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How Does Financial Risk Management Impact Financial Performance of Microfinance Banks?

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Abstract: Microfinance banks (MFBs) in Nigeria play an important role of delivering financial services to the underserved population and low-income individuals. MFBs are exposed to various financial risks, including borrower defaults and liquidity management, posing serious survival threats. We apply the autoregressive distributive lag (ARDL) regression, on published data from 1993 to 2022, to confirm how financial risk management of the MFBs in Nigeria impacts their financial performance. The finding from the short run of the main (ROA) estimation identifies that except for the loan-deposit magnitude, which is insignificant, the coefficients on capital adequacy strength, risk asset quality, liquidity strength and loan loss provision are significant. For the long run, capital adequacy, liquidity, risk asset quality and loan loss provision have significant coefficient while loan-deposit magnitude has an insignificant coefficient. The lag term of error correction is negative (-1.60) and significant, implying that the model would converge to equilibrium upon any perturbation. Similar results are evident when the return on equity is considered as a measure of financial performance to verify the sensitivity of the outcomes. This suggests the estimation is not sensitive to any performance measure used. The findings underscore the importance of capital adequacy and liquidity strength for improving the financial performance as well as the detrimental impact of risk asset quality and high loan loss provisions on the MFBs. To ensure enhanced financial performance, sustainability and effectiveness, we recommend offer that policy markets should different regulatory measures including recapitalization, reshaping of

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risk asset holdings, regulating loan loss provisions, clarifying regulations on loan-deposit ratios, and regulating liquidity levels.

Keywords: Microfinance banks; financial risk management; financial performance; capital adequacy strength; risk asset quality

1. Introduction

The banking sector is regarded as the pillar of economy, as its operation is crucial for the growth of the country. Modern banking institutions profitably operate to maintain stability and enhance growth. Amongst others, the microfinance banks (MFBs) are specialized financial service provider, delivering financial services to the underserved population and low-income individuals. Their financial services include savings, microcredit and other products with the goal of enhancing the economic standing of small-scale producers in both urban and rural areas. They provide financial services to the under banked or unbanked, who are typically not served by the traditional formal financial sector (Afolabi et al., 2020).

Decisions involving financial institution activities, have an element of risk, which has effects on the overall performance and value of the firm (Achimugu et al., 2021). This is because any forms of fund loss will reduce the profitability, financial risks threaten the aim of shareholder's wealth maximisation. To ensure profitability, various risk management strategies are required (Ademokoya et al., 2020). Increased default risk exposure might lead to loss of funds and lower bank profitability, which would cause financial instability and insolvency. Proactive risk-taking is crucial for the viability and sustainability of the MFBs. For the MFBs that operate on a for-profit basis, maintaining a good strategy that assures an ideal combination of risk-return trade-off is considerably more crucial.

There is evidence that the MFBS are tending to be the most vulnerable to financial risk (Afolabi, 2021). Therefore, several studies have tended to examine how credit risk management affect financial performance. Some studies, including Laxmikantham (2021), Karugu et al. (2021), Dunyoh et al. (2021), Nwosu et al. (2020) and Bello et al. (2021), examine the influence of credit risk. Few studies, such as Mwambui and Koori (2019), Kolawole (2020), and Ayinuola and Gumel (2023) focused on financial risk - combining credit risk and liquidity risk management. However, most focus on commercial bank, and concluded that credit risk management is significantly related and capable enhancing performance. Singh et al. (2021) and Hacini et al. (2021) measure the effect of credit risk management. Ansari et al. (2021) investigates the liquidity risk effects on the performance of MFBs and Bundi et al. (2021) examine the roles of financial risk management (credit and liquidity risk management) on the performance of MFBs.

In Nigeria, despite the implementation of different reforms, the banking sector has lost well over 224 MFBs to liquidation because of financial insolvency within the last five years (CBN, 2021). Financial risk has been identified as the most crucial services of MFBs as it relates directly with their core business which is credit administration and deposit taking. There is need to empirically determine the role of liquidity and credit risks in terms of liquidity strength, loan-deposit magnitude, capital adequacy strength and loan loss provision techniques on the financial performance of MFB in Nigeria.

