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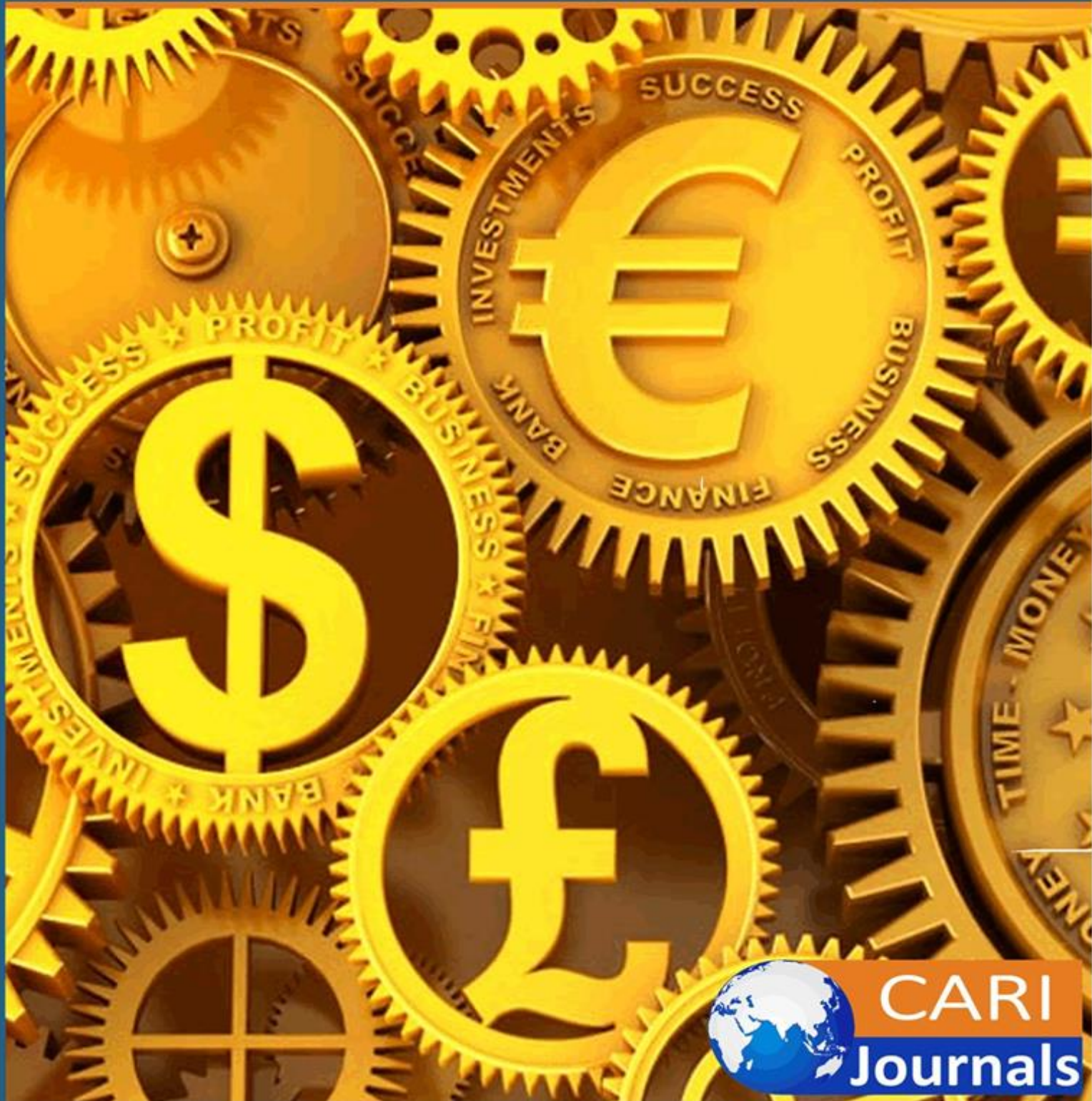

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Cash Reserves, Capital Structure, and Profitability: An Analysis of Liquidity Risk Management in Public Limited Microfinance Institutions in Rwanda

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Abstract

Purpose: The purpose of this study was to investigate the influence of liquidity risk management on the financial performance of microfinance institutions in Rwanda. This research focused on the relationship between the Cash Ratio (CAR) and Equity Capital to Total Assets (ECTA) on Return on Assets (ROA), with the Lending Rate (LR) and Inflation Rate (IR) acting as control variables.

Methodology: A quantitative method was applied for this research, based on a panel data model. The information needed was derived from the financial statements of fifteen licensed microfinance institutions that kept steady records of their finances in Rwanda. The panel data estimation techniques used included Fixed Effects and Random Effects models. The Hausman test was applied to choose the right estimator.

Findings: It has been found that Cash Ratio has an impact on financial performance at $\beta = 0.049$ and $p = 0.011$, and Equity Capital/Total Assets also have a similar impact at $\beta = 0.281$ and $p = 0.034$. The results above imply that if the MFIs have sufficient liquidity and capitalization, then they would perform well financially. It was found out from the study that lending rate influences profitability moderately, but inflation does not have any impact on the financial performance. Also, it has been found that the combined influence of liquidity risk management indicators impacts profitability significantly.

Unique Contribution to Theory, Policy and Practice: This paper offers practical evidence from the microfinance sector in Rwanda, which has been ignored in the previous studies. This work also supports the theory in that it stresses the importance of having proper liquidity and capitalization in improving organizational stability and profitability. For the purpose of policy, the results of this research are useful for the regulators and policymakers because they highlight the importance of developing an appropriate framework for liquidity and capital adequacy among the microfinance institutions.

