inventory control processes, ensuring that accounts receivable are collected in accordance with the company's debt policy.

Ngaruiya (2022) conducted a study to assess the impact of cash flow management on the profitability of firms listed in the manufacturing sector at the Nairobi Securities Exchange in Kenya. The study utilized the Baumol model theory, free cash flow theory, Keynesian theory of money and stakeholders' theory as theoretical frameworks. Causal research design was employed to establish causal relationships between predictors and the response variable. Cash management practices were measured using operating cash flow management, investing cash flow management and financing cash flow management as predictors. The census method was applied, with eight firms forming the unit of analysis. Secondary data, collected through documentary review, served as the basis for the study. The predictors were found to significantly affect return on equity and they recommended manufacturing companies implement policies that focus on efficiency in managing inventory turnover.

Mutai (2023) carried out a study with an aim to establish the relationship between treasury management practices and profitability of DT-SACCOs in Kericho County, Kenya. Liquidity policies, cash-flow forecasts, member deposits and cash budgeting were used to measure treasury management practices where SASRA regulations moderated the relationship. The study adopted the Baumol EOQ model of cash management, the Miller-Orr cash management model and stakeholder theory. A descriptive research design and census method was employed and data collected using questionnaires was analyzed with the help of SPSS. The analysis revealed a significant association between treasury management practices and profitability. The descriptive analysis revealed a need for SACCOs management to establish stringent controls which may improve cash budgets and prevent deviations between projected and actual figures. The study recommends SACCOs explore strategies to mobilize members to make regular contributions, recognizing the potential impact on the SACCOs' overall financial situation. Figure 1 shows the conceptual framework of this study.

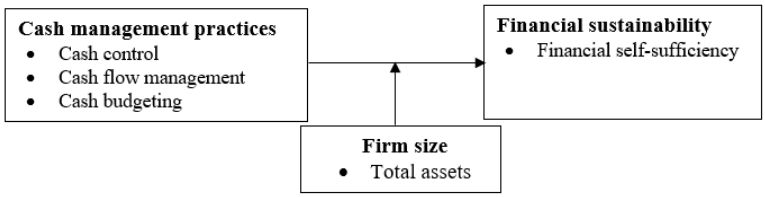

Figure 1. Conceptual framework

3. Research Methodology

The study adopted a cross-sectional survey design guided by the positivist philosophical paradigm. A sample of 122 respondents was selected using Yamane's formula. A two-stage sampling technique was employed, first clustering SACCOs based on their original membership bonds, followed by simple random sampling to select the final sample. Data were then collected using structured questionnaires, achieving a 98% response rate. The

reliability test confirmed the appropriateness of the questionnaire with a Cronbach's alpha coefficient of 0.844. Factor analysis showed the data were suitable for further analysis, leading to regression. A hierarchical binary logistic regression model was applied. Eq. (1) tested the direct relationship between the independent and dependent variables, while Eqs. (2) and (3) examined the moderating and interaction effects.

$$Logit\ [p] = ln\frac{p}{1-p} = \beta_0 + \beta_1 CC + \beta_2 CFM + \beta_3 CB \quad (1)$$

$$Logit\ [p] = \beta_0 + \beta_1 CC + \beta_2 CFM + \beta_3 CB + \beta_4 FS \quad (2)$$

$$Logit\ [p] = \beta_0 + \beta_1 CC + \beta_2 CFM + \beta_3 CB + \beta_4 FS + \beta_5 CC*FS + \beta_6 CFM*FS + \beta_7 CB*FS \quad (3)$$

where, $Logit\ [p]$ represents the natural logarithm of the odds that a SACCO will be financially sustainable, β_0 is the intercept, $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7$ is the coefficient, *CB* is the cash control, *CFM* is the cash flow management, *CC* is the cash budgeting (predictor variable), and *FS* is the firm size (moderating variable). Nagelkerke R^2 change evaluated the strength of the moderating effect of firm size.

