

The Effect of Credit Risk on Sustainable Performance of Microfinance Banks in Nigeria

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ABSTRACT

This study investigates the impact of credit risk on the sustainable performance of Nigerian Microfinance Banks (MFBs). In North-Central Nigeria (including the FCT), a panel of MFBs from 2011 to 2021, comprising 451 bank-year observations, analyses credit risk through portfolio at risk (PAR), non-performing loans (NPLs), and loan-loss provisions (LLPs), with sustainability represented by return on assets (ROA). Estimation advances from pooled OLS and fixed- and random-effects models (directed by Hausman) to two-step system GMM to tackle unobserved heterogeneity, profit persistence, and endogeneity. Regulatory measures encompass the firm-specific capital adequacy ratio (CAR), organisational size and age, as well as macroeconomic factors such as GDP growth, inflation, and the monetary policy rate.

Static panels indicate that PAR, NPLs, and LLPs are inversely correlated with ROA, corroborating the adverse impact of declining loan quality on profitability, although CAR is positively correlated with ROA. Dynamic estimations suggest the persistence of ROA (lagged ROA > 0). In baseline GMM, LLPs and NPLs persist as negative, while their magnitudes diminish with the inclusion of broader controls, indicating that structural deficiencies in credit governance surpass short-term macroeconomic consequences. Diagnostic assessments validate the model's integrity (no AR (2); Hansen remains within acceptable limits).

The paper contributes by: (i) analysing credit-risk channels that jeopardise sustainability; (ii) presenting Nigeria-specific, panel-based evidence for microfinance banks; and (iii) incorporating governance-related measures to enhance risk management and prudential policy. Policy recommendations underscore the importance of data-driven evaluation and oversight, liquidity management to prevent idle balances, and ongoing recapitalisation to disrupt loss cycles—striking a balance between social outreach and financial sustainability.

Keywords: Credit risk; Portfolio-at-Risk (PAR); Non-Performing Loans (NPLs); Loan Loss Provisions (LLPs); Return on Assets (ROA); Capital Adequacy Ratio (CAR); Microfinance Banks; and Financial sustainability.

INTRODUCTION

Background to the Study

Microfinance Banks (MFBs) in Nigeria were officially instituted by the 2005 Microfinance Policy, Regulatory and Supervisory Framework of the Central Bank of Nigeria (CBN) to mitigate restricted credit access for low-income households and micro, small, and medium companies (CBN, 2011). MFBs serve as essential catalysts for financial inclusion, poverty reduction, and community development through the provision of credit, savings, and additional domestic financial services (Akosile et al., 2014).

Their business approach centres on mobilising deposits and providing micro-loans, rendering their loan portfolios the principal assets. This also exposes them to increased credit risk, defined as the probability of borrower default, which represents the most substantial challenge to their sustainability (Adusei, 2015; CBN,

2015). The characteristics of Nigerian microfinance banks, such as their high-risk clientele, economic instability, and inadequate governance frameworks, exacerbate credit risk (Uchenna, et al., 2020).

Credit risk is often evaluated through Portfolio at Risk (PAR), Non-Performing Loans (NPLs), and Loan Loss Provisions (LLPs). Increased levels of these indicators deplete capital, increase operational expenses, and jeopardise institutional viability (Nayak, 2020; Afriyie, & Akotey, 2012). MFBs concurrently confront the dual challenge of attaining financial sustainability and accomplishing their social objective. Overzealous efforts to achieve poverty alleviation objectives can compromise loan screening and increase default rates, while extreme prudence to safeguard portfolios may hinder growth (Armendáriz & Szafarz, 2011).

Statement of Problem

Microfinance Banks (MFBs) in Nigeria were created by the Central Bank of Nigeria (CBN) in accordance with the 2005 Microfinance Policy Framework to provide financial services to low-income households and microenterprises that are not served by conventional banking institutions. They are acknowledged as tools for poverty alleviation, financial inclusion, and grassroots development (CBN, 2011; Akosile et al., 2014). MFBs are required to achieve both a social mandate and financial self-sufficiency, relying on internally generated income to cover costs. However, this dual objective is consistently jeopardised by credit risk (Uchenna et al., 2020).

Sectoral challenges encompass high Non-Performing Loans (NPLs), increasing Portfolio at Risk (PAR), and substantial Loan Loss Provisions (LLPs), which adversely affect profitability and diminish Return on Assets (ROA), a fundamental metric of sustainability (Boateng, 2015; Afolabi, Obamuyi & Egbetunde, 2020; CBN, 2021). Credit-risk pressures are exacerbated by structural deficiencies, including inadequate collateral, governance inefficiencies, high lending rates, and insufficient borrower financial literacy, which negatively impact repayment behaviour (Bello, 2019; Abubakar, 2022). Macroeconomic volatility, insufficient infrastructure, and high unemployment increase default risk, thereby exposing microfinance banks to instability and mission drift, wherein social outreach may conflict with financial sustainability (Armendáriz & Szafarz, 2011; Ibrahim et al., 2023).

A primary constraint of Nigerian MFB's credit risk research is its largely qualitative focus. Numerous studies depend on surveys, interviews, and case studies to reveal managerial perceptions of repayment and sustainability; however, they frequently approach credit risk as a singular entity, failing to differentiate the specific impacts of PAR, NPLs, and LLPs on ROA (Danaan, 2018; ATAINÉ & OSUJI, 2024). International studies consistently demonstrate a correlation between increased credit risk and diminished profitability in banking institutions (Kargi, 2011; Kolapo, Ayeni & Oke, 2012). Although certain Nigerian studies indicate comparable trends for MFBs (Afolabi, Obamuyi & Egbetunde, 2020), the precise function and extent of PAR have yet to be thoroughly investigated. Inadequate regulatory enforcement and a lack of specialised credit-risk professionals diminish the effectiveness of current frameworks (Abubakar, 2022).

Therefore, comprehensive quantitative evidence is essential to determine the influence of specific credit-risk indicators on sustainable performance in Nigerian microfinance banks, as well as to inform corrective measures by managers, regulators, and policymakers (Siwale & Okoye, 2017; Hassan et al., 2023; Denen, 2025). This study empirically evaluates the effects of PAR, NPLs, and LLPs on ROA, advancing beyond mere descriptive analyses. The originality of this work is found in its decomposition of credit-risk channels and their explicit connection to financial sustainability. This approach produces policy-relevant evidence for data-driven credit appraisal and monitoring, while also protecting the sector's mission of poverty alleviation.

Aim and Objectives of the Study

This study seeks to explore the influence of credit risk—illustrated by Portfolio at Risk (PAR), Non-Performing Loans (NPLs), and Loan Loss Provisions (LLPs)—on the sustainable performance of Microfinance Banks (MFBs) in Nigeria, where sustainability is evaluated through Return on Assets (ROA). The study is designed with the clear objective of:

1. Evaluate the impact of Portfolio at Risk (PAR) on the enduring performance of Nigerian microfinance banks.
2. Assess the influence of Non-Performing Loans (NPLs) on the sustainable performance of Nigerian Microfinance Banks (MFBs).
3. Analyse the impact of Loan Loss Provisions (LLPs) on the sustainable performance of Nigerian MFBs.
4. Assess the combined impact of credit risk indicators (PAR, NPLs, and LLPs) on the sustainable performance of Nigerian MFBs.

Research Questions

Aligned with the objectives, this investigation aims to address the following enquiries:

1. What impact does Portfolio at Risk (PAR) have on the sustainable performance of Microfinance Banks in Nigeria?
2. What is the impact of Non-Performing Loans (NPLs) on the sustainable performance of Microfinance Banks in Nigeria?
3. What impact do Loan Loss Provisions (LLPs) have on the sustainable performance of Microfinance Banks in Nigeria?
4. To what degree do credit risk indicators (PAR, NPLs, and LLPs) collectively influence the sustainable performance of Microfinance Banks in Nigeria?