Keywords: *Liquidity Risk Management, Cash Ratio, Equity Capital, Return on Assets, Microfinance Institutions, Financial Performance*

JEL Codes: *G21, G32, G28, G23*

1. Introduction

Microfinance institutions have been instrumental in ensuring financial inclusion in the economy by providing financial services to low-income households, small entrepreneurs, and the poor in society. This is important in ensuring poverty reduction, job creation, and economic empowerment in the economies of developing countries, especially in Sub-Saharan Africa. Financial intermediaries involved in microfinance play an important part in enhancing the welfare of poor people as they offer financial products that would be difficult to obtain through traditional banking channels. By offering a range of financial services including lending, savings, insurance, and financial education, microfinance makes it possible for marginalized members of society and aspiring entrepreneurs to engage in income generating activities, improve their well-being, and alleviate poverty (Cull et al., 2019).

In recent years, the microfinance sector has experienced tremendous growth due to the recognition of its importance in ensuring economic growth in the economies of developing countries. The expansion of microfinance organizations plays a crucial role as it facilitates financial inclusion and ensures opportunities for disadvantaged people. In line with the expansion of microfinance organizations, they have become more sustainable and able to provide their clients with financial services that would help them invest and earn money. The expansion of microfinance organizations also helps alleviate poverty, create employment opportunities, foster entrepreneurship, and enhance living standards (Ledgerwood et al., 2021).

Despite the great milestones made by the microfinance institutions, there still exist various problems that continue to affect the sustainability and financial performance of the sector. Many of these organizations suffer from various inefficiencies that include high costs of operations, inefficient internal control systems, lack of technological resources, and poor risk management practices. Besides, high default rates resulting from nonperforming loans and inability of borrowers to repay due to economic instability pose another major problem for the microfinance institutions. Moreover, competition in the sector from commercial banks and other forms of electronic financial services providers adds more pressure to the MFIs to ensure both competitiveness and affordable services. Other challenges affecting the growth and financial sustainability of microfinance institutions include inflation, volatile lending rates, difficulties in accessing long-term financing, regulatory compliance expenses, and managerial problems. (Bwana & Mwakujonga, 2020).

Liquidity risk exists when financial institutions are not in a position to meet their short-term financial obligations as they fall due without incurring significant losses. For financial stability and the smooth operation of microfinance institutions in an environment characterized by financial volatility, it is important for financial institutions to have adequate levels of liquidity (Basel Committee on Banking Supervision, 2021). For effective liquidity risk management by financial institutions, it is important for the institutions to strike a balance between liquidity and

income-generating investments. Although liquidity is important for the smooth operation of financial institutions since it helps the institutions meet their short-term financial obligations as they fall due and respond to unexpected financial shocks, excessive liquidity may result in low profitability since the excess liquidity may not generate income (Mushtaq & Siddiqui, 2022).

Inadequate liquidity could put microfinance institutions in financial trouble, hence limiting the capacity of these institutions to continue offering financial services to their customers. Microfinance institutions that lack sufficient liquidity will not be in a position to provide credit facilities to their clients in a timely manner, withdraw savings for depositors, and finance day-to-day operations. Failure by microfinance institutions to manage liquidity properly might expose them to various challenges such as rising borrowing costs, insolvency, among others. This is because microfinance institutions require a consistent flow of funds to operate and generate profits. In this case, the maintenance of an optimal level of liquidity has become the main goal of financial management in microfinance institutions across the globe (Muriu, 2019).

Financial indicators used in the assessment of the management of liquidity risk in financial institutions include the cash ratio (CAR) and the equity capital to total assets ratio (ECTA). The cash ratio measures the capacity of the financial institution to meet its short-term obligations using liquid assets, while the equity capital to total assets ratio measures the strength of the capital base of the financial institution, hence its capacity to withstand financial shocks (Tehulu, 2022). These financial indicators are used in financial studies to assess the effect of the management of liquidity risk on the stability of financial institutions. Adequate capital structures in microfinance institutions promote the maintenance of the stability of these institutions, hence the capacity for long-term institutional growth (Parvin et al., 2020). Financial performance of microfinance institutions is often assessed through financial ratios such as profitability ratios like Return on Assets (ROA). ROA measures how microfinance institutions use their assets to achieve profits. This financial ratio is regarded as one of the most accurate measures of financial sustainability of microfinance institutions (Muriu, 2019).

Empirical studies have shown that liquidity risk management has a considerable effect on financial performance of financial institutions. An empirical study conducted to examine microfinance institutions has shown that liquidity levels, capital adequacy, and risk management practices play an important role in assessing financial performance of microfinance institutions (Nyangaresi & Simiyu, 2024). Financial risks, including liquidity risk, credit risk, and operational risk, have a significant effect on the profitability of microfinance banks in African microfinance institutions, as revealed by various studies. Therefore, microfinance institutions that manage their liquidity well have the ability to sustain financial stability and avoid financial difficulties (Ogundele, 2023).

Moreover, it has been established through various studies that capital structure also affects the sustainability of microfinance institutions. This is because the availability of finance through

equity finance and capital adequacy helps microfinance institutions to survive financial challenges and sustain their operations in times of economic instability (Parvin et al., 2020). The microfinance sector in Africa is still growing, with most African countries prioritizing financial inclusion and poverty reduction. However, the sector is facing a number of challenges, including the availability of capital markets, financial management, and the effects of macroeconomic factors (Cull et al., 2019). In Rwanda, the role of microfinance institutions is crucial in supporting financial inclusion. This is because the expansion of the microfinance sector is a major contributor to the improvement of access to financial services, hence economic development (National Bank of Rwanda, 2023).