This study seeks to determine the impact of financial risk management on the financial performance of the MFBs in Nigeria. We consider how capital adequacy strength, risk asset quality, loan loss provision, loan-deposit magnitude, and liquidity strength impact financial performance of the banks. The finding from the short run of estimations for return on assets, ROA (the main analysis) identifies that except for the loan-deposit magnitude, which is insignificant, the coefficients on capital adequacy strength, risk asset quality, liquidity strength and loan loss provision are significant. For the long run, capital adequacy, risk asset quality, liquidity and loan loss provision have significant coefficient while loan-deposit magnitude has an insignificant coefficient. The lag term of error correction is negative and significant, implying that the model would converge to equilibrium upon any perturbation. Similar results are evident when the return on equity (ROE) is considered as a measure of financial performance to verify the sensitivity of the outcomes. This suggests the estimation is not sensitive to any performance measure used.

To ensure enhanced financial performance, sustainability and effectiveness of the MFBs in Nigeria, we recommend offer that policy makers should employ different regulatory measures, including recapitalization, reshaping of risk asset holdings, regulating loan loss provisions, clarifying regulations on loan-deposit ratios, and regulating liquidity levels. The following is how the other sections are presented: Section 2 surveys the body of literature, section 3 gives the method, section 4 the outcomes and section 5 closes.

2. Materials

Different materials have examined how financial risk management impacts financial performance of MFBs. Although available, countries on the research issue, from developed economies is scanty but they agreed that financial risk have significant and positive effect of bank profitability (Saeed & Zahid, 2016; Chimelikova et al., 2018). Saeed and Zahid (2016) analysed the impact of credit risk on profitability of five big UK commercial banks, during 2007 to 2015. They considered return on assets (ROA) and return on assets (ROE) as measure of profitability, and the net charge off (or impairments), and non-performing loans for credit risks. They found that credit risks had a positive effect on profitability. Also, bank size, leverage, and

growth positively interlinked with each other, and the banks achieved profitability after the financial crisis. This means that even after the deep effects of credit crisis, the banks still take risks, and get benefits from interest rates, fee, and commissions. Chimelikova et al. (2018) investigated the performance of 302 microfinance in Europe, from 2008 to 2015. They measure performance in terms of credit risk, financial and social performance, and efficiency. They test some hypotheses using various measures of conditions conducive to building social capital, such as the client base of a microfinance supplier and the level of cultural fractionalization in a society. The findings confirm that a higher intensity of social capital is positively associated with all areas of the performance of microfinance suppliers. This suggest that building social capital, which refers to trust, networks, and relationships within the microfinance sector, can positively impact the performance of microfinance suppliers.

Studies on developing countries examine the different issues on the research matter (King'ori et al., 2017; Ndab, 2018; Al-Eitan & Bani-Khalid, 2019; Ray & Mahapatra, 2019; Bhattarai, 2019; Mwambui & Koori, 2019; Singh et. al, 2021). King'ori et al. (2017) examine the determinants of financial performance of MFBs in Kenya and concluded that there is direct relationship between operational efficiency, capital adequacy, firm size and financial performance of microfinance banks in Kenya. Al-Eitan and Bani-Khalid (2019) examined the impact of credit risk (CR) on the financial performance of Jordanian commercial banks for 2008-2017. The results showed that CR has a negative and significant impact on ROA and ROE. The results indicated that CR have positive and significant impact on financial performance of the banks. Watol (2019) assessed the credit risk management practices and financial performance of MFIs in Ethiopia. The findings indicate that credit risk management practices are significant in influencing financial performance of the selected MFIs. Ray and Mahapatra (2019) analysed the impact of the asset quality on the financial performance of the Indian MFIs. The study confirmed the fact that quality of asset is an important criterion in the determination of performance. The findings emphasize the significance of maintaining a quality asset portfolio for ensuring positive financial performance.

Mwambui and Koori (2019) investigated the effect of liquidity management and financial performance of MFBs in Nairobi from 2011 to 2017. The findings for capital adequacy on financial performance of MFBs indicated a weak positive relationship that was not significant while loan repayments and cash management had a significant positive relationship with financial performance of MFBs. Agasha et al. (2020) examined the loan portfolio quality of Uganda's MFIs and finds that funding, pricing of funds, client/borrower engagement, and social capital influence loan repayment. Njue et al. (2021) investigated the effect of liquidity management on financial performance of MFIs in Kenya and finds positive link between capital

adequacy and financial performance and a negative relationship between asset quality and financial performance.