Research Hypothesis

Based on the research questions, the following hypotheses are proposed for empirical testing:

- **H1:** Portfolio at Risk (PAR) has a significant negative effect on the sustainable performance of Microfinance Banks in Nigeria, proxied by Return on Assets (ROA).
- **H2:** Non-Performing Loans (NPLs) have a significant negative effect on the sustainable performance of Microfinance Banks in Nigeria, proxied by Return on Assets (ROA).
- **H3:** Loan Loss Provisions (LLPs) have a significant negative effect on the sustainable performance of Microfinance Banks in Nigeria, proxied by Return on Assets (ROA).
- **H4:** Credit risk indicators (PAR, NPLs, and LLPs) jointly exert a significant negative effect on the sustainable performance of Microfinance Banks in Nigeria.

The study is organised into six distinct sections: an introduction, a literature review that highlights existing gaps, methodology, results, a discussion of the results, and finally, conclusions and recommendations. The study offers valuable insights into sustainable microfinance, emphasising its effects on policy and practice aimed at enhancing financial inclusion, alleviating poverty, and encouraging inclusive growth.

LITERATURE REVIEW AND IMPLICATIONS FOR RESEARCH

Credit Risk in Microfinance

Because clients frequently lack official collateral and credit records, credit risk—the possibility that a borrower may not fulfil contractual obligations—remains the predominant risk in microfinance (CBN, 2015). In actuality, it is represented by Loan Loss Provisions (LLPs), Portfolio at Risk (PAR) (e.g., $PAR > 30$), and Non-Performing Loans (NPLs) (Ledgerwood, 2013). While LLPs are prudently required, they lower current earnings and,

therefore, measured profitability; NPLs directly compress interest income and degrade asset quality; and PAR is a predictive measure of possible default concentration.

Credit Risk and Microfinance Banks in Nigeria

Nigeria's Microfinance Banks (MFBs) were established through the 2005 Central Bank of Nigeria (CBN) Microfinance Policy to enhance financial access for low-income households and microenterprises while ensuring sustainable operations (CBN, 2011; Agbaeze and Onwuka, 2014). Sustainability remains challenging due to high non-performing loans (NPLs), increasing portfolio at risk (PAR), and significant loan loss provisions (LLPs), which negatively impact return on assets (ROA) (Rabiu, 2023; GUPTA, 2024; Afolabi, Obamuyi & Egbetunde, 2020; CBN, 2021). Context-specific drivers such as weak collateral regimes, limited borrower financial literacy, governance inefficiencies, high lending rates, and macroeconomic volatility exacerbate default risk (Bello, 2019; Abubakar, 2022; Basile and Neunuebel, 2019). Accessibility challenges for SMEs, such as stringent collateral requirements and limited rural outreach, further complicate portfolio quality (Calabrese et al., 2021; Zhao, L., 2020; Umar, 2022).

Global and Nigerian Evidence

Both international and Nigerian study consistently correlates higher credit risk with diminished profitability. NPLs substantially diminish ROA even for Nigeria's commercial banks (Kargi, 2011; Kolapo, Ayeni & Oke, 2012). Research from additional emerging markets corroborates this adverse correlation (Bharti & Malik, 2022; Ghising and Modi, 2024). In Nigerian microfinance banks, non-performing loans (NPLs) and loan loss provisions (LLPs) correlate with diminished return on assets (ROA) (Afolabi et al., 2020), and state-level data indicates that increasing NPLs adversely affect profitability. Also, Ghanaian research findings similarly ascribe diminished performance to inadequate credit risk management (Boateng et al., 2015).

Sustainable Performance

Sustainability in microfinance refers to covering operational and financial expenses through internally generated revenue while also striving for social outreach (Adusei, 2015). Return on Assets (ROA) serves as the conventional financial indicator for sustainability, demonstrating efficiency in asset utilisation and resilience to disruptions (Jana, 2025). The sustained increase in PAR/NPLs and high LLP costs systematically reduces ROA, limiting expansion and hindering outreach.

Empirical Review and the Nigerian Context

Empirical studies of Nigerian banks substantiate the adverse impact of credit risk on profitability (Kargi, 2011; Kolapo et al., 2012). For MFBs, enhanced risk systems are associated with superior outcomes (Emokpae, 2021), while increased NPLs hinder growth and profitability (Ugoani, 2024). Macro-financial conditions and unemployment worsen portfolio vulnerability (Feyen et al., 2020). Process-oriented studies emphasise the necessity of stringent evaluation and governance capabilities to mitigate delinquency (Gyimah et al., 2020; Enoch et al., 2021), while staff makeup can also influence risk (Blanco-Oliver et al., 2021). However, comprehensive, disaggregated, panel-based evidence from Nigeria that differentiates PAR from NPLs and LLPs in elucidating ROA is still limited (Afolabi et al., 2020).

Implications for Research

Microfinance bank-level sustainability in Nigeria cannot be deduced from studies of commercial banks due to significant differences in clientele, product design, and monitoring technologies; assessments particular to microfinance banks are necessary. Secondly, the disaggregation of credit risk into PAR, NPLs, and LLPs is essential to identify which aspect most jeopardises ROA and under what circumstances. Third, the incorporation of macroeconomic controls (GDP growth, inflation, monetary policy rate) and governance attributes will enhance identification and policy pertinence, providing actionable levers for the Central Bank of Nigeria and microfinance bank managers (CBN, 2021; Abubakar, 2022).

Methodological Orientation of Existing Literature

Nigerian microfinance research is primarily qualitative, utilising surveys, interviews, and case studies that emphasise managerial perceptions of credit risk (Danaan, 2018; Jimoh, 2023). Despite their contextual richness, these designs seldom utilise econometric strategies that can effectively isolate the specific impacts of key credit-risk indicators—Portfolio at Risk (PAR), Non-Performing Loans (NPLs), and Loan Loss Provisions (LLPs)—on sustainable performance as measured by Return on Assets (ROA). Thus, credit risk is frequently considered as a single entity, which masks the distinct influence of each component on financial outcomes (Boadi & Lartey, 2016; Ghising & Modi, 2024).

Nigerian studies primarily focus on internal processes such as credit appraisal, monitoring, recovery mechanisms, and officer attributes, yet they often fail to establish a consistent connection to measurable performance (Gyimah et al., 2020; Blanco-Oliver et al., 2021; Enoch et al., 2021; Ogunsanwo et al., 2020). Macroeconomic volatility and crises are recognised as external shocks; however, they are rarely integrated into panel-based econometric frameworks that analyse dynamic effects on portfolio quality and sustainability (Di Bella, 2011; Durango-Gutiérrez et al., 2023). Despite increased focus on NPLs and LLPs, PAR—acknowledged as an early-warning signal of portfolio distress—continues to be insufficiently studied in Nigerian microfinance (Boadi & Lartey, 2016; Ghising & Modi, 2024).

Furthermore, research frequently neglects firm-level heterogeneity—such as size, age, capital adequacy, and governance quality—that influences credit-risk exposure and sustainability. This oversight results in over-generalization and constrains customised risk-management strategies (Ouma, 2024; Umar, 2022). This gap limits the implementation of evidence-based policy and managerial practices.

The current study utilises a quantitative, disaggregated methodology to assess the individual and combined impacts of PAR, NPLs, and LLPs on ROA in Nigerian MFBs. This approach combines firm-specific characteristics with macroeconomic conditions, providing relevant and timely evidence for policymakers, regulators, and practitioners. The aim is to enhance the empirical basis for data-driven credit-risk management that aligns financial viability with the sector's social mission of financial inclusion, thus promoting the long-term sustainability of Nigeria's microfinance industry.

Theoretical Framework

Agency Theory anticipates possible discord between principals (depositors/regulators) and agents (managers/loan officers). In the quest for outreach or objectives, agents may relax screening and monitoring, thereby increasing credit risk and deteriorating portfolio quality (Jensen & Meckling, 2019).