4. Results and Discussions

4.1 Financial Sustainability Descriptive Statistics

To assess the financial sustainability of DT-SACCOs, the study employed the Financial Self-Sustainability (FSS) ratio. This approach categorized SACCOs as either financially sustainable (coded as 1) or financially unsustainable (coded as 0). FSS was calculated using the following formula:

$$FSS = \frac{\text{Adjusted Financial Revenue}}{\text{Adjusted (Financial cost + operating + loan loss provision) Expenses}} \quad (4)$$

Adjusted financial revenue was derived by subtracting grants or subsidies from the total income, specifically: Adjusted Financial Revenue = Income from Loans + Income from Investments + Other Income – Grants/Subsidies. This method provided a clear picture of sustainability based solely on internally generated income, excluding external support. Based on this calculation, the findings revealed that 96 DT-SACCOs were financially self-sustainable, while 24 were financially unsustainable. These results offered a practical basis for examining the factors contributing to sustainability in SACCO operations.

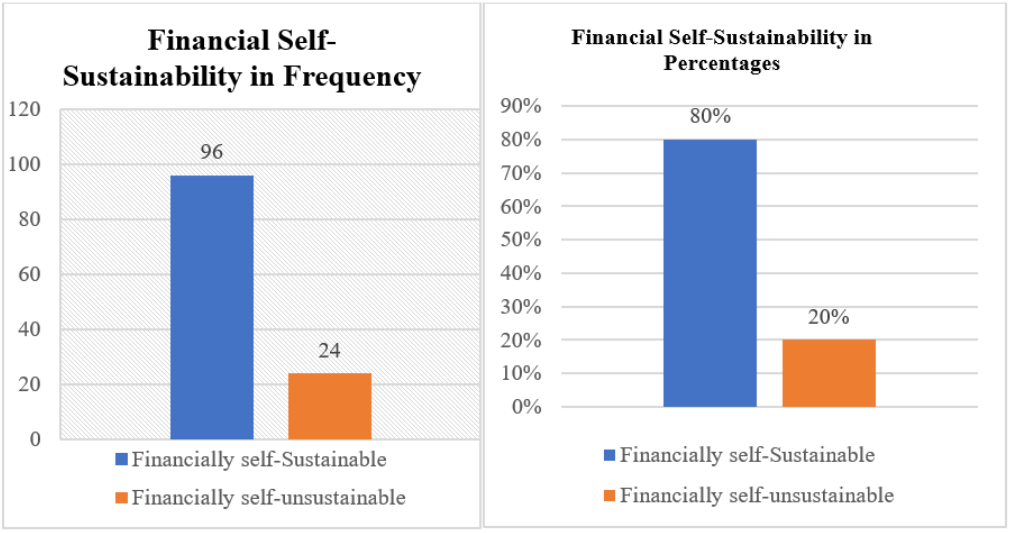

Figure 2. FSS

In reference to Figure 2, 96 DT-SACCOs accounting for 80 percent were financially self-sustainable. The findings are consistent with Mushonga (2018), who insinuated that 77 percent of financial co-operatives in South Africa were financially self-sustainable. However, the study further noted that 82 percent struggled to maintain consistent profitability due to high operational expenses and inefficient management. Similarly, Anakpo et al. (2023) highlighted that credit unions globally continue to face sustainability challenges, largely due to limited

capital, high operating costs and a strong dependence on external funding. These insights suggest that while a majority of SACCOs have achieved FSS, sustaining it over time remains a significant challenge, making financial sustainability a ticking time bomb.

4.2 Outliers

To assess the presence of outliers, Mahalanobis distance (D^2) was used to measure how far each observation deviated from the mean across all variables. A regression analysis was conducted to generate the distance values. The results identified one case, case number 108 with a Mahalanobis distance of 5.83. This value was below the critical threshold of 9.02, indicating that it was not a significant outlier. As a result, the case was retained for further analysis since it did not pose a risk of distorting the results. Table 1 shows the extreme values of total assets.