Bundi et al. (2021) determined the effect of financial risk management practices on financial performance of the MFBs in Kenya. The study concludes that credit risk management, liquidity risk management practices, operational risk management and market risk management practices have a significant effect on the financial performance of the MFBs. Rasa (2021) examined the effects of credit risk on commercial banks' profitability in Afghanistan. The study finds a robust negative and significant effect of LLRTL on ROAA, and ROAE, but positive and insignificant on NIM. Karugu et al. (2021) investigated the interplay of interest rate, leverage and financial performance, experiences, and lessons from MFIs in Kenya, and find that interest rates and financial leverage have a positive effect on their financial performance. Amanu and Gebissa (2021) investigated the MFIs' profitability in Ethiopia. The results show that operational self-sufficiency ratio, financial self-sufficiency ratio and total assets have positive significant relationship with the ROA of the MFIs whereas operating expense ratio, debt-to-equity ratio and liquidity ratio have negative significant effects on their ROA.

Dunyoh et al. (2021) examined how credit risk affects financial performance of rural and community banks in Ghana. The study notes that steadily increasing credit risk may hinder the financial performance of rural and community banks in the future. Gichobi and Omagwa (2021) find that increasing the levels of board characteristics, financing mix, credit default risk management, assets and liabilities management increases the financial of MFBs in Kenya. Ansari et al. (2021) finds that nonperforming loans have been found to have an important positive association with the country's economy during 2020–2021. Leone et. al (2022) evaluated the nexus between credit risks and performance of commercial banks in Sierra Leone over the 2008Q1-2018Q4 period and find that the fragility of the banking system stems from high NPLs.

Studies on specific to Nigeria are mostly focused on commercial bank evidence (Onyekwelu et al., 2018; Ahmadu et al. 2019). Ogboi (2013) showed that sound capital adequacy and credit risk management (loans and advances) have positive (negative) impacted on commercial bank's financial performance. This suggests that effective financial risk management practices in areas such as loan portfolio management and capital adequacy can positively impact the financial performance.

Abubakar et al. (2020) revealed that capital adequacy ratio (non-performing loans) has a negative (positive) and significant effect on financial performance in Nigeria. Nwosu et al. (2020) examined the extent to which non-performing loans affect commercial bank profitability, and to suggest measures toward mitigating their impact on the banking sector in Nigeria. The study showed that lower bank profitability can be explained by higher volume of non-performing loan, increased

liquidity ratio and inflation, while higher profitability could be because of increase in bank size and capital adequacy ratio.

Ajayi and Lawal (2021) examined the relationship between liquidity management and bank performance. The study concludes that, there is a significant and positive relationship between liquidity management and profitability of banks in Nigeria. Effectively managing liquidity is key for ensuring the stability and profitability of financial institutions, including microfinance banks. Bello et al. (2021) investigated fisk asset management and profitability of money deposit Banks in Nigeria and revealed that the provision of the non –performing loan does not translate a positive financial performance e of banks. Gambo et al. (2022) reveals low level of profitability and sustainability. It emphasizes the need for MFBs to effectively manage their loan portfolios, capital, liquidity, and overall business operations to achieve sustainable profitability and long-term viability.

3. Methods

The paper applied published information on all MFBs, with available data on the CBN statistical bulletin and economic report of the MFBs from 1993 to 2022. The timeframe for this study was deliberately selected to align with significant events and transformations in the Nigerian banking sector. This includes the transition period from community banks to microfinance banks as well as the economic challenges marked by factors such as inflation, recession, and the unprecedented impact of the COVID-19 pandemic.

The aim is to confirm the effect of financial risk management on the financial performance of the MFBs. W**e complete two estimations. The first – the main analysis, extend Otieno et. al (2015) – to confirm how** capital adequacy, risk asset quality, loan-deposit magnitude, and liquidity strength, impact returns on assets using **equation 1:**

$$\mathrm{ROA}_t = \alpha_0 + \alpha_1 \mathrm{CAR}_t + \alpha_2 \mathrm{PAR}_t + \alpha_3 \mathrm{LDR}_t + \alpha_4 \mathrm{LQR}_t + \alpha_5 LLP_t + \mu_t \quad (1)$$

Table 1 presents the description for the variables, including their apriori expectations, stated as: $\alpha_i\ (i = 0,1,3,4) > 0;\ \alpha_i\ (i = 2,5) < 0$.