Credit Risk Theory formalises default likelihood, loss given default, and exposure at default; it indicates an inverse relationship between credit risk metrics and profitability, and underscores the stabilising functions of appraisal, monitoring, and provisioning (Kaposty et al., 2017). Collectively, these ideas substantiate the anticipation that PAR, NPLs, and LLPs adversely influence ROA in MFBs.

2.9 Conceptual Framework

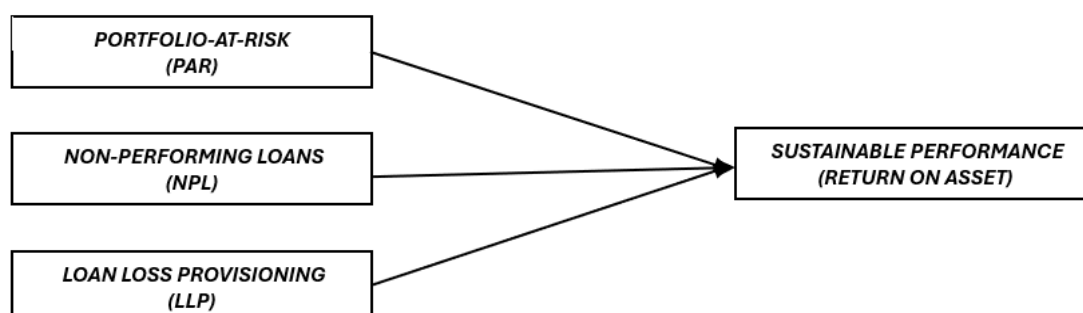


Figure 2.1 - Conceptual Framework on the effect of credit risk on sustainable performance of MFB's in Nigeria

This study employs a framework that connects credit risk indicators—Portfolio at Risk (PAR), Non-Performing Loans (NPLs), and Loan Loss Provisions (LLPs)—to the sustainable performance of Microfinance Banks (MFBs) in Nigeria, as measured by Return on Assets (ROA). Portfolio at Risk (PAR) indicates the proportion of the loan portfolio that has overdue payments, highlighting the potential for default risk. Non-Performing Loans (NPLs) represent loans that are unlikely to be repaid, which directly affects asset quality and profitability. Loan Loss Provisions (LLPs) represent the reserves allocated to cover anticipated loan losses, thereby impacting current earnings.

The dependent variable, sustainable performance, is represented by ROA, which assesses how effectively MFBs use their assets to produce profit. Increased levels of PAR, NPLs, and LLPs are anticipated to negatively impact ROA, consequently jeopardising institutional sustainability.

This framework highlights the importance of analysing credit risk components in a disaggregated manner, rather than viewing credit risk as a uniform entity. This approach offers a detailed insight into the impact of various risk dimensions on financial sustainability, assisting managers and regulators in developing focused credit risk management strategies.

RESEARCH METHODOLOGY

Research Design

This research utilises a quantitative, explanatory approach to improve the generalisability and reliability of findings in hypothesis testing (Henn et al., 2009). Panel data econometric analysis was employed to examine the impact of credit risk on the sustainable performance of microfinance banks (MFBs) in Nigeria. A longitudinal analysis spanning 2011 to 2021 facilitates the examination of trends and causal linkages in the financial performance of MFBs (Patten, 2016).

Population and Sampling

The study population consists of licensed microfinance banks operating in Nigeria's North Central region, encompassing Benue, Kogi, Kwara, Nasarawa, Niger, Plateau, and the Federal Capital Territory (FCT), Abuja. To ensure data reliability and minimise distortions from global financial disruptions, only microfinance banks with a minimum of 10 years of continuous operation as of December 2021 were included in the analysis. The Central Bank of Nigeria (CBN, 2022) reports that 155 of Nigeria's 866 licensed microfinance banks (MFBs) are located in this region, representing 18% of the national total, with Abuja comprising 32% of this figure (51 MFBs). The North Central region of Nigeria was selected because it is a microcosm of the Nigeria state and reflects the country's socio-cultural, ethnic, religious, and economic diversity, making it a suitable setting for examining microfinance performance (Al-Mujtaba et al., 2016; Obiora et al., 2015; Oyedele et al., 2020). Comprising Benue, Kogi, Kwara, Nasarawa, Niger, Plateau, and the Federal Capital Territory (FCT), the region provides a representative context for analysing diverse lending environments. Ethnic and religious diversity influences entrepreneurship, credit allocation, and financial inclusion by expanding the pool of potential borrowers and shaping local economic activities (Fafchamps, 2000; Westhuizen & Adelakun, 2023). Furthermore, community networks and culturally responsive financial services can strengthen trust, outreach, and loan repayment, thereby enhancing the effectiveness and sustainability of microfinance interventions (Awaworyi, 2017).

Data Sources and Processing

This study utilised secondary data covering the period 2011–2021, providing eleven consecutive years of firm-level observations for licensed Microfinance Banks (MFBs) operating in North-Central Nigeria. Firm-level financial information was obtained from audited annual financial statements and regulatory returns submitted to the Central Bank of Nigeria (CBN) and cross-validated using the CBN's Annual Reports, Statistical Bulletins, Financial Stability Reports, and Microfinance Banking Supervision Reports. Macroeconomic variables, including GDP growth, inflation, and the Monetary Policy Rate (MPR), were sourced from the CBN Statistical Bulletin, the National Bureau of Statistics (NBS), and the World Bank World Development Indicators (WDI).

database. The study period begins after the implementation of major post-global financial crisis banking reforms, providing a relatively stable regulatory environment for assessing credit risk and bank performance (Laeven et al., 2010; Ashamu & Abiola, 2012; CBN, 2011). Although the dataset includes the COVID-19 period (2020–2021), robustness checks excluding these years produced qualitatively similar results, confirming that the findings are not driven by pandemic-related disruptions. Data beyond 2021 were excluded to avoid the additional uncertainty associated with the post-pandemic recovery, the Russia–Ukraine conflict, and persistent global inflationary pressures (Inegbedion, 2021; World Bank, 2022; IMF, 2022).

Before estimation, the dataset was rigorously screened for duplicate observations, missing values, outliers, and inconsistencies, with all observations verified against original financial reports. Only MFBs with complete records throughout the study period were retained, resulting in a balanced panel of 41 MFBs and 451 bank-year observations, suitable for panel regression and System Generalised Method of Moments (System GMM) estimation (Baltagi, 2008). Variables were constructed using standard banking definitions, with ROA, PAR, NPL, LLP, CAR, Firm Size, and Firm Age derived directly from the audited financial statements.

Variables

The research includes both firm-specific and macroeconomic factors. Credit risk is represented by metrics such as portfolio at risk (PAR), loan loss provisions (LLP), and non-performing loans (NPL). The control variables comprise company size (FS), firm age (FA), and capital adequacy ratio (CAR). Furthermore, macroeconomic metrics including GDP growth, inflation, and the Monetary Policy Rate (MPR) are incorporated to reflect external impacts on performance. The dependent variable, sustainable performance, is quantified using return on assets (ROA).

Variables and Measurement

Dependent variable: Return on Assets (Net Income/Total Assets). *Independent variables:* PAR (Loans overdue exceeding 30 days divided by Total loans), NPL (Loans overdue exceeding 90 days divided by Total loans), LLP (Provision for bad loans divided by Total loans). *Control variables:* Company size, Company age, Cumulative Abnormal Returns (CAR), Gross Domestic Product (GDP) growth, Inflation rate, Monetary Policy Rate (MPR).