Table 1. Extreme values of total assets

		Row Number	Value
Highest	1	87	10.76
	2	62	10.59
	3	45	10.52
	4	3	10.30
	5	82	10.22
Lowest	1	108	5.83
	2	1	5.93
	3	43	7.62
	4	41	7.81
	5	70	7.87

4.3 Descriptive Results of Cash Management Practices

Cash management practices were assessed based on cash control, cash flow management and cash budgeting parameters. Respondents rated their agreement with various cash management practices using a five-point scale, with 1 representing strongly disagree and 5 representing strongly agree. Descriptive analysis presented in Table 2 reveals that the construct on clear separation of duties in cash recording yielded the highest average score of 4.20. This was followed by the frequency of regular bank reconciliations, with an average score of 4.02 and the efficiency in managing the payment of cash expenses recorded a mean of 4.01. The construct on whether cash is only spent with prior budget approval had a mean of 3.99, while the construct on whether SACCO has a clear plan for managing cash outflows recorded a mean of 3.83. Moreover, the respondents agreed that cash inflows are promptly recorded with a mean of 3.80 and the construct as to whether cash budgets are prepared accurately yielded a mean of 3.73. The construct on whether SACCO has effective measures in place to address cash shortages recorded a mean of 3.71. The construct on whether cash flow management has enhanced the SACCO's liquidity had a mean of 3.69. The construct on whether SACCO records all cash outflows in a timely manner had a mean of 3.67. The construct on internal audits being conducted regularly to ensure compliance with cash control policies scored a mean of 3.58. The lowest score was observed in the construct on whether SACCO monitors cash budget performance consistently throughout the year which had a mean of 3.47.

Table 2. Summary for cash management practices

Statements	Mean	S. D
All cash inflows are promptly recorded.	3.80	0.759
The SACCO has effective measures in place to address cash shortages.	3.71	0.934
The SACCO monitors cash budget performance consistently throughout the year.	3.47	0.884
The SACCO has a clear plan for managing cash outflows.	3.83	0.952
Internal audits are conducted regularly to ensure compliance with cash control policies.	3.58	1.194
Bank reconciliations are performed regularly.	4.02	0.730
There is a clear separation of duties in cash recording.	4.20	0.675
Cash is only spent with prior budget approval.	3.99	0.677
The SACCO records all cash outflows in a timely manner.	3.67	0.952
The SACCO manages the payment of cash expenses efficiently.	4.01	0.926
Cash budgets are prepared accurately.	3.73	0.946
Cash flow management has enhanced the SACCO's liquidity.	3.69	0.998

Table 2 provides a snapshot of cash management practices in the DT-SACCOs. The analysis indicates that 85 percent of respondents believe there is a clear separation of duties related to cash handling and recording, which leads to effective cash control. This finding aligns with Maina et al. (2020), who established that segregation of

duties significantly reduces opportunities for fraudulent activities, as no single individual has control over all aspects of cash handling, including receiving, depositing, recording and reconciling funds. Furthermore, 89 percent of respondents agreed that bank reconciliations are conducted regularly. This is supported by the Kenya Accountants and Secretaries National Examinations Board (KASNEB) (2018), which described how effective reconciliation processes contribute to better cash flow management by ensuring that all receipts and payments are accounted for. Consequently, comprehensive cash flow management is essential for SACCOs to manage their liquidity efficiently, ensuring they have sufficient funds available for immediate needs while also planning for future investments or loans. This further supports the response that cash inflows are promptly recorded and that cash budget preparations are both accurate and timely.

To ensure that the study accurately captured the intended concepts, principal component analysis **(PCA)** was further applied to validate and reduce the parameters into meaningful components. A sample adequacy test was initially conducted to assess multicollinearity among the constructs and to verify the data's suitability for factor analysis. The analysis found that multicollinearity was not a concern, as the determinant of the correlation matrix was 0.000, which surpassed the critical threshold of 0.00001 (Field, 2000). To further establish the suitability of the data, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy assessed the degree of common variance among the variables, while Bartlett's test of sphericity evaluated the degree of association. The analysis revealed a KMO value of 0.557 > 0.5, revealing the suitability of observed data for factor analysis. Additionally, Bartlett's test of sphericity yielded a chi-square value of 103.468 with 66 degrees of freedom and a significance value of 0.002, confirming that the data was appropriate for factor analysis.

PCA was further employed to reduce the observed data into a smaller set of factors. This ensured that the extracted factors captured the underlying structure of the data, enhancing the accuracy with which the variables represent the intended constructs. The analysis established three latent factors explained by the twelve hidden factors, as presented in Table 3.