Despite the positive contribution of the expansion of the microfinance sector, there are a number of financial management challenges affecting microfinance institutions in Rwanda. These challenges include financial constraints, capital reserves, inefficiency, and sensitivity to other economic risks, which may affect the profitability of the microfinance institutions (National Bank of Rwanda, 2022).

Although there are a number of studies that have been conducted on the determinants of financial performance in microfinance institutions, there is a lack of empirical evidence on the effect of managing liquidity risks on the profitability of microfinance institutions in Rwanda. This is because most of the research conducted on the financial performance of microfinance sectors is based on commercial banks and other African countries (Habimana & Manirakiza, 2024).

Moreover, past studies may focus more on individual factors rather than the combined effect of the liquidity management indicators. The combined effect of the cash ratio and the equity capital to total assets ratio on the profitability of the microfinance institutions is important for the development of effective financial management practices. This is because the effect of the cash ratio and the equity capital to total assets ratio on the profitability of the microfinance institutions has not been well understood (Tehulu, 2022).

The objective of this study is to examine the effect of the liquidity risk management practices on the financial performance of the microfinance institutions in Rwanda by examining the effect of the cash ratio and the equity capital to total assets ratio on the Return on Assets. This study also examines the effect of the lending rate and the inflation rate as the macroeconomic control variables. The study aims to contribute to the existing literature on the microfinance institutions' risk management practices. The study also aims to contribute to the development of effective financial management practices for the microfinance institutions in Rwanda.

2. Literature review

2.1 Theoretical Literature review

Liquidity Preference Theory

Liquidity Preference Theory has continued to be the leading theory for the management of liquidity risks in financial institutions. The theory was first proposed by John Maynard Keynes; however, the modern financial literature still uses the theory for banking and microfinance studies. Liquidity Preference Theory suggests that financial institutions prefer liquid assets because liquidity acts as a guarantee against unforeseen withdrawal and financial uncertainty. Financial institutions, therefore, prefer to invest a part of their assets in liquid assets such as cash reserves to meet unforeseen financial obligations without facing financial difficulties.

The Liquidity Preference Theory has been used to explain the significance of maintaining cash reserves for microfinance institutions. Cash reserves are usually measured by the Cash Ratio (CAR). Cash Ratio represents the proportion of liquid assets maintained by financial institutions compared with current liabilities. Cash Ratio represents the ability of financial institutions to meet current financial obligations. Maintaining adequate liquidity minimizes the chances of insolvency for financial institutions. Liquidity management by financial institutions allows institutions to meet financial obligations and carry out business operations without facing financial losses (Wuave & Yua, 2020).

However, the liquidity preference theory also acknowledges the trade-off between liquidity and profitability. While holding liquid assets helps in protecting the institution from financial shocks, holding excess liquid assets may result in reduced profitability as liquid assets tend to offer relatively lower returns compared to the returns from the institution's lending business. Microfinance institutions mostly earn income in the form of interest on loans, and hence holding excess liquid assets may result in reduced income-generating opportunities for the institution. Recent studies emphasize the need for microfinance institutions to strike an optimal balance between liquid assets and income-generating assets in order to sustain financial performance (Yahaya & Mahat, 2022)).

In the context of emerging financial markets such as the microfinance sector in Rwanda, liquidity management is critical as microfinance organizations are likely to experience fluctuating deposits and may not have alternative sources of funds. Thus, for stability in this sector, liquidity is critical in ensuring the continued delivery of financial services to the poor. Within this research, the theory of liquidity preference forms the basis for analyzing the role of Cash Ratio (CAR) in influencing Return on Assets (ROA) in microfinance organizations.

Capital Buffer Theory

The second theory relevant to this study is the Capital Buffer Theory attributed to Marcus (1984) and later developed Milne and Whalley (2002). This theory explains the link between financial

performance and capital adequacy in financial institutions. The theory posits that microfinance institutions build buffers of capital above and beyond the minimum regulatory requirements as a way of absorbing unexpected losses and minimizing the likelihood of insolvency.

In financial institutions, the level of capital adequacy is determined by the use of financial ratios such as Equity Capital to Total Assets (ECTA). This financial ratio represents the proportion of assets that are financed by the shareholders' equity as opposed to debt. Financial institutions with higher levels of capital adequacy ratios have a stronger financial base and are thus more effective in absorbing risks arising from liquidity crises, loan defaults, and other macroeconomic risks.

Recent studies have emphasized that financial performance is improved by adequate capital buffers, which enhance stability and reduce funding risks. Financial institutions that have adequate capital buffers have a higher likelihood of maintaining depositor confidence, accessing external finance, and resisting economic shocks. Furthermore, financial institutions with adequate capital buffers have the ability to increase their lending activities while maintaining adequate risk absorption capacity (Vu &Ngo, 2023).

However, there is a potential trade-off between capital buffer levels and financial profitability, according to the capital buffer theory. While financial institutions benefit from adequate capital levels, high levels of capitalization may result in reduced financial profitability due to high levels of equity finance, which is more expensive compared to debt finance. Studies analyzing financial institutions performance in various economies have shown that there is a nonlinear relationship between capital levels and financial profitability, depending on the level of capitalization and institutional efficiency (Pratomo, 2025).

For microfinance institutions, it is imperative to have a proper capital base due to the high-risk business environment in which they operate, characterized by vulnerability in borrowers and economic instability. A proper capital structure will allow microfinance institutions to continue providing financial services while managing liquidity risk. In this study, Capital Buffer Theory is used to provide a rationale for investigating the effect of Equity Capital to Total Assets (ECTA) on Return on Assets (ROA).