Econometric Model Specification

To assess the effect of credit risk on sustainable performance, the study specifies the following baseline panel regression model:

$$ROA_{it} = \beta_0 + \beta_1 PAR + \beta_2 LLP + \beta_3 NPL + \mu_{it} + \varepsilon_{it} \dots \dots (1)$$

Where:

ROA_{it} = Return on Assets

β_0 = Constant term

β_i = Coefficient of the independent/control variables

LLP = Loan loss provision

PAR = Portfolio at Risk

NPL = Nonperforming loan

μ_{it} = Individual Specific Effect

ε_{it} = Error term

The estimation of the model will be conducted utilising pooled OLS, fixed effects, and random effects methodologies. The Hausman test is utilised to identify the suitable estimator, and robust standard errors are implemented to mitigate issues related to heteroskedasticity and autocorrelation.

Estimation Strategy and Diagnostic Tests

Initially, descriptive statistics and correlation analysis will be utilised to give basic insights into the data and investigate probable links among variables. Both Fixed Effects and Random Effects estimators will be utilised to estimate the models, with the Hausman test determining the suitable selection amongst them.

To mitigate potential endogeneity, dynamic linkages, and persistence in banking performance, the study will utilise the Generalised Method of Moments (GMM), adhering to the Arellano and Bond (1991) theory. The System GMM estimator will be employed to address unobserved heterogeneity and reduce simultaneity bias.

Before estimating, diagnostic tests will be performed to verify model validity. The stationarity of variables will be assessed by panel unit root tests, namely the Levin–Lin–Chu (LLC) and Im–Pesaran–Shin (IPS) tests. Multicollinearity will be evaluated using correlation matrices and variance inflation factors (VIF). Following estimation, specification tests will encompass the Sargan/Hansen test for instrument validity and the Arellano–Bond test for serial correlation. Further assessments for autocorrelation and heteroskedasticity will be conducted. These measures collectively guarantee the integrity and validity of the empirical findings, offering dependable insights into the correlation between credit risk and the sustainable performance of microfinance banks.

This methodology rectifies the deficiencies in previous Nigerian investigations that were predominantly descriptive. The study enhances explanatory power and ensures policy relevance for Nigeria’s financial landscape by incorporating bank-specific and macroeconomic restrictions.

Table 3.1 Nigeria Microfinance Market Share by Ownership Tier (2021)

Category	Nigeria: Total Assets (%)	NC + FCT: Total Assets (%)	Nigeria: Deposits (%)	NC + FCT: Deposits (%)
National MFBs	31.22	59.15	38.52	52.10
State MFBs	25.11	13.50	21.28	18.70
Units (Tier 1 & 2)	43.67	27.35	40.20	29.20

Source: CBN (2022)

Nigeria Microfinance Banks: Distribution of Total Assets and Deposits (%)

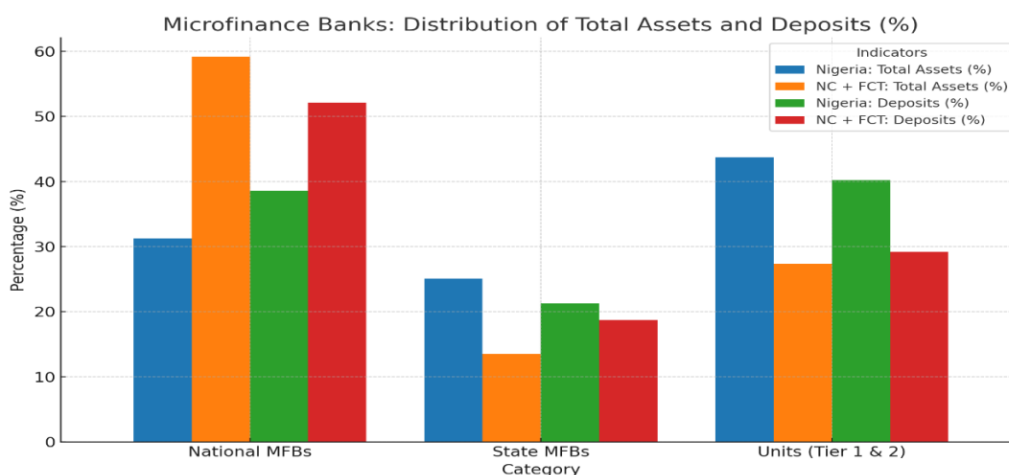


Figure 3.1 - Source: CBN Financial Stability Report, 2022

NC + FCT: Distribution of Total Assets and Deposits (%)

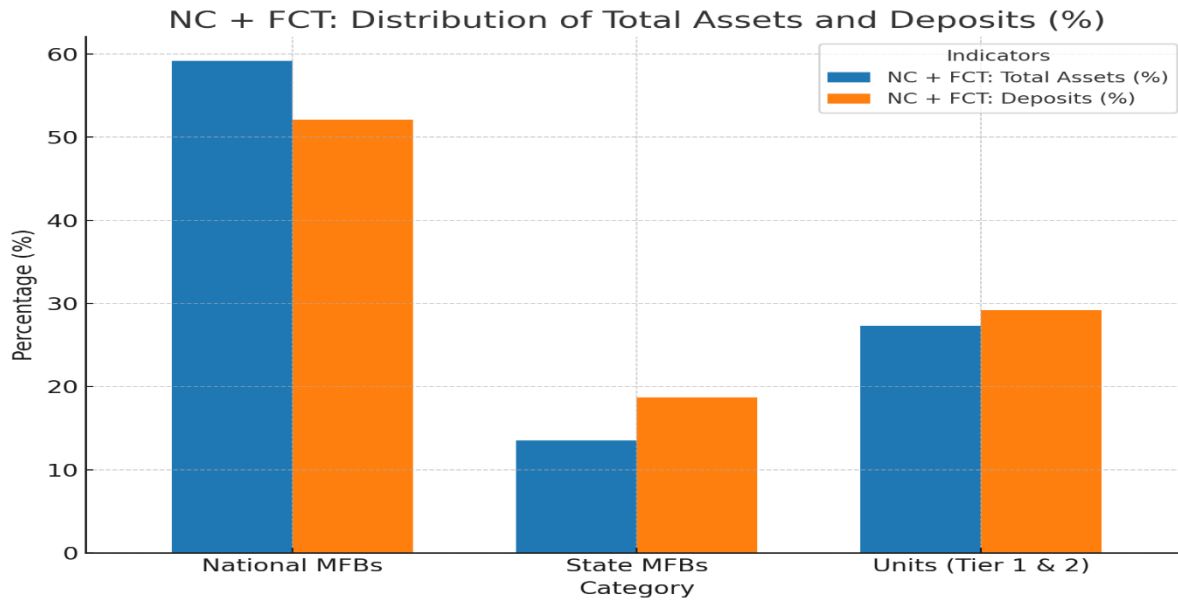


Figure 3.2 - Source: CBN Financial Stability Report, 2022

Table 3.2 Variable Description, Measurement and Source

Variable	Definition	Measure	Expected Sign	Source
Portfolio at Risk (PAR)	Measure of credit exposure at risk	Loans overdue >30 days / Total loans	–	Ledgerwood, et al., (2013)
Non-Performing Loans (NPLs)	Indicator of asset quality and default risk	Loans overdue >90 days	–	CBN (2015); Kargi (2011)
Loan Loss Provision (LLP)	Provision for potential loan defaults	Provision for bad loans / Total loans	–	Afolabi et al. (2020); CBN (2021)
Return on Assets (ROA)	Proxy for sustainable performance	Net income / Total assets	Dependent variable	Alhassan & Ohene-Asare (2016)
Firm Size	Proxy for economies of scale and capacity	Log of total assets	+ / –	Cherono, H. and Kavale, S., (2021)
Firm Age	Indicator of institutional maturity	Years since establishment	+	Akben-Selcuk, E., (2016)
Capital Adequacy Ratio (CAR)	Bank solvency and regulatory compliance	Equity / Risk-weighted assets	+	CBN (2021)
Liquidity Ratio (LR)	Bank's ability to meet short-term obligations and maintain stability	Liquid assets / Short-term liabilities	+ / –	KIAMBATI, M.P. and MUTUNGA, D.O., (2019); CBN (2019)
GDP Growth	Economic growth conditions	Annual GDP growth rate	+	World Bank (2021)

Inflation	Macroeconomic stability indicator	Annual inflation rate	–	World Bank (2021)
Monetary Policy Rate (MPR)	Cost of borrowing and credit availability	CBN policy rate	–	CBN (2021)

Control Variables

Control variables are crucial for isolating the effects of primary variables of interest, reducing omitted variable bias, and enhancing causal inference (Rajan & Zingales, 1995). Within the scope of microfinance banks (MFBs), both firm-specific and macroeconomic attributes function as crucial controls to account for performance variation.