Table 3. PCA for cash management practices

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.762	39.682	39.682	4.762	39.682	39.682	4.086	34.052	34.052
2	1.862	15.513	55.195	1.862	15.513	55.195	2.133	17.775	51.827
3	1.448	12.066	67.262	1.448	12.066	67.262	1.852	15.435	67.262
4	.985	8.206	75.468						
5	.873	7.276	82.743						
6	.719	5.988	88.731						
7	.547	4.555	93.286						
8	.261	2.175	95.461						
9	.209	1.740	97.201						
10	.179	1.491	98.692						
11	.115	.962	99.654						
12	.042	.346	100.000						

Extraction Method: PCA.

Table 3 indicates that the three factors accounted for 67.262 percent of the variance while the remaining nine components explained 22.138 percent. Consequently, the three components with eigenvalues greater than 1.0 were retained for further analysis while components with eigenvalues less than 1.0 were ignored due to the low vector loadings. This resulted in the retention of components 1, 2 and 3. The three extracted components were subsequently renamed based on the study's theoretical and conceptual framework. The first component was renamed cash control, the second as cash flow management and the third as cash budgeting. The three components/factors were then utilized in the binary logistic regression analysis to assess their influence on financial sustainability.

4.4 Hierarchical Regression Analysis for Cash Management Practices

The hierarchical regression model was employed to assess the moderating effect of firm size on the relationship between cash management practices and the financial sustainability of Kenya's DT-SACCOs. The primary objective of the analysis was to determine whether firm size moderates this relationship. To evaluate the strength of the moderating effect, Nagelkerke R^2 change was considered. Additionally, the analysis sought to establish the direct relationship between the study predictors of cash control, cash flow management and cash budgeting on the response variable financial sustainability, as summarized in Table 4.

Table 4. Hierarchical regression results for cash management practices

	Model 1			Model 2			Model 3		
Predictors	Beta[a]	Wald	P	Beta[a]	Wald	P	Beta[a]	Wald	P
(*Constant*)	-13.731	13.645	.000	-16.017	9.443	.002	-31.822	.463	.509
CC	1.470	10.949	.001	1.467	10.965	.001	3.603	.396	.529
CFM	1.512	8.872	.003	1.561	9.037	.003	8.378	1.421	.233
CB	1.045	1.810	.178	1.027	1.741	.187	-3.587	.127	.721
FS				.243	.428	.513	1.919	.134	.714
*CC*FS*							-.217	.121	.728
*CFM*FS*							-.743	.940	.332
*CB*FS*							.499	.205	.650
Nagelkerke R^2		.457			.461			.474	

The hierarchical regression model 1 established a positive nexus between cash control, cash flow management and the financial sustainability of DT-SACCOs, with statistically significant p-values of 0.001 and 0.003, respectively. These results are supported by the Wald statistics (Wald = 10.965 and 9.037), which exceed the critical Wald value of 1.96, thereby indicating a significant relationship. The findings are consistent with the studies by Richo & Onyiego (2023) and Mong'ina & Munene (2021), who reported a significant association between cash flow forecasting and financial sustainability. Consequently, results on cash control support the research carried out by Turgut (2022), who identified a significant association between cash control and financial sustainability. However, the results on cash control contradict the study carried out by Katana et al. (2023), who found a negative link between cash control and financial outcomes in manufacturing firms.

Moreover, the analysis revealed that cash budgeting has an inverse nexus with financial sustainability, with a p-value of 0.178, indicating that the effect is not statistically significant. The findings contradict those of Aguilar et al. (2024) and Oseko (2024), who reported a positive link between cash budgeting and financial performance in micro-enterprises and commercial banks. However, the results align with Mutai (2023), who found that limited member participation, low financial literacy and weak budgetary control mechanisms hinder the effectiveness of cash budgeting in SACCOs. According to the cash management theory, effective budgeting enables organizations to forecast cash inflows and outflows accurately to ensure liquidity and financial stability. Yet, in the SACCO context, this theoretical framework faces unique constraints. SACCOs experience irregular member-driven liquidity flows due to unpredictable deposits, seasonal income patterns and inconsistent loan repayments. These challenges complicate the accurate prediction and control of cash movements, limiting the impact of budgeting practices. KUSCCO (2022) highlights further constraints, including high loan demand, frequent defaults and limited access to external financing, which weaken the budgeting function. Similarly, SASRA (2023) reports that delays in remittance of member contributions and high delinquency rates disrupt reliable cash planning and execution. The model generated the following equation:

$$Logit\ [p] = ln\ [p/(1\text{-}p)] = \text{-}13.731 + 1.470\ CC + 1.512\ CFM + 1.045\ CB \quad (5)$$