2.2 Empirical Literature Review

The empirical literature on microfinance institutions (MFIs) is increasingly recognizing the significance of financial risk management, especially in explaining the sustainability and profitability of microfinance institutions. In this case, liquidity risk management is one of the aspects that have received much attention, especially because microfinance institutions have to ensure that there is liquidity to cater to withdrawal needs while continuing to finance their lending activities. Liquidity risk management is considered essential in explaining the financial performance of microfinance institutions, which is usually determined by Return on Assets (Muriu, 2019).

The use of the cash ratio is widespread as a tool for managing liquidity risks. This is because it is a reflection of the financial institutions' capacity to meet short-term financial obligations. In the context of microfinance, it is crucial for financial institutions to build sufficient cash reserves for the stability of the operations and for meeting deposit withdrawals. Capital adequacy is another important determinant of financial performance in microfinance institutions. The ratio of equity capital to total assets (ECTA) reflects the financial strength of an institution and its ability to absorb financial shocks. Institutions with strong capital bases are generally better positioned to manage financial risks and maintain operational stability.

Several empirical studies have been conducted on the relationship between financial performance and liquidity indicators. Abebe (2022) conducted a study on the effect of liquidity management in microfinance institutions across sub-Saharan countries. The study established that financial performance is improved by effective asset liability management, as it helps financial institutions meet short-term financial obligations without affecting their operations. The research also indicates that excessive liquidity may have an adverse effect on profitability due to low returns on idle funds. This indicates that for optimal performance, an optimal level of liquidity is important rather than high liquidity.

Njue et al. (2020) also investigated the role of liquidity management in financial performance in microfinance institutions in Kenya. The researchers found that liquidity indicators have an effect on profitability in microfinance institutions in Kenya, but the extent may vary for individual microfinance institutions. Microfinance institutions that have optimal levels of liquidity are better placed to manage their operations and financial performance.

Parvin et al. (2020) observed that well-capitalized microfinance institutions have better financial sustainability due to a buffer against financial risks. The study observed that microfinance institutions that have a high ratio of equity capital have better financial sustainability. Fonchamnyo et al. (2023) studied the relationship between capital structure and financial sustainability in microfinance institutions in Cameroon and observed that equity financing has a positive effect on financial sustainability in microfinance institutions. In this case, well-capitalized microfinance institutions have better financial sustainability due to low financial vulnerability.

However, other studies indicate that the relationship between capital structure and financial performance may not be as straightforward as previously thought. Tehulu (2022) noted that whereas profitability may lead to increased capitalization, excess capital accumulation may also be an indication of a lack of investment opportunities. This indicates that whereas ECTA is likely to have a positive effect on institutional stability, its effect on profitability may be subject to the efficiency with which resources are harnessed.

Nevertheless, other studies have reported mixed findings regarding the relationship between liquidity indicators and financial performance. King'ori et al. (2020) found that liquidity risk had

a negative but statistically insignificant relationship with financial performance among Kenyan microfinance banks. According to the authors, operational efficiency and institutional size had a stronger effect on profitability than liquidity indicators. This divergence in empirical findings indicates that the influence of liquidity management on financial performance may depend on institutional characteristics and the economic environment.

Other studies have also reported conflicting findings with regard to the relationship between liquidity indicators and financial performance. King'ori et al. (2020) established that liquidity risk had an insignificant negative relationship with financial performance for microfinance banks in Kenya. The authors argued that the effect of operational efficiency and size of institutions was more significant than liquidity indicators for profitability. The conflicting findings of various studies suggest that the effect of liquidity management may vary depending on the characteristics of the institutions and the environment.

Macro-economic factors also have an effect on the financial performance of microfinance institutions. The lending rate (LR) is an important factor in this case as it affects both the demand for loans and the ability of borrowers to pay. According to the rates of lending also play a crucial role in the profitability of financial institutions (Cull et al., 2019). An increase in the rates of lending may lead to an increase in the interest income of the financial institution, hence an increase in profitability. However, an increase in the rates of lending may also lead to a decline in the repayment capacity of the borrowers, hence a decline in financial performance. Mushtaq and Siddiqui (2022) also argued that the rates of interest play a crucial role in the financial performance of financial institutions. The authors argued that an increase in the rates of interest may lead to a decline in the financial performance of financial institutions.

Another macroeconomic factor that could affect the financial performance of microfinance institutions is inflation. Inflation is a general increase in prices of goods and services in an economy, which could affect the cost of operation, real value of loan repayment, and general economic environment of operation of financial institutions. Studies have shown that inflation could negatively affect the performance of financial institutions. Muriu (2019) established that inflation negatively effects the profitability of financial institutions because it leads to high operation costs and reduces the purchasing power of borrowers. Mushtaq and Siddiqui (2022) established that inflation is one of the factors that influences financial sustainability in financial institutions, considering its effect on the real value of financial transactions. There is evidence suggesting that moderate inflation may have a neutral or even a positive effect on financial institutions if their respective interest rates adjust properly. Thus, there is a possibility that the effect of inflation on financial performance is dependent on certain macroeconomic stability and monetary policy conditions.

Although various studies have focused on exploring the factors affecting financial performance of microfinance institutions in various African countries, there is limited empirical evidence

available to explore the effect of liquidity risk management indicators, such as the cash ratio (CAR) and equity capital to total assets ratio (ECTA), on the financial performance of microfinance institutions, specifically in Rwanda. Most studies have focused on analyzing liquidity risk and capital structure separately, rather than jointly analyzing their effect on institutional profitability while considering macroeconomic factors such as lending rate (LR) and inflation rate (IR).