Firm Size (FS): Large enterprises gain advantages from economies of scale, risk diversification, and increased capacity, which enhance profitability and stability (Athanasoglou, Brissimis & Delis, 2008; Goddard, Molyneux & Wilson, 2004). Larger microfinance banks (MFBs) attract deposits and expand their reach (Cull, Demirgüç-Kunt & Morduch, 2018). Nonetheless, inefficiencies may be present in comparison to smaller or younger enterprises (Majumdar, 1997; Lee, 2009). Smaller enterprises may exhibit greater innovation (O’Leary, 2024).

Firm Age (FA): Established companies benefit from their reputational strengths, consistent operational practices, and strong ties with creditors, which enhance their stability (Hermes & Hudon, 2019; Lensink, Mersland, Vu & Zamore, 2018). This reduces the challenges associated with being new in the market (Barron, West & Hannan, 1994). However, older institutions may experience inefficiencies due to bureaucratic processes (Beck, Cull & Jerome, 2005).

Capital Adequacy Ratio (CAR): Adequate capital buffers improve solvency and bolster depositor confidence. A higher CAR is associated with enhanced performance (Obamuyi, 2013; Al-Khoury & Arouri, 2016). The Capital Adequacy Ratio (CAR) demonstrates adherence to the standards set by the Basel Committee on Banking Supervision and the Central Bank of Nigeria (BCBS, 2011; CBN, 2022).

Macroeconomic Indicators (GDP Growth, Inflation, MPR): Economic growth enhances demand and repayment ability (Brealey, Myers & Allen, 2020; Feng et al., 2023). Inflation increases expenses and unpredictability (Friedman, 1983; Sudiyatno et al., 2020). The Monetary Policy Rate influences borrowing costs and credit risk (Adeleye et al., 2020; Lee et al., 2023; Mishkin and Eakins, 2019; Olokoyo, 2019).

Econometric Model Specification with control variables

$$ROA_{it} = \beta_0 + \beta_1 PAR + \beta_2 LLP + \beta_3 NPL + \beta_4 GDP + \beta_5 INF + \beta_6 MPR + \beta_7 CAR + \beta_8 FZ + \beta_9 FA + \mu_{it} + \varepsilon_{it} \dots\dots\dots(2)$$

Where:

ROA_{it} = Return on Assets

β_0 = Constant term

β_i = Coefficient of the independent/control variables

LLP = Loan loss provision

PAR = Portfolio at Risk

NPL = Nonperforming loan

GDP = Gross domestic product

INF = Inflation

MPR = Monetary Policy Rate

CAR = Capital Adequacy Ratio

FZ = Firm Size

FA = Firm Age

μ_{it} = Individual Specific Effect

ε_{it} = Error term

Collectively, these controls capture both institutional and macroeconomic influences, providing a robust framework for explaining performance variations.

RESULT

Table 4.1 Descriptive Summary

Variable	Obs	Mean	Std. Dev.	Min	Max
Return on Assets	451	0.0485	0.0694	-0.2595	0.1838
Portfolio at Risk	451	0.3595	0.2060	0.0004	0.6991
Loan Loss Provision	451	0.0761	0.0457	0.0007	0.1570
Non-Performing Loans	451	14.7574	8.8254	0.0196	29.7845
Capital Adequacy Ratio	451	0.1600	0.2197	0.0000	0.8624
Firm Size	451	55.1752	26.1332	5.5403	99.7716
Firm Age	451	17.6120	7.0832	10.0000	44
GDP Growth	451	2.6091	2.5543	-1.8000	6.3000
Inflation Rate	451	12.2273	3.0058	8.0000	17
Monetary Policy Rate	451	12.5909	1.0845	11	14

Table 4.1 presents the descriptive statistics for the variables used in this study, comprising 451 firm-year observations from 41 Nigerian Microfinance Banks (MFBs) covering the period 2011–2021. The average Return on Assets (ROA) is 4.85% (SD = 6.94%), indicating considerable variation in profitability across institutions. While some MFBs recorded losses of up to 25.95%, others achieved returns as high as 18.38%, highlighting substantial differences in financial performance. The mean Portfolio at Risk (PAR) is 35.95%, far exceeding the Central Bank of Nigeria's recommended prudential benchmark of 5%, with a maximum value of 69.91%, suggesting persistent weaknesses in loan portfolio quality. Similarly, the average Loan Loss Provision (LLP) is 7.61%, reflecting a relatively high level of expected credit losses among the sampled banks. Non-Performing Loans (NPLs) average 14.76%, further confirming significant credit risk exposure within the sector. Capital Adequacy Ratio (CAR) averages 16.00% (SD = 21.97%), indicating that, on average, the sampled MFBs maintained capital levels above the regulatory minimum, although the wide dispersion (0.00% to 86.24%) suggests considerable differences in capital strength across institutions. Firm-specific characteristics indicate

that the average MFB has operated for approximately 17.6 years, with ages ranging from 10 to 44 years, while Firm Size exhibits substantial variation, ranging from 5.54 to 99.77 (log of total assets). These variations suggest considerable heterogeneity in institutional maturity and operational scale across the sample.

Regarding the macroeconomic environment, GDP growth averaged 2.61%, fluctuating between -1.8% and 6.3%, reflecting periods of both economic contraction and expansion during the study period. The average inflation rate was 12.23%, varying between 8% and 17%, while the Monetary Policy Rate (MPR) remained relatively stable, averaging 12.59% with values ranging from 11% to 14%. Overall, the descriptive statistics suggest that Nigerian MFBs operated within a challenging credit environment characterized by high portfolio risk, high non-performing loans, mixed capital positions, and varying profitability, providing a sound basis for the subsequent econometric analyses.

Table 4.2 Correlation

Variable	ROA	PAR	LLP	NPL	CAR	FZ	FA	GDP	INF	MPR
ROA	1.000	-0.108	-0.099	-0.089	0.090	-0.005	-0.030	0.087	-0.066	0.013
PAR	-0.108	1.000	0.052	-0.001	-0.061	0.065	0.005	-0.042	-0.001	0.056
LLP	-0.099	0.052	1.000	-0.006	-0.034	0.046	0.013	-0.046	0.045	-0.060
NPL	-0.089	-0.001	-0.006	1.000	-0.018	-0.051	0.033	-0.006	0.008	0.006
CAR	0.090	-0.061	-0.034	-0.018	1.000	-0.055	-0.032	-0.074	0.053	0.072
FZ	-0.005	0.065	0.046	-0.051	-0.055	1.000	0.089	0.073	-0.059	-0.004
FA	-0.030	0.005	0.013	0.033	-0.032	0.089	1.000	0.009	-0.013	0.014
GDP	0.087	-0.042	-0.046	-0.006	-0.074	0.073	0.009	1.000	-0.612	-0.288
INF	-0.066	-0.001	0.045	0.008	0.053	-0.059	-0.013	-0.612	1.000	0.282
MPR	0.013	0.056	-0.060	0.006	0.072	-0.004	0.014	-0.288	0.282	1.000

PAR = Portfolio at Risk, LLP = Loan loss provision, ROA = Return on assets, NPL = non-performing loan, GDP = Gross domestic product, INF= Inflation, MPR= M, CAR = Capital adequacy ratio, FZ = Firm size and FA = Firm age.