The second – the sensitivity analysis – re-estimate (1), using an alternative measure of performance (the return on equity). W**e confirm how** capital adequacy strength, risk asset quality, loan-deposit magnitude, and liquidity strength, impact the return on equity using **equation 2:**

$$\mathrm{ROE}_t = \alpha_0 + \alpha_1 \mathrm{CAR}_t + \alpha_2 \mathrm{PAR}_t + \alpha_3 \mathrm{LDR}_t + \alpha_4 \mathrm{LQR}_t + \alpha_5 LLP_t + \mu_t \quad (2)$$

$Where$: μ_t **- Error term. Both (1) and (2) are estimated using the a**utoregressive distributive lag (ARDL) approach. The ADRL specification for (1) and (2) are provided by equation (3) and (4).

$$ROA_t = \alpha_0 + \sum_{i=1}^{p} \alpha_{1i} \Delta ROA_{t-i} + \sum_{i=0}^{q} \alpha_{2i} \Delta CAR_{t-i} + \sum_{i=0}^{r} \alpha_{3i} \Delta PAR_{t-i}$$

$$+ \sum_{i=0}^{s} \alpha_{4i} \Delta LDR_{t-i} + \sum_{i=0}^{v} \alpha_{5i} \Delta LQR_{t-i} + \sum_{i=0}^{w} \alpha_{6i} \Delta LLP_{t-i} + \alpha_7 ECT_{t-1}$$

$$+\varphi_1 CAR_t + \varphi_2 PAR_t + \varphi_3 LDR_t + \varphi_4 LQR_t + \varphi_5 LLP_t + \epsilon_t \quad (3)$$

$$ROE_t = \alpha_0 + \sum_{i=1}^{p} \alpha_{1i} \Delta ROE_{t-i} + \sum_{i=0}^{q} \alpha_{2i} \Delta CAR_{t-i} + \sum_{i=0}^{r} \alpha_{3i} \Delta PAR_{t-i}$$

$$+ \sum_{i=0}^{s} \alpha_{4i} \Delta LDR_{t-i} + \sum_{i=0}^{v} \alpha_{5i} \Delta LQR_{t-i} + \sum_{i=0}^{w} \alpha_{6i} \Delta LLP_{t-i} + \alpha_7 ECT_{t-1}$$

$$+\varphi_1 CAR_t + \varphi_2 PAR_t + \varphi_3 LDR_t + \varphi_4 LQR_t + \varphi_5 LLP_t + \epsilon_t \quad (4)$$

Where, ECT is the error correction term (with α_7, as the speed of adjustment), and ϵ is the error term. The terms in change form (Δ) and summations of lagged terms are short run terms. α_2 to α_6 (φ_1 to φ_5) are the parameters for short-run (long-run) influence of the variables, respectively. The p, q, r, s, v, and w are the optimum lag, for ROA/ROE, CAR, PAR, LDR, LQR, and LLP, respectively. Before the estimation, we confirm the characterisation of variables based on the Augmented Dickey-Fuller (ADF) tests to confirm inherent unit root. We complete the cointegration test, based on the bounds method, to find whether there is a long-run relationship amongst the variables. The outcome for short-run error correction model and long-run cointegrating form were presented.

Table 1. Variables' Descriptions

Variables	Measurement	Source	Apriori
Return on Assets (ROA)	Measured by the percentage of net income to total assets.	Oladele et al. (2019) **Ademokoya et. al (2020)** Asima et al. (2022)	
Return on Equity (ROE)	Measure by the percentage ratio of net income to equity.	**Ademokoya et. al (2020)** Asima et al. (2022)	
Capital Adequacy Strength (CAR)	Measured by the percentage ratio of qualified capital to risk weighted assets	Saeed & Zahid (2016) Inegbedion et al. (2020)	+

Risk Assets Quality (PAR)	Measured by the ratio of non-performing loans to total outstanding loans	**Ademokoya et. al (2020)** Asima et al. (2022)	–
Loan-Deposit Magnitudes (LDR)	Measured by the percentage of total loan to total deposit liabilities	Saeed & Zahid (2016) Oladele et al. (2019)	+
Liquidity Strength (LQR)	Measured by the percentage of liquid asset to total deposit liabilities	Saeed & Zahid (2016) Oladele et al. (2019) Asima et al. (2022)	+
Loan Loss Provision (LLP)	Measured by ratio of loan loss provisions to total outstanding loan & advances	Saeed & Zahid (2016) Asima et al. (2022)	–

4. Results and Discussions

4.1. Results

Pre-Estimation

Table 2 presents the outputs of the stationarity tests. The outcome reveals that only ROA and ROE (with p-value of the ADF statistic less than 0.05) are stationary, while other variables are integrated, each with p-value of the ADF statistic greater than the 0.05. However, they are differenced stationary since the p-value of ADF statistic of their first difference is less than 0.05).