Consequently, the aim of this study is to bridge the existing knowledge gap in the subject matter by examining the influence of liquidity risk management indicators, namely CAR and ECTA, on financial performance as measured by Return on Assets (ROA) while considering the influence of the lending rate (LR) and inflation rate (IR) in the case of microfinance in Rwanda.

3. Methodology

The research study adopted a quantitative research approach with a study design that incorporated panel data analysis. This research approach was adopted with the objective of examining the association that exists between the management of liquidity risks and the financial performance of microfinance institutions in Rwanda. The target population of the research study comprised 22 licensed public limited microfinance institutions that are regulated by the National Bank of Rwanda. However, it was observed that not all the financial information of the microfinance institutions was available for the study period. Only 15 microfinance institutions published financial statements, while others did not. Therefore, the research study adopted a purposive sampling approach, where only the microfinance institutions with reliable financial data were selected for the study. This is because panel data analysis requires accurate, consistent, and comparable data. The use of institutions with incomplete records may result in biased estimations and less reliable econometric results. The study used secondary data collected from the financial statements of the identified microfinance institutions and supplemented it with macro data from the National Institute of Statistics in Rwanda and the National Bank of Rwanda.

For this study, a regression model was used to investigate the relationship between liquidity risk management and financial performance. In this model, Return on Assets (ROA) was used as a proxy for financial performance as a dependent variable. On the other hand, Cash Ratio (CAR) and Equity Capital to Total Assets (ECTA) were used as a proxy for liquidity risk management as independent variables in the model. In addition, Lending Rate (LR) and Inflation Rate (IR) were used as control variables in the model to represent macroeconomic factors that affect financial performance in terms of profitability.

The econometric model was specified as follows:

$$ROA_{it}=\beta_0+\beta_1 CAR_{it}+\beta_2 ECTA_{it}+\beta_3 LR_{it}+\beta_4 IR_{it}+\varepsilon it$$

The analysis is performed using panel data estimation techniques such as the Fixed Effects Model and the Random Effects Model. The choice of the appropriate estimator is based on the

Hausman Specification Test. Further tests are conducted to ascertain the robustness and reliability of the analysis.

4. Findings and Discussion

4.1 Findings

The results of the descriptive statistics provide a summary of the main features of the variables, which were used for the investigation of the association between the management of liquidity risk and financial performance for the microfinance institutions.

Table 1:

Descriptive statistics

Variable	Mean	Std Dev	Min	Max
ROA	0.1	0.093	0	0.404
CAR	0.562	0.724	0.022	3.192
ECTA	0.248	0.101	0.101	0.515
LR	22.67	1.88	14	24
IR	6.03	0.77	5	6.8

Note: ROA=Return on Asset; CAR= Cash Ratio; ECTA: Equity Capital to Total Asset; LR= Lending Rate; IR= Inflation Rate.

The results from the table above show the mean, standard deviation, minimum, and maximum for the Return on Assets (ROA), Cash Ratio (CAR), Equity Capital to Total Assets (ECTA), Lending Rate (LR), and Inflation Rate (IR) variables.

The results show that the average Return on Assets (ROA) for the microfinance institutions is 0.10, meaning that the microfinance institutions are earning an average of 10% of their total assets as profit. The standard deviation of 0.093 shows that there is moderate variability in the profitability of the microfinance institutions. The minimum of 0 shows that there are instances when the microfinance institutions did not make any profits, while the maximum of 0.404 shows that there are instances when the microfinance institutions were making profits of about 40.4%.

The Cash Ratio (CAR), which is used to assess the liquidity position of microfinance institutions, has an average value of 0.562. This shows that, on an average basis, liquid assets are approximately equal to 56.2% of short-term liabilities. This also indicates that most microfinance institutions have a relatively good liquidity position. However, the high standard deviation value of 0.724 and the large difference in the minimum value (0.022) and maximum value (3.192) suggest that there is a large difference in the liquidity management practices adopted by the

microfinance institutions. Some microfinance institutions have low levels of liquidity, while others have extremely high levels of liquidity.

The Equity Capital to Total Assets ratio (ECTA) has an average of 0.248, implying that about 24.8% of the total assets of microfinance institutions are financed through equity capital. The standard deviation of the Equity Capital to Total Assets is 0.101, implying that there is moderate variation in the capital structure of the microfinance institutions. The minimum of the Equity Capital to Total Assets is 0.101, while the maximum is 0.515. This implies that while some microfinance institutions rely heavily on external finance, others have relatively stronger capital.

With regard to the control variables, the average Lending Rate (LR) is 22.67%, with a standard deviation of 1.88. This suggests that the variations in the lending rates are relatively low. The lending rate ranges from 14% to 24%. This suggests that the interest rates in the microfinance industry are relatively high compared to other sectors because of the higher operating costs and credit risks involved in lending to small-scale borrowers.

Finally, with regard to the Inflation Rate (IR), the average is 6.03%, with a standard deviation of 0.77. This suggests that the macroeconomic environment has been relatively stable during the study period. The inflation rate ranges from 5% to 6.8%.

In summary, the descriptive statistics show that even though microfinance institutions have relatively good levels of liquidity and capital, there are differences in the way they manage their liquidity and profitability. This calls for further econometric analysis to ascertain the effect of liquidity risk management indicators such as Cash Ratio and Equity Capital to Total Assets on financial performance as measured by Return on Assets.