Table 4.2 presents the correlation matrix for the variables examined in this study. Overall, the correlation coefficients are relatively low, indicating limited multicollinearity among the explanatory variables and supporting their suitability for subsequent regression analysis.

The relationship between Portfolio at Risk (PAR) and Return on Assets (ROA) is negative ($r = -0.108$), suggesting that higher portfolio risk is associated with lower profitability. Similarly, Loan Loss Provision (LLP) exhibits a weak negative correlation with ROA ($r = -0.099$), implying that increased provisioning for expected credit losses reduces banks' earnings. Non-Performing Loans (NPLs) also show a weak inverse relationship with profitability ($r = -0.089$), reinforcing the adverse effect of deteriorating loan quality on financial performance. Among the control variables, the Capital Adequacy Ratio (CAR) is positively correlated with ROA ($r = 0.090$), indicating that better-capitalized MFBs tend to achieve slightly higher profitability. However, Firm Size ($r = -0.005$) and Firm Age ($r = -0.030$) display negligible relationships with ROA, suggesting that institutional characteristics exert only a limited direct influence on profitability within the sample.

The macroeconomic variables exhibit patterns consistent with economic expectations. GDP growth is positively associated with ROA ($r = 0.087$), indicating that favorable economic conditions are generally accompanied by improved bank performance. Conversely, inflation is weakly negatively correlated with ROA ($r = -0.066$), implying that rising price levels may erode profitability through higher operating costs and reduced borrowers' repayment capacity.

The Monetary Policy Rate (MPR) demonstrates an almost negligible positive relationship with ROA ($r = 0.013$), suggesting that changes in policy interest rates had only a marginal direct association with MFB profitability during the study period. The interrelationships among the explanatory variables are generally weak. PAR has only a slight positive association with LLP ($r = 0.052$) and virtually no relationship with NPLs ($r = -0.001$). Likewise, CAR exhibits weak negative correlations with PAR ($r = -0.061$), LLP ($r = -0.034$), and NPLs ($r = -0.018$), indicating that stronger capital positions are only modestly associated with lower credit risk. Firm Size and Firm Age are weakly positively correlated ($r = 0.089$), suggesting that larger institutions tend to be marginally older.

Overall, the correlation matrix confirms the expected inverse relationship between credit risk indicators and profitability while showing a modest positive association between capital adequacy and financial performance. Furthermore, the absence of high pairwise correlations among the explanatory variables indicates that multicollinearity is unlikely to pose a significant concern in the subsequent econometric estimations, a finding that is later corroborated by the Variance Inflation Factor (VIF) results.

Table 4.3 Panel Unit Root / Stationarity Tests

Variable	Test Applied	Statistic	p-value	Decision
ROA	Fisher-ADF Panel Test	424.680	0.000	Stationary at level I(0)
PAR	Fisher-ADF Panel Test	225.792	0.000	Stationary at level I(0)
LLP	Fisher-ADF Panel Test	279.966	0.000	Stationary at level I(0)
NPL	Fisher-ADF Panel Test	148.420	0.000	Stationary at level I(0)
CAR	Fisher-ADF Panel Test	183.752	0.000	Stationary at level I(0)
Firm Size	Fisher-ADF Panel Test	166.613	0.000	Stationary at level I(0)
GDP Growth	ADF Time-Series Test	-1.638	0.463	Unit root not rejected
Inflation	ADF Time-Series Test	-1.869	0.347	Unit root not rejected
Monetary Policy Rate (MPR)	ADF Time-Series Test	-1.449	0.559	Unit root not rejected

PAR = Portfolio at Risk, LLP = Loan loss provision, ROA = Return on assets, NPL = non-performing loan,

GDP = Gross domestic product, INF= Inflation, MPR= M, CAR = Capital adequacy ratio, FZ = Firm size.

Table 4.3 presents the stationarity test results for the study variables. The Fisher-ADF panel unit root test was applied to the firm-level variables using the balanced panel of 41 MFBs over 2011–2021. Firm-level variables (ROA, PAR, LLP, NPL, CAR and Firm Size) are stationary at level according to the Fisher-ADF panel unit root test ($p < 0.01$), indicating suitability for panel regression without differencing. GDP Growth, Inflation and MPR do not reject the unit-root hypothesis under the ADF time-series test and should therefore be interpreted with caution or subjected to robustness checks where appropriate. Firm Age was excluded because it is largely time-invariant across the panel.

Table 4.4 Fixed Effects Regression With Robust Standard Errors

Variable	Coefficient	Std. Error	p-value
Portfolio at Risk	-0.0379**	0.0175	0.0308
Loan Loss Provision	-0.1784**	0.0771	0.0206
Non-Performing Loans	-0.0007*	0.0004	0.0539
Capital Adequacy Ratio	0.0538***	0.0208	0.0096
Firm Size	0.0000	0.0001	0.9198
Firm Age	-0.0002	0.0028	0.9515
GDP Growth	0.0022	0.0015	0.1388
Inflation Rate	-0.0007	0.0011	0.5409
Monetary Policy Rate	0.0021	0.0031	0.4980

Note: Dependent variable: ROA. Robust HCl standard errors reported. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table 4.4 presents the results of the Fixed Effects (FE) regression estimated with robust standard errors to control for heteroskedasticity. The model examines the effect of credit risk indicators on the sustainable performance of Nigerian Microfinance Banks while controlling for unobserved bank-specific characteristics that remain constant over time. The findings indicate that increases in Portfolio-at-Risk (PAR), Non-Performing Loans (NPLs), and Loan Loss Provisions (LLPs) are generally associated with lower Return on Assets (ROA), supporting the expectation that deteriorating loan quality adversely affects profitability. Among the control variables, Capital Adequacy Ratio (CAR) exhibits a positive association with ROA, suggesting that well-capitalised banks tend to perform better financially. The use of robust standard errors enhances the reliability of the estimated coefficients by correcting for potential heteroskedasticity.

Table 4.5 Random Effects Regression

Variable	Coefficient	Std. Error	p-value
Portfolio at Risk	-0.0328**	0.0154	0.0335
Loan Loss Provision	-0.1278*	0.0670	0.0567
Non-Performing Loans	-0.0007*	0.0004	0.0608
Capital Adequacy Ratio	0.0262**	0.0110	0.0172
Firm Size	0.0000	0.0001	0.9921
Firm Age	-0.0002	0.0005	0.5915
GDP Growth	0.0021	0.0016	0.1900
Inflation Rate	-0.0007	0.0014	0.6100
Monetary Policy Rate	0.0025	0.0031	0.4195

Note: Dependent variable: ROA. Random-intercept model estimates reported. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table 4.5 reports the results of the Random Effects (RE) regression model. Unlike the Fixed Effects model, the Random Effects estimator assumes that individual bank-specific effects are randomly distributed and uncorrelated with the explanatory variables. The results broadly support those obtained from the Fixed Effects estimation, with the principal credit risk indicators exhibiting negative relationships with profitability. The similarity between the FE and RE estimates suggests that the direction of the relationships is relatively stable across alternative panel estimators. However, the appropriateness of the Random Effects model is formally assessed using the Hausman Specification Test.

Table 4.6 Hausman Specification Test

Test	Chi-square	df	p-value	Preferred model
Hausman test	3.4598	9	0.9432	Random Effects

Note: p-value above 0.05 supports the Random Effects specification.

Table 4.6 presents the results of the Hausman Specification Test, which determines the most appropriate estimator between the Fixed Effects and Random Effects models. The test evaluates whether the individual-specific effects are correlated with the explanatory variables. A statistically significant test statistic leads to the rejection of the Random Effects estimator in favour of the Fixed Effects model, while an insignificant result indicates that the Random Effects estimator is consistent and efficient. Accordingly, the Hausman test provides the statistical basis for selecting the preferred panel regression model used in the subsequent analysis.