Table 2. Stationarity Tests

	Level		Difference		
Variable	**ADF**	**p-value**	**ADF**	**p-value**	**Remark**
ROA	-7.150***	0.000			I(0)
ROE	-7.211***	0.000			I(0)
CAR	-1.043	0.724	-9.273***	0.000	I(1)
PAR	0.639	0.987	-9.574***	0.000	I(1)
LDR	-1.444	0.547	-6.018***	0.000	I(1)
LQR	-2.389	0.153	-7.929***	0.000	I(1)
LLP	1.528	0.998	-3.039**	0.047	I(1)

*Note: *, **, ***, signify significance at 10%, 5%, 1%. The remark presents the order of integration, denoted I(0), for stationary and I(1), for the non-stationary. [b]Only the first difference is assumed as the variables attain stationarity and become integrated).*

Main Analysis

According to the procedure, we present the outcome for the main analysis. Table 3 presents the outcome for the cointegration bounds test for the study's main performance indicators (ROA) and its correlated (independent) covariates. With I(0)

and I(1) bounds for the model, at 5% significance level, are 2.62 and 3.79, respectively, the evidence indicates that the F-statistic of 17.89 is greater than I(1) bound. The test is significant and suggests the rejection of null. There exist long-run relationships series for the ROA's ARDL estimation. Table 4 presents the ROA model's regression coefficients for the short (long) run in Panel A (B).

The short run shows that first period lag of the error correction term (ECT (-1)) is negative and significant. The coefficient on ECT(-1)) is 1.66 and indicates that the model drive back to equilibrium in the long-run and about more than 100 percent of its disequilibrium is addressed in a single period. This implies that the model adjusts back to equilibrium in less than one periods (i.e. one years). The capital adequacy, risk asset quality, loan-deposit magnitude, liquidity strength and loan loss provision, all have significant coefficient. The coefficients of capital adequacy strength, liquidity strength, and loan loss provisions are highly significant at 1%. Loan-deposit magnitude is slightly significant at 10%. Capital adequacy strength and liquidity strength have positive coefficients while risk asset quality, loan loss provision and loan-deposit magnitude have negative coefficients. This signifies that the later variables have positive short run impact, but the former have negative short run impact on ROA.

With the coefficient of capital adequacy (0.647) being positive, a percent increase in the capital adequacy will lead to a short run increase in ROA by 0.647%. The coefficient on liquidity strength (0.008) is positive, implying a percent increase in liquidity strength of the microfinance banks will lead to a short run increase in their ROA by 0.008%. The coefficient on risk asset quality (-0.199) is negative, suggesting a percent increase in the risk asset quality will lead to a short run decline in their return on asset by 0.199%. The coefficient on loan-deposit magnitude (-0.152) is negative, suggesting, a percent increase in loan-deposit magnitude will lead to a short run decline the ROA by 0.152%. The coefficient on loan loss provision (-2.413) is negative, suggesting a percent increase in it will lead to a short run decline in their ROA by 2.413%.

The long-run output shows that the capital adequacy, risk asset quality, liquidity strength and loan loss provision have significant coefficient while loan-deposit magnitude does not have significant coefficient. The coefficients on capital adequacy, risk asset quality, and liquidity strength are highly significant at 1%, while the coefficient of loan loss provisions is significant at 5%. The coefficient of loan-deposit magnitude, however, is not significant. Both capital adequacy strength and liquidity strength have positive coefficients while risk asset quality and loan loss provision have negative coefficients. This signifies that the former variables have positive long run impact on the ROA, while the latter variables have negative long run impact on it.

With the coefficient of capital adequacy (0.920) being positive, a percent increase in the capital adequacy strength will lead to a long run increase in ROA by 0.920%. The coefficient of liquidity strength (0.003) is positive, implying that a percent increase in the liquidity strength leads to a long run increase in the ROA by 0.003%. The coefficient of risk asset quality (-0.431) is negative, suggesting that a percent increase in the risk asset quality led to a long run decline in their ROA by 0.431%. The coefficient on loan loss provision (-2.396) is negative, suggesting that a percent increase in the loan loss provision leads to a long run decline in their ROA by 2.396%. The F-statistic has a value of 10.629 with a p-value (0.000) less than the 0.01 significance level. This shows that the entire model is significant, thus signifies a good fit.