Table 2:

Correlation Matrix Analysis

Variables	ROA	CAR	ECTA	LR	IR
ROA	1				
CAR	0.205	1			
ECTA	0.246	-0.111	1		
LR	0.131	-0.452	-0.059	1	
IR	0.023	0.037	-0.01	-0.009	1

Note: ROA=Return on Asset; CAR= Cash Ratio; ECTA: Equity Capital to Total Asset; LR= Lending Rate; IR= Inflation Rate.

The correlation matrix as presented in the Correction matrix in the table above shows the correlation relationships that exist among the study variables, which include Return on Assets (ROA), Cash Ratio (CAR), Equity Capital to Total Assets (ECTA), Lending Rate (LR), and

Inflation Rate (IR). Correlation analysis is conducted to identify the direction of the relationships that exist among the variables before carrying out regression analysis. It also helps in identifying any multicollinearity problems that may exist among the explanatory variables.

The results show that there is a positive correlation that exists between Cash Ratio (CAR) and Return on Assets (ROA), with a correlation coefficient of 0.205. This shows that microfinance institutions with high levels of liquidity tend to perform better in terms of profitability. There is a positive correlation between Equity Capital to Total Assets (ECTA) and ROA with a correlation coefficient of 0.246. This means that financial institutions with robust capital structures have a high probability of delivering good financial performance. This is because equity capital acts as a financial buffer against possible losses and also helps to minimize the need for borrowing, which may lead to good financial performance.

The Lending Rate (LR) also shows a weak positive relationship with ROA at 0.131. This indicates that high lending rates may lead to high profitability because interest income is a major source of income for microfinance institutions. The weak relationship shown by the return on asset indicates that other factors may also affect profitability. Inflation Rate (IR) shows a very weak positive relationship with ROA at 0.023, which indicates that inflation has a minimal effect on the profitability of microfinance institutions.

In terms of the inter-relationship between the independent variables, the correlation coefficient between the CAR and the LR is -0.452. This is a negative and relatively moderate correlation coefficient. This implies that there is a potential link between lending rates and liquidity levels. However, the inter-relationship between the other independent variables is relatively low. This implies that the independent variables are not closely related. More significantly, none of the independent variables have a correlation coefficient above 0.80. This is the commonly cited threshold beyond which multicollinearity is a potential problem in regression analysis. The results imply that the independent variables will not be affected by multicollinearity. They will, therefore, be included in the regression analysis.

Overall, the results of the correlation analysis imply that liquidity and capital structure indicators may have a positive effect on financial performance. They, therefore, warrant further analysis through the panel regression analysis.

Panel Regression Results

In this section, the panel regression analysis using the Fixed Effects model and the Random Effects model is carried out, considering the differences across the institutions. The Hausman test is used to find the best fit for the data, in order to ensure proper analysis of the relationship between the variables and the financial performance.

Table 3:

Fixed Effects Model

Variable	Coefficient	Std. Error	t-stat	p-value
CAR	0.052	0.021	2.47	0.018
ECTA	0.294	0.138	2.13	0.041
LR	0.015	0.008	1.84	0.075
IR	0.003	0.024	0.12	0.904
Constant	-0.225	0.181	-1.24	0.223

Note: ROA=Return on Asset; CAR= Cash Ratio; ECTA: Equity Capital to Total Asset; LR= Lending Rate; IR= Inflation Rate.

The results of the fixed effects regression model presented above examine the relationship between liquidity risk management indicators and financial performance, considering microfinance institution-specific characteristics. As presented above, it is noticeable that there is a positive relationship between the Cash Ratio (CAR) and Return on Assets (ROA) (β= 0.052, p= 0.018), which is statistically significant at 5%. This indicates that an increase in the level of liquid assets has a positive effect on the financial performance of microfinance institutions. This is due to the fact that liquidity allows microfinance institutions to meet their short-term financial obligations, thus enhancing their financial performance.

Likewise, Equity Capital to Total Assets (ECTA) also has a positive and statistically significant effect on ROA (β = 0.294, p = 0.041). This indicates that institutions with robust capital structures tend to have high profitability. This is because a high level of equity finance minimizes the need to borrow funds, which can be lost in case of business failure.

Concerning the control variables, the Lending Rate (LR) is positively but weakly correlated with ROA (β = 0.015, p = 0.075), which may imply that a high lending rate can result in an increase in interest received, hence a better profitability. On the other hand, the Inflation Rate (IR) is positive but insignificant as a determinant of ROA (β = 0.003, p = 0.904), which may imply that inflation did not affect the performance of microfinance institutions.

Table 4:

Random Effects Model

Variable	Coefficient	Std. Error	z-stat	p-value
CAR	0.049	0.019	2.55	0.011
ECTA	0.281	0.133	2.11	0.034
LR	0.016	0.007	2.04	0.042
IR	0.002	0.022	0.09	0.926
Constant	-0.198	0.169	-1.17	0.246

Note: ROA=Return on Asset; CAR= Cash Ratio; ECTA: Equity Capital to Total Asset; LR= Lending Rate; IR= Inflation Rate.

The random effects regression analysis results have shown similar findings. The results have shown that Cash Ratio (CAR) has a positive and significant effect on ROA, as $\beta = 0.049$ and $p = 0.011$.

Furthermore, Equity Capital to Total Assets (ECTA) has remained a positive and significant predictor of ROA, as $\beta = 0.281$ and $p = 0.034$. It has shown that a strong capital structure is important for enhancing the profitability of microfinance institutions because it will be able to withstand various types of risk and sustain its lending business.