In model 2, the study examined the moderating effect of firm size on the relationship between cash control, cash flow management, cash budgeting and financial sustainability. The analysis revealed that cash control and cash flow management had significant p-values of 0.001 and 0.003, respectively, indicating a positive nexus with financial sustainability. The findings were further supported by the Wald statistic values of 10.965 and 9.037, which exceeded the critical value of 1.96, confirming the significance of the predictors. However, the study established that cash budgeting and firm size had an inverse nexus with p-values of 0.187 and 0.513, respectively, with the model generating the following equation:

$$Logit\ [p] ln\frac{p}{1-p} = \text{-}16.017 + 1.467\ CC + 1.561\ CFM + 1.027\ CC + 0.243\ FS \quad (6)$$

In model 3, the study examined the interaction effect of firm size and found that cash control, cash flow management, cash budgeting and financial sustainability have an inverse nexus with p-values of 0.529, 0.233, 0.721, 0.714, 0.728, 0.332 and 0.650. The analysis further generated the following equation:

$$Logit\ [p] = \text{-}31.822 + 3.603CC + 8.378CFM - 3.587CB + 1.919FS - 217\ CC*FS - 743\ CFM*FS + 499\ CB*FS \quad (7)$$

To assess the moderating effect, Nagelkerke R^2 was used where firm size was measured through total assets. Model 1 showed that cash control, cash flow management and cash budgeting explained 45.7 percent of the variation in financial sustainability. In model 2, after including firm size as a moderator, the Nagelkerke R^2 increased slightly to 0.461, indicating that firm size contributes to strengthening this relationship. When the

interaction term for firm size was added in model 3, the Nagelkerke R^2 further improved to 0.474. This confirms the moderating role of firm size in enhancing the explanatory power of cash management practices on financial sustainability. These findings align with Kılıç et al. (2022) and Nwanaka (2022), who found that firm size measured by total assets impacts sustainability by increasing an institution's capacity to absorb financial shocks and support diversified income activities. Larger SACCOs with more assets can manage operational risks better, maintain stable cash flows and invest in systems that enhance efficiency and financial control (Mathuva, 2018). This is in line with Bolibok (2024) and Linawati et al. (2022), who established that an increase in total assets allows larger banks to improve diversification across different business lines and asset classes, which leads to risk diversification. These banks tend to benefit from more diversified business models and greater access to both human and capital resources, providing them with competitive advantages over smaller banks. Specifically, these institutions can afford to offer higher wages to attract highly skilled specialists, enabling them to leverage a broader range of expertise. They also have access to a wider variety of funding sources, often at lower costs, which enhances their financial sustainability. In contrast, smaller SACCOs, with limited asset bases, often lack the financial flexibility to manage cash flow volatility, making them more susceptible to financial instability during economic stress (Maina et al., 2020).

Furthermore, the study evaluated whether firm size moderates the relationship between the mean of cash management practices and the financial sustainability of DT-SACCOs. Hierarchical regression analysis was employed and changes in the Nagelkerke R^2 were used to evaluate the strength of the moderating effect, as presented in Table 5, where the following models were employed:

$$Logit\ [p] = ln\frac{p}{1-p} = \beta_0 + \beta_1 CMP \quad (8)$$

$$Logit\ [p] = \quad \beta_0 + \beta_1 CMP + \beta_2 FS \quad (9)$$

$$Logit\ [p] = \quad \beta_0 + \beta_1 CMP + \beta_2 FS + \beta_3\ CMP*FS \quad (10)$$

where, $Logit\ [p]$ refers to the natural logarithm of the SACCOs that will be financially sustainable, β_0 is the intercept, $\beta_1, \beta_2, \beta_3$ is the coefficient, *CMP* is the cash management practices, *FS* is the firm size (moderating variable), and *CMP*FS* is the cash management practices * firm size.