Table 3. Ardl Bounds Test For The Roa Model

Test Statistic	Value	k
F-statistic	17.89	5
Critical Value Bounds:		
Significance	I(0) Bound	I(1) Bound
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	5.68

Note: The null of no long-run association between variables is used in the bounds test.

Table 4. Short and Long Run Regression Coefficients for Roa Model

Variable		**Est.**	**S.e.**	***t*-stat**	$\mathbf{p}_r(\boldsymbol{t})$
Panel A: Error correction (short run) model					
D(CAR)		0.6472***	(0.1933)	3.3471	0.0048
D(PAR)		-0.1993**	(0.0679)	-2.9325	0.0109
D(LDR)		-0.1518*	(0.085)1	-1.7841	0.0961
D(LQR)		0.0080***	(0.0013)	5.9441	0.0000
D(LLP)		-2.4134***	(0.7807)	-3.0912	0.0080
ECT(-1)		-1.6565***	(0.1722)	-9.6145	0.0000
Panel B: Equilibrium (long run) coefficients					
Const.		0.2276*	(0.1098)	2.0723	0.0572
CAR		0.9204***	(0.1880)	4.8950	0.0002
PAR		-0.4309***	(0.0764)	-5.6389	0.0001
LDR		-0.0916	(0.0523)	-1.7498	0.1020
LQR		0.0030***	(0.0008)	3.5524	0.0032
LLP		-2.3956**	(0.8182)	-2.9278	0.0110
Statistics:					
F-statistic		10.629***			0.0000

Note: Const. is constant term. The variables are as defined in Table 1. Est. is the estimates for the coefficient. The values in the parathesis are the standard error (σ). S.e. is standard error of estimate,

*t-stat and $p_r(t)$ are the t- statistics, and p-value using $prob|t| = 0$. *$p \leq 1\%$; **$p \leq 5\%$; ***$p \leq 10\%$.*

Robustness

For the sensitivity analysis, we first confirm the cointegration evidence. Table 5 presents the outcome for the cointegration bounds test for ROE and its correlated covariates. Both the I(0) and I(1) bounds at 5% significance level, are 2.62 and 3.79, respectively, indicating that the F-statistic of 19.71 is significant since it is greater than the I(1) bound. This suggests the rejection of null, thus there exist long-run relationships for the ROE's ARDL estimation. Table 6 presents the ROA model's regression coefficients for the short run (Panel A) and the long run (Panel B). The lag term of error correction of- 1.60 is negative and significant. This implies that the model would converge to equilibrium for any perturbation. Except for the loan-deposit magnitude, which is insignificant, the coefficients on others - capital adequacy strength, risk asset quality, liquidity strength and loan loss provision - are significant. For the long run, capital adequacy, risk asset quality, liquidity and loan loss provision have significant coefficient while loan-deposit magnitude has an insignificant coefficient consistent with the previous estimation for the asset returns. The F-statistic (10.164) is highly significant at 0.01, supposing the ROE model showcase a good fit. Both the short- and long-run evaluation identifies similar result with the main analysis for the ROA, confirming that the estimates are not sensitive to the performance measure applied.

Table 5. Ardl Bounds Test for Roe Model

Test Statistic	Value	k
F-statistic	19.71	5
Critical Value Bounds:		
Significance	I(0) Bound	I(1) Bound
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	5.68

Note: The null of no long-run association between variables is used in the bounds test.

Table 6. Short and Long Run Regression Coefficients for Roe Model

Variable	**Est.**	**S.e.**	***t*-stat**	$\mathbf{p}_r(\boldsymbol{t})$
Panel A: Error correction (short run) model				
D(CAR)	2.5365***	(0.8411)	3.0154	0.0093
D(PAR)	-0.8063**	(0.2976)	-2.7085	0.0170
D(LDR)	-0.5557	(0.3770)	-1.4736	0.1627
D(LQR)	0.0340***	(0.0060)	5.6683	0.0001
D(LLP)	-9.4207**	(3.4156)	-2.7581	0.0154
ECT(-1)	-1.6031***	(0.1639)	-9.7797	0.0000
Panel B: Equilibrium (long run) coefficients				
Const.	0.9767*	(0.4995)	1.9551	0.0708
CAR	3.6710***	(0.8557)	4.2897	0.0007
PAR	-1.9178***	(0.3529)	-5.4341	0.0001
LDR	-0.3466	(0.2383)	-1.4543	0.1679
LQR	0.0131***	(0.0038)	3.3826	0.0045
LLP	-9.7490**	(3.7100)	-2.6277	0.0199
Statistics:				
F-statistics	10.1642			0.0000