The Lending Rate (LR) variable also demonstrates a positive relationship with ROA, which is statistically significant according to the random effects model ($\beta = 0.016$, $p = 0.042$). This implies that high lending rates result in high levels of interest income, thus enhancing financial performance. However, similar to the fixed effects model, the Inflation Rate (IR) is found to be statistically insignificant ($\beta = 0.002$, $p = 0.926$) and thus failed to affect financial performance, indicating that inflation did not affect profitability differences between microfinance institutions during the study period.

To choose between the fixed effects estimator and random effects estimator, a Hausman specification test was carried out. According to the test results, the Chi-square statistic is 3.17, while the p-value is 0.529. Since the p-value is > 0.05, the null hypothesis that claims that the random effects estimator is consistent is not rejected.

This indicates that the Random Effects model is appropriate for this research since efficient and consistent estimates are obtained. The random effects model is based on the assumption that individual institutional differences are random and not correlated with the explanatory variables. Thus, the interpretation of the results for this research should be based on the estimates obtained using the random effects model.

In conclusion, the regression analysis indicates that liquidity risk management is an important factor in influencing the financial performance of microfinance institutions in Rwanda. This is because Cash Ratio (CAR) and Equity Capital to Total Assets (ECTA) have a positive and statistically significant effect on profitability. This indicates that microfinance institutions with good liquidity positions and capital structures have better financial performance. Lending Rate also has a positive effect on profitability but is relatively low compared to Cash Ratio and Equity Capital to Total Assets. However, inflation does not have a significant effect on profitability during the period under consideration.

It is clear that microfinance institutions need to maintain good liquidity positions and capital structures in order to enhance financial performance.

Robust regression analysis

Table 5:

Robust Regression Analysis

Variable	Coefficient	Robust Std. Error	z-stat	p-value
CAR	0.047	0.02	2.31	0.021
ECTA	0.276	0.129	2.14	0.033
LR	0.015	0.009	1.71	0.088
IR	0.002	0.025	0.08	0.934
Constant	-0.192	0.176	-1.09	0.276

Note: ROA=Return on Asset; CAR= Cash Ratio; ECTA: Equity Capital to Total Asset; LR= Lending Rate; IR= Inflation Rate.

In order to ensure the reliability of the results of the regression analysis, robust regression analysis was carried out.

From the results of the regression analysis, it is noted that the Cash Ratio (CAR) has a positive and significant effect on Return on Assets (ROA), with a coefficient of 0.047 and a p-value of 0.021. This implies that an increase in the liquidity levels of microfinance institutions results in an improvement in their financial performance. This is because an increase in the cash ratio is associated with an increase in ROA by 4.7%. This implies that microfinance institutions that have sufficient liquid assets to meet their short-term financial obligations will be able to sustain their lending business.

Similarly, the result indicates a positive and significant relationship between Equity Capital to Total Assets (ECTA) and ROA ($\beta = 0.276$, $p = 0.033$). This means that microfinance institutions with robust capital structures have the potential to attain improved profitability. This is because improved financial stability through the mobilization of more equity finance reduces the need for

debt finance, thus improving the ability of the institution to manage risk and finance income-generating activities.

With regard to the control variables, the result indicates a positive and relatively weak relationship between the Lending Rate (LR) and ROA ($\beta = 0.015$, $p = 0.088$). Although the result indicates a potential for improved profitability through the mobilization of more interest income at higher lending rates, the result is relatively weak. This is because the result is only marginally significant at the 10% confidence level. The result also indicates a positive and relatively insignificant relationship between the Inflation Rate (IR) and ROA ($\beta = 0.002$, $p = 0.934$), indicating that inflation has a relatively insignificant effect on the financial performance of microfinance institutions.

Overall, the robust regression findings support the initial hypothesis that the role of liquidity risk management indicators, i.e., cash reserves and capital adequacy, is significant in the profitability of microfinance institutions. The consistency of the findings with the initial hypothesis based on the panel regression analysis adds strength to the reliability of the study, indicating the stability of the influence of liquidity risk management indicators, along with capital structure, on the financial performance of the microfinance institutions.

The findings of the regression analysis, taken together, indicate that the influence of liquidity management and capital structure on the financial performance of the microfinance institutions is mutually inclusive, as the availability of adequate liquidity coupled with strong equity capital positions enables the microfinance institution to withstand financial shocks, operate with stability, and support financial services that are revenue-generating in nature. The findings, therefore, confirm the hypothesis that the influence of CAR and ECTA on the financial performance, as measured in terms of Return on Assets, is significant.

4.2 Discussions of the findings

From the descriptive statistics above, it is evident that the microfinance institutions included in the study had an average Return on Assets (ROA) of 0.10. This implies that the microfinance institutions included in the study had an average profit of 10% of the total assets. On the other hand, the average Cash Ratio (CAR) of 0.562 and Equity Capital to Total Assets (ECTA) of 0.248 imply that the microfinance institutions included in the study maintained average levels of liquidity and capital. From the above findings, it is evident that the cash ratio varied significantly among the microfinance institutions. Some microfinance institutions maintained high levels of liquid assets, while others maintained low levels of liquid assets. This implies that the institutions had varying levels of liquidity management. This finding suggests that liquidity management is a critical factor in the financial sustainability of microfinance institutions since they are required to balance the needs for liquidity and income-generating investments (Abebe, 2022).

The results from the correlation analysis offer initial insights into the association between liquidity risk management indicators and financial performance. The findings reveal that Cash Ratio (CAR) and Equity Capital to Total Assets (ECTA) have a positive association with Return on Assets (ROA). Therefore, it can be concluded that institutions that have better liquidity positions and capital structures are more likely to have better financial performance. The positive association between liquidity and financial performance is in line with the findings by Njue et *al.,* (2020), which noted that microfinance institutions that have better liquidity positions are more likely to sustain their operations and maintain financial stability. In addition, the positive association between capital adequacy and financial performance supports the findings by Parvin et al. (2020), which noted that better capital structures are more likely to sustain microfinance institutions and maintain financial sustainability.