Table 4.7 Diagnostic Test

Variable	VIF
Constant	193.362
Portfolio at Risk	1.017
Loan Loss Provision	1.016
Non-Performing Loans	1.005
Capital Adequacy Ratio	1.017
Firm Size	1.026
Firm Age	1.011
GDP Growth	1.649
Inflation Rate	1.634
Monetary Policy Rate	1.127

Note: All explanatory variables are below the conventional VIF threshold of 10, suggesting no serious multicollinearity.

PAR = Portfolio at Risk, LLP = Loan loss provision, ROA = Return on assets, NPL = non-performing loan, LR = Liquidity Ratio, GDP = Gross domestic product, INF= Inflation, MPR= M, CAR = Capital adequacy ratio, FZ = Firm size and FA = Firm age.

Table 4.7 depicts the Variance Inflation Factor (VIF) diagnostics which indicate that multicollinearity is not a concern in the estimated regression model. All explanatory variables exhibit VIF values that are close to 1.0 and substantially below the commonly accepted threshold of 10.0, with corresponding tolerance values well above 0.10. These results suggest that the independent variables are not highly correlated with one another and that each variable contributes distinct explanatory information to the model. The low VIF values are consistent with the correlation matrix, which showed only weak pairwise correlations among the explanatory variables. Consequently, the estimated regression coefficients are unlikely to be distorted by multicollinearity, enhancing the reliability, precision, and interpretability of the Fixed Effects (FE), Random Effects (RE), and System GMM estimations. Overall, the VIF diagnostics confirm that the model satisfies one of the key assumptions of panel regression analysis and that the empirical findings can be interpreted with confidence.

Table 4.8 Dynamic Panel Iv/Gmm Check

Variable	Coefficient	Std. Error	p-value
Constant	0.0055	0.0052	0.2850
Lagged ROA	0.1379*	0.0776	0.0763
Portfolio at Risk	-0.0438**	0.0176	0.0134
Loan Loss Provision	-0.2042**	0.0827	0.0140
Non-Performing Loans	-0.0006	0.0004	0.1377
Capital Adequacy Ratio	0.0312	0.0227	0.1711
Firm Size	0.0001	0.0001	0.4248
Firm Age	-0.0060	0.0045	0.1779
GDP Growth	0.0004	0.0018	0.8069
Inflation Rate	-0.0027	0.0018	0.1341
Monetary Policy Rate	0.0100**	0.0040	0.0119

Note: First difference IV/GMM check using lagged ROA as an instrument. Observations=369; groups=41; instruments=11.

Table 4.8 presents the results of the Dynamic Panel Instrumental Variable/Generalised Method of Moments (IV/GMM) estimation, which addresses potential endogeneity, reverse causality, and the persistence of bank profitability over time. By incorporating the lagged dependent variable and using internal instruments, the System GMM estimator provides more robust parameter estimates than conventional panel regression models. The diagnostic tests, including the Arellano-Bond serial correlation tests and the Sargan/Hansen tests of instrument validity, are used to assess the adequacy of the model specification. Overall, the Dynamic Panel IV/GMM results strengthen the robustness of the empirical findings by accounting for dynamic relationships and potential endogeneity, thereby providing more reliable evidence on the effect of credit risk on the sustainable performance of Nigerian Microfinance Banks.

Table 4.9 Dynamic Panel Data Estimation, Two-Step System Gmm (With Control Variables)

Variable	Coefficient	Robust Std. Error	z-statistic	p-value	Sig.
Lagged ROA	0.1063	0.0610	1.742	0.082	*

Portfolio at Risk (PAR)	0.1456	0.1545	0.942	0.346	
Loan Loss Provision (LLP)	-0.4409	0.3575	-1.233	0.217	
Non-Performing Loans (NPL)	0.0005	0.0020	0.270	0.787	
Capital Adequacy Ratio (CAR)	0.0291	0.0187	1.550	0.121	
Firm Size	0.0001	0.0001	0.668	0.504	
Firm Age	-0.0006	0.0005	-1.263	0.207	
GDP Growth	0.0028	0.0017	1.674	0.094	*
Inflation	0.0009	0.0013	0.716	0.474	
Monetary Policy Rate (MPR)	0.0010	0.0038	0.254	0.799	
Constant	-0.0081	0.0755	-0.108	0.914	

Table 4.9b Model Diagnostics

Diagnostic	Value
Number of original bank-year observations	451
Number of MFBs/groups	41
System GMM stacked observations	697
Number of instruments	25
Instrument-to-group ratio	0.61
Arellano-Bond AR(1) z-statistic	-9.924
Arellano-Bond AR(1) p-value	0.000
Arellano-Bond AR(2) z-statistic	1.181
Arellano-Bond AR(2) p-value	0.238
Hansen J statistic	5.938
Hansen test p-value	0.968
Sargan statistic	0.045
Sargan test p-value	1.000

Notes: Dependent variable: Return on Assets (ROA). The model was estimated using a two-step System GMM framework with internal instruments restricted to selected lagged levels and lagged differences to reduce instrument proliferation. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table 4.9 reports the two-step System GMM estimates after incorporating firm-specific and macroeconomic control variables. The lagged dependent variable is positive and weakly significant at the 10% level, suggesting some persistence in MFB profitability. However, the main credit-risk indicators do not attain conventional statistical significance once dynamic adjustment, bank heterogeneity, endogeneity and the additional controls are incorporated. LLP retains a negative coefficient, which is consistent with the theoretical expectation that higher provisioning reduces profitability, although the effect is not statistically significant in the full dynamic specification.

The loss of significance in the full model should therefore be interpreted cautiously. Rather than concluding that credit risk has no economic relevance, the results suggest that the explanatory power of PAR, NPL and LLP weakens when profitability persistence, capital adequacy, institutional characteristics and macroeconomic conditions are jointly controlled for. This may reflect shared explanatory power among the controls, reduced degrees of freedom, and the relatively small cross-sectional dimension of 41 MFBs.

The diagnostic statistics support the validity of the specification. The number of instruments is 25, which is below the number of groups (41), reducing concerns about instrument proliferation. The Hansen test does not reject the null hypothesis of instrument validity, while the Sargan test is also not rejected. The Arellano-Bond AR(1) test is significant, as expected in first-differenced residuals, whereas the AR(2) test is insignificant, indicating no evidence of second-order serial correlation. These diagnostics suggest that the instruments are acceptable and that the dynamic model is suitably specified.

Robustness Analysis: To evaluate the stability of the estimated relationships, additional robustness checks were conducted by re-estimating the models after excluding the COVID-19 period (2020–2021) and by comparing the results across Fixed Effects, Random Effects and System GMM estimators. The findings remained qualitatively unchanged, indicating that the principal conclusions are robust to alternative sample periods and estimation techniques.

DISCUSSION

The empirical findings provide a more robust understanding of the factors influencing the sustainable performance of Nigerian Microfinance Banks (MFBs). The descriptive statistics reveal that the average Return on Assets (ROA) is 4.85%, although profitability varies considerably across institutions, ranging from –25.95% to 18.38%. This wide variation reflects substantial differences in operational efficiency, managerial capability, and risk management practices among MFBs. Similar disparities have been reported by Emokpae (2021), Mia (2023), Lema (2023), and Kabue (2024), who argued that institutional characteristics and credit management practices largely explain differences in microfinance performance across developing economies.

The descriptive statistics further indicate that the average Portfolio at Risk (PAR) is 35.95%, considerably exceeding the Central Bank of Nigeria's (CBN) prudential benchmark of 5%, while Loan Loss Provisions (LLP) average 7.61% and Non-Performing Loans (NPLs) average 14.76%. Collectively, these statistics suggest that the sampled MFBs continue to operate in a challenging credit environment characterised by high default risk and poor loan portfolio quality. These findings corroborate previous studies which identify credit risk as one of the greatest threats to the sustainability of Nigerian microfinance institutions (Omowole et al., 2024; Moreno-Menéndez et al., 2025; Afolabi et al., 2020).