*Note: Const. is constant term. The variables are as defined in Table 1. Est. is the estimates for the coefficient. The values in the parathesis are the standard error (σ). S.e. is standard error of estimate, t-stat and $p_r(t)$ are the t- statistics, and p-value using $prob|t| = 0$. *$p \leq 1\%$; **$p \leq 5\%$; ***$p \leq 10\%$.*

Diagnostics

The results are subjected to post regression diagnostics – normality, heteroscedasticity and the autocorrelation tests. Figure 1 (2) depicts the histogram for the ROA (ROE) model's residuals. For ROA (ROE), Jarque-Bera (jb) statistic is 1.439 with p-value of 0.4869 (1.4100 with p-value of 0.4941). The null holds, suggesting the residuals are normally distributed. Table 8 presents the heteroscedasticity (Panel A) and autocorrelation (Panel B) diagnostic evidence for the ROA and ROE estimations. The result shows that the F-statistic and Obs*R-squared values for ROA model are 0.504 and 8.933 with respective p-values of 0.8868 and 0.7780, and for the ROE model are 0.699 and 11.025 with respective p-values of 0.7371 and 0.6087. This offers no sufficient evidence to reject the null, therefore, supposing the models are heteroscedasticity free. The result shows that the F-statistic and Obs*R-squared values for the ROA model are 0.591 and 2.514 with respective p-values of 0.5686 and 0.2844, and for the ROE model are 0.541 and 2.314 with respective p-values of 0.5959 and 0.3143. This offers no sufficient evidence to reject the null hence, the models are autocorrelation free.

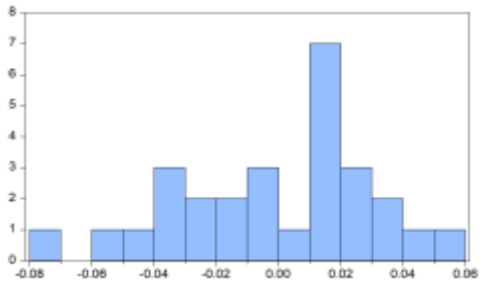

Figure 1. Histogram for ROA Model

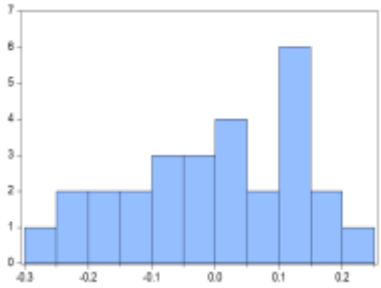

Figure 2. Histogram for ROA Model

Table 7. Diagnostic Tests

	ROA Model		**ROE Model**	
Statistic	**Stat. value**	**p-value**	**Stat. value**	**p-value**
Heteroskedasticity (Breusch-Pagan-Godfrey):				
F-statistic	0.5049	0.8868	0.6994	0.7371
Obs*R-squared	8.9331	0.7780	11.0250	0.6087
Autocorrelation (Breusch-Godfrey):				
F-statistic	0.5919	0.5686	0.5406	0.5959
Obs*R-squared	2.5145	0.2844	2.3145	0.3143

Note: The null for the Breusch-Pagan-Godfrey's Heteroskedasticity test is that the residuals have constant variance. The autocorrelation test follows the Breusch-Godfrey procedure. The null for the Breusch-Godfrey's autocorrelation is that the residuals have no autocorrelation.

4.2. Discussions

The study used the ARDL regression, on published data, to confirm how financial risk management of the MFBs in Nigeria impacts their financial performance. This outcome suggests that the level of capital adequacy in Nigerian MFBs is vital to help them promote their financial performance. The finding follows the postulations from the Hirigoyen theory that the liquidity of a bank is important for it to improve its medium- and long-term profitability, as well as consistent with previous studies King'ori et al. (2017), Mwambui and Koori (2019), Laxmikantham (2021), that found a positive impact of capital adequacy on financial performance. The findings highlight the importance for MFBs to maintain adequate capital levels to absorb potential losses and meet regulatory requirements. The MFBs should focus on robust capital management practices, including regular capital assessments, capital planning, and capital-raising strategies. This ensures long-term sustainability, enhances financial resilience, and helps mitigate the impact of economic downturns or unexpected shocks.