Table 5. Hierarchical regression results for cash management practices

	Model 1			**Model 2**			**Model 3**		
Predictors	Beta[a]	Wald	P	Beta[a]	Wald	P	Beta[a]	Wald	P
(*Constant*)	-10.252	19.773	.001	-11.491	7.939	.005	-14.548	.354	.552
CMP	3.176	24.864	.001	3.183	24.825	.001	4.045	.352	.553
FS				.135	.142	.707	.471	.031	.860
*CMP*FS*							-.095	.016	.899
Nagelkerke R^2		.412			.414			.414	

Cognizant of Table 5, model 1 established a significant nexus between cash management practices and financial sustainability of DT-SACCOs, with a p-value of 0.001. This was supported by a Wald statistic of 24.864, above the critical threshold of 1.96. These findings align with prior research by Hoque (2023) and Mutai (2023) who found that cash management improves financial performance. The logistic regression model produced the following equation:

$$Logit\ [p] = \ln [p/(1\text{-}p)] = 10.252 + 3.176\ CMP \quad (11)$$

In Model 2, the study tested whether firm size moderates the nexus between cash management practices and financial sustainability. The results showed a significant relationship, with a p-value of 0.001 and a Wald statistic of 24.825, exceeding the threshold of 1.96, indicating a strong predictive contribution of the model. However, firm size on its own did not have a significant effect, as shown by a p-value of 0.707 and a Wald statistic of 0.142. The model yielded the following equation:

$$Logit\ [p] ln\frac{p}{1-p} \quad = 4.406 + 110\ CMP + 196\ FS \quad (12)$$

Model 3 examined the interaction effect of firm size and cash management practices in predicting financial sustainability. The interaction effect established an insignificant nexus with p-values of 0.553, 0.860 and 0.899, indicating an inverse and statistically insignificant moderating effect. These outcomes suggest that the presence of firm size as a moderator weakens the relationship between cash management practices and financial sustainability.

Consequently, the analysis generated the following equation:

$$Logit\ [p] = \ 14.548 + 4.045\text{CMP} + 471\text{FS} - 095\text{CMP*FS} \quad (13)$$

A hierarchical regression analysis was further conducted to assess whether firm size moderates the relationship between cash management practices and financial sustainability among DT-SACCOs. In model 1, cash management practices accounted for 41.2 percent of the variance in financial sustainability (Nagelkerke R^2 = 0.412). With the inclusion of firm size in model 2, the explained variance rose slightly to 0.414, suggesting a modest moderating role. However, the addition of the interaction term in model 3 did not lead to any further change in the model's explanatory power, as the Nagelkerke R^2 remained at 0.414. This suggests that although firm size contributes marginally as a moderator, its interaction with cash management practices does not significantly strengthen the model's explanatory capacity.

5. Conclusions and Recommendations

The study examined the impact of cash management practices on the financial sustainability of DT-SACCOs, focusing on cash control, cash flow management and cash budgeting. The hierarchical model revealed that cash management practices have a significant association with the financial sustainability of DT-SACCOs. Consequently, cash control and cash flow management have a significant effect on financial sustainability, while cash budgeting was found to have an inverse nexus. On the other hand, firm size was found to have strengthened the nexus between cash management practices and financial sustainability of DT-SACCOs. Based on the findings, the study recommends that SACCOs adopt digital treasury management systems to automate and centralize cash operations like collections, disbursements, reconciliation and liquidity tracking. To ensure successful implementation, especially for rural SACCOs with limited technical capacity, a phased adoption approach is suggested. This approach includes conducting cost-benefit analyses and addressing potential challenges step-by-step, helping SACCOs improve accuracy, reduce errors, gain real-time cash visibility and make better financial decisions over time. For large SACCOs with more advanced infrastructure and resources, a comprehensive and integrated digital treasury solution can be implemented more rapidly to maximize operational efficiency and scalability.

Data Availability

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

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Conflicts of Interest

The authors declare that there are no conflicts of interest related to this study.

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