Furthermore, the findings reveal that Equity Capital to Total Assets ratio (ECTA) significantly influences Return on Assets (ROA) in a positive manner. This implies that microfinance institutions with robust capitalization are likely to achieve better financial performance. This is because financial institutions with adequate equity capital are less vulnerable to financial shocks, as they are in a position to protect themselves from financial loss through the availability of financial cushions, hence promoting financial stability. This finding is in agreement with Parvin et al. (2020) that robust capitalization is vital in promoting financial sustainability, as it enables financial institutions to be more resilient in the face of financial shocks. Fonchamnyo et al. (2023) argue that financial vulnerability is reduced through adequate capitalization, hence promoting financial stability.

The results obtained from regression analysis indicated that Cash Ratio (CAR) has a positive and significant effect on Return on Assets (ROA). This indicates that microfinance institutions with high levels of liquid assets are likely to attain high financial performance. This is due to their ability to meet their short-term financial obligations, thus sustaining their business of lending. This study agrees with Abebe (2022), which noted that financial institutions' effective liquidity management improves their profitability as it involves effective asset and liability management practices. Njue et al. (2020) also noted that microfinance institutions' ability to maintain adequate liquidity levels helped them to sustain their business of lending, thus avoiding financial challenges.

However, the results differ from what King'ori et al. (2020) found, where it was established that liquidity risk had a negative but statistically insignificant effect on the performance of microfinance banks in Kenya. The difference in the results may be attributed to the different institutional environments. In the case of Rwanda, the significance of maintaining liquidity may be attributed to the confidence it generates in the minds of the depositors, which is essential for financial performance.

Additionally, it is evident that the study results show that Equity Capital to Total Assets Ratio (ECTA) has a positive effect on Return on Assets (ROA). This indicates that microfinance institutions that are well-capitalized are likely to attain high financial performance. This is due to the fact that financial institutions that are well-capitalized in terms of equity capital are unlikely to experience financial risks, as they can protect themselves against financial loss through the availability of financial cushions. This study result is in agreement with Parvin et al. (2020) that robust capitalization is essential in promoting financial sustainability, as it allows financial institutions to remain resilient to financial shocks.

Fonchamnyo et al. (2023) state that financial vulnerability is reduced through adequate capitalization. Appropriate capitalization is very significant in minimizing financial risks faced by financial microfinance organizations. An appropriately capitalized microfinance will have enough equity to cover any financial loss that might be incurred because of operational problems, non-repayment of loans, fluctuations in the financial market, or economic difficulties without compromising on its existence. Good capitalization contributes to the financial stability of the organization and increases the level of confidence among depositors and investors. Besides, good capitalization helps financial organizations continue their operations, fulfill their legal obligations, and cope with financial liquidity problems.

However, there have been suggestions that excessive capitalization may lead to reduced profitability as the resources in equity form may not be fully utilized. This is based on the argument presented by Tehulu (2022), which indicates that the relationship between capital adequacy and profitability may vary depending on the efficiency in the utilization of resources in the respective institutions. Nevertheless, the findings of this study clearly indicate that in the Rwandan microfinance sector, the benefits outweigh any possible inefficiencies in relation to high equity resources.

The study attempted to find out the combined effect of liquidity risk management indicators (CAR and ECTA) on financial performance (ROA). From the regression analysis, it is evident that the two variables are positive and significant when they are combined. This implies that liquidity and capital structure are mutually supportive in the sense that they complement each other in influencing financial performance. Institutions with adequate liquidity and financial positions are in a better position to cope with financial risks and sustain income-generating activities.

The results also show that the lending rate has a positive effect on financial performance, though the level of significance differs depending on the estimation method. This indicates that an increase in the lending rates may lead to an increase in interest income, hence an improvement in financial performance. This result is similar to that of Cull et al. (2019), which indicates that interest income is one of the main sources of revenue for microfinance institutions.

On the other hand, the results show that inflation has a positive but statistically insignificant effect on financial performance. This indicates that inflation did not affect the financial performance of microfinance institutions during the study period. Although other studies, such as Muriu (2019) and Mushtaq and Siddiqui (2022), indicate that inflation negatively effects financial sustainability as it increases operating expenses and weakens repayment capacity, the stable inflation environment during the study period may have influenced the results.

5 Conclusion and recommendations

This study set out to investigate the effect of liquidity risk management on the financial performance of microfinance institutions in Rwanda, with special reference to Cash Ratio (CAR) and Equity Capital to Total Assets (ECTA) as factors that influence Return on Assets (ROA). Findings indicated that CAR and ECTA have a positive effect on financial performance, implying that microfinance institutions that are well-managed in terms of liquidity and capitalization tend to achieve better financial performance in terms of profitability. Findings also indicated that interest rates have a positive effect on financial performance, while inflation has no effect on financial performance. This study has clearly indicated that liquidity and capitalization are essential factors in financial performance of microfinance institutions.

In addition, microfinance institutions should improve their liquidity position through the maintenance of cash reserves and the enhancement of financial planning. The microfinance institutions should improve their capital adequacy through the enhancement of equity finance. This will improve the financial stability of the microfinance institutions. Finally, policymakers and regulators should improve financial regulations and capacity-building initiatives to improve the risk management of the microfinance institutions in Rwanda.

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