Second, the evidence suggests that risk asset quality is a relevant factor that affects financial performance of the MFBs, although it negative impact is contrary to expectation, as higher levels of asset quality are expected to yield more profitability. The finding is consistent with Ray and Mahapatra (2019), as well as Mnyampanda and Chindengwike (2021). The findings emphasize the significance of operative financial risk management to maintain a high-quality loan portfolio. The MFBs should strengthen their financial risk evaluation processes, implement prudent underwriting standards, implement robust monitoring mechanisms, and establish proactive loan recovery strategies. The practices reduce the likelihood of non-performing loans, improve asset quality, and enhance profitability.

Third the outcome suggests that higher loan loss provision is detrimental to the financial performance of the MFBs. The finding is in line with Ogboi (2013) and Al-Eitan and Banu-Khalid (2019). The findings indicate the need for effective loan loss provisioning and recovery strategies to mitigate the impact of loan defaults and economic downturns. The MFBs should develop robust risk management frameworks, strengthen credit risk assessment practices, establish provisions for expected losses, and monitor the adequacy of loan loss reserves. The practices help mitigate credit risks, protect profitability, and ensure the financial stability of MFBs.

Forth, the evidence suggests that loan-deposit magnitude is only a weak, although negative factor to be considered regarding the issues of financial performance. This corresponds with literature that, on one hand, loan-deposit magnitude has negative impact on performance (Bhattarai, 2019), and on the other hand, the loan-deposit magnitude has little or no role to play in the financial performance (Onyekwelu et al., 2018). The findings highlight the importance of managing the loan-deposit magnitude effectively to maintain proper funding for lending activities and mitigate liquidity risks. Practically, MFBs should closely monitor the loan-deposit ratio, strike a balance between loan growth and deposit mobilization, implement effective deposit mobilization strategies, diversify sources of funding, and establish reliable funding channels. Thes practices ensure sufficient funding for lending operations while maintaining optimal liquidity levels.

Fifth, the evidence suggests that the level of liquidity strength is vital to help them promote their financial performance. The finding is in line with the Hirigoyen theory which posits that the liquidity of banks is very important for it to improve its medium- and long-term profitability, as well as evidence of a positive impact of liquidity strength on financial performance from King'ori et al. (2017). The findings underline the importance of proactive liquidity risk controlling to ensure MFBs have sufficient liquidity to meet their obligations and unexpected cash flow demands. The MFBs should adopt comprehensive liquidity risk management frameworks, diversify funding sources, monitor cash flows regularly, establish contingency funding plans, and build relationships with liquidity providers. The practices

enhance liquidity strength and allow MFBs to navigate economic disruptions effectively.

5. Conclusions

The MFBs are tending to be the most vulnerable to financial risk; being specialized organizations that offer financial services to low-income individuals and groups. Their financial services include savings, microcredit and other products. They provide financial services to the under banked or unbanked, who are typically not served by the traditional formal financial sector (Afolabi et al., 2020). There are many risks that the MFBs manage to perform their roles. The risks are connected to the borrower's capacity to repay the loan and advances granted. We confirm how financial risk management drives financial performance of the banks, and found that:

i. Capital adequacy strength has a positive impact on return on asset and return on equity both in the short and long run;

ii. Risk asset quality has a negative impact on return on asset and return on equity both in the short and long run;

iii. Loan loss provision has a negative influence on return on asset and return on equity both in the short and long run;

iv. Loan-deposit magnitude only has a negative impact on return on asset in the short but not in the long run;

v. Liquidity strength has a positive impact on return on asset and return on equity both in the short and long run.

The findings underscore the importance of capital adequacy and liquidity strength for improving the financial performance as well as the detrimental impact of risk asset quality and high loan loss provisions on the MFBs. To ensure enhanced financial performance, sustainability and effectiveness of the MFBs, we recommend policy makers should implement different regulatory measures including recapitalization, reshaping of risk asset holdings, regulating loan loss provisions, clarifying regulations on loan-deposit ratios, and regulating liquidity levels. Lastly, future study should incorporate all other aspect of financial risk which includes market risk, exchange rate risk, interest rate risk and others with a view to offering a robust explanation of financial risk management and performance of the MFBs.

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