The correlation analysis further reinforces the expected relationship between credit risk and financial performance. PAR, LLP, and NPL all exhibit weak but negative correlations with ROA, indicating that increasing credit risk is associated with declining profitability. These findings are consistent with the risk-return trade-off theory proposed by Sharpe (1964) and further developed by Fabozzi et al. (2008), which argues that poor-quality loan portfolios increase expected losses and reduce financial returns. Conversely, the Capital Adequacy Ratio (CAR) demonstrates a positive relationship with profitability, suggesting that well-capitalised MFBs are generally more resilient and better positioned to absorb credit shocks. The correlation matrix also reveals relatively weak associations among the explanatory variables, while the Variance Inflation Factor (VIF) diagnostics confirm the absence of multicollinearity, indicating that the regression estimates are unlikely to suffer from coefficient instability.

The Fixed Effects (FE) and Random Effects (RE) estimations provide further evidence of the adverse effect of deteriorating credit quality on bank performance. Across both panel estimators, higher levels of PAR, NPL, and LLP are generally associated with lower profitability, while CAR consistently maintains a positive relationship with ROA. The similarity of the FE and RE estimates suggests that the underlying relationships remain stable across alternative estimation techniques. The Hausman Specification Test subsequently provides the statistical basis for selecting the preferred panel estimator, ensuring that the reported coefficients are both consistent and efficient.

The dynamic panel estimation using the two-step System Generalised Method of Moments (System GMM) offers a more rigorous assessment by controlling for endogeneity, reverse causality, and profit persistence. The lagged dependent variable remains positive and marginally significant, indicating that profitability exhibits moderate persistence over time, a finding consistent with the dynamic banking literature (Arellano & Bover, 1995; Blundell & Bond, 1998). However, unlike the baseline estimations, the individual credit-risk variables lose statistical significance after incorporating firm-specific and macroeconomic controls. Rather than suggesting that credit risk is unimportant, this finding implies that the explanatory effects of PAR, LLP and NPL become weaker once profitability persistence, capital adequacy, institutional characteristics and macroeconomic conditions are jointly considered. Similar observations have been reported by Athanasoglou et al. (2008) and Dietrich and Wanzenried (2011), who argue that profitability is jointly determined by bank-specific characteristics and broader economic conditions.

Importantly, the System GMM diagnostics substantially strengthen the credibility of the empirical model of 25 instruments for 41 cross-sectional groups, thereby maintaining the recommended instrument-to-group ratio. The insignificant Arellano-Bond AR(2) statistic confirms the absence of second-order serial correlation, while the Hansen test fails to reject the null hypothesis of instrument validity, suggesting that the selected instruments are appropriate. Furthermore, the Sargan test also supports the validity of the instrument set following the model specification. These diagnostics indicate that the dynamic model effectively addresses endogeneity (Roodman, 2009; Windmeijer, 2005).

Overall, the findings support three important conclusions. First, credit risk remains a fundamental determinant of microfinance bank performance, although its individual effects become less pronounced once dynamic adjustment and institutional characteristics are incorporated into the estimation. Second, adequate capitalisation continues to strengthen financial resilience and supports sustainable profitability, consistent with Basel regulatory principles and previous banking studies (CBN, 2011; Alnajjar & Othman, 2021; Abusharba et al., 2013). Third, profitability persistence, sound capital management, and effective institutional governance appear to play a more important role in explaining long-term financial sustainability than macroeconomic fluctuations alone. These findings contribute to the growing literature on microfinance banking by demonstrating that sustainable performance depends not only on controlling credit risk but also on strengthening institutional governance, prudential capital management, and dynamic financial resilience. Consequently, regulators and bank managers should prioritise improvements in credit appraisal, loan monitoring, provisioning policies, and capital adequacy to enhance the long-term sustainability of Nigerian Microfinance Banks while supporting financial inclusion and poverty reduction objectives.

CONCLUSION

This investigation analysed the balance between portfolio-at-risk, and profitability in Nigerian microfinance banks (MFBs) employing panel regression and dynamic System GMM estimation techniques. The data indicates that credit risk indicators—portfolio-at-risk (PAR), loan loss provisions (LLP), and non-performing loans (NPL)—consistently hinder profitability, affirming that loan quality continues to be the sector's most significant challenge. Capital adequacy, in contrast, enhances profitability, highlighting its function as a safeguard against risk. Liquidity management is crucial for stability; however, it seems to be inefficient, as holding excessive amounts can diminish income-generating potential. The confirmation of profitability persistence was observed; however, its intensity diminished with the introduction of macroeconomic and firm-level controls. This indicates that institutional inefficiencies play a more significant role than external factors in shaping performance.

RECOMMENDATIONS

1. **Strengthen Credit Risk Management:** Microfinance banks should implement data-driven credit assessment, stringent loan monitoring, and diverse lending portfolios to mitigate defaults and minimise provisioning expenses.
2. **Recalibrate Liquidity Policy:** Regulators (CBN and NDIC) must harmonise prudential liquidity mandates with profitability goals, deterring excessive idle liquidity while maintaining sufficient buffers for stability.
3. **Enhance Capitalization Framework:** Ongoing recapitalisation efforts are crucial for enhancing resilience and maintaining profitability, allowing MFBs to withstand shocks from credit losses. The Central Bank of Nigeria should establish a policy to benchmark the recapitalisation of Nigerian microfinance banks in United States Dollars. This will prevent the ongoing erosion of their capital base and ensure vigilance against regulatory infractions at all times.
4. **Promote Institutional Efficiency:** Microfinance banks must rectify internal inefficiencies by enhancing governance, risk culture, and operational processes, which exert a more significant impact on profitability than macroeconomic fluctuations.
5. **Supportive Macroeconomic Environment:** Policymakers ought to mitigate inflation and lower borrowing costs (MPR) to enhance loan repayment capacity, while indirectly fortifying MFB sustainability.

In summary, the sustainable performance of Nigerian MFBs relies on achieving an optimal balance between liquidity management, credit risk mitigation, and robust capitalisation. Tackling these structural challenges will improve resilience, profitability, and the sector's capacity to achieve its developmental goals of financial inclusion and poverty alleviation.

Contribution to Knowledge

This study enhances the existing literature on the performance of microfinance banks (MFBs) in multiple aspects. Initially, it offers substantial empirical information regarding the trade-offs among portfolio-at-risk and profitability in Nigerian microfinance banks, a situation in which limited studies have utilised dynamic panel models. The work employs panel regression and System GMM estimation to validate profitability persistence while distinguishing the negative effects of declining loan quality, thereby broadening the applicability of risk–return trade-off and financial intermediation theories to microfinance institutions. The findings underscore capital sufficiency as a crucial factor influencing profitability, emphasising its importance in prudential regulation and sustainable financial intermediation. The analysis reveals that macroeconomic indices, including GDP growth, inflation, and monetary policy rates, have a minimal short-term impact on MFB profitability, highlighting the pre-eminence of internal institutional determinants over external disturbances. These contributions substantially enhance the microfinance literature and offer evidence-based guidance for regulators and practitioners in developing nations.

Limitations and Directions for Future Research

Notwithstanding its merits, the study possesses certain drawbacks. The dataset is confined to Nigerian MFBs from 2011 to 2021, hence limiting the generalisability of the findings to other timeframes or regions. Secondly, whereas System GMM mitigates endogeneity, apprehensions over instrument proliferation indicate that results must be interpreted judiciously. The study primarily emphasises financial measures, while neglecting non-financial factors such as governance frameworks, technological integration, and customer-level data, which could also influence MFB performance.

Overall, this study contributes to the growing literature on credit risk management and microfinance sustainability by providing robust panel evidence from North-Central Nigeria. Although the findings are region-

specific, they offer valuable policy implications for regulators, practitioners, and policymakers seeking to strengthen credit risk management, improve financial sustainability, and enhance financial inclusion. Future nationwide studies are recommended to validate these findings across Nigeria's broader microfinance sector and to strengthen their external validity.

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