

“Credit Risk Management and Financial Performance of Microfinance Banks in Nigeria (2011- 2020)”

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Abstract

Microfinance banks holds the key to economic growth in developing economics and their financial health is sacrosanct to achieving this role. They provide small scale finances to small business enterprises. Previous publications which investigated effect of credit risk management on financial performance of Microfinance banks relied essentially on primary data for its analysis. This study was initiated to examine the effect of credit risk management on the financial performance of Microfinance banks in Nigeria using secondary data extracted from the published financial reports of six purposively selected Microfinance banks, covering the period of 2010 - 2019. The study employs descriptive statistics, Panel least squares regressions and correlation analysis to estimate the effect of the credit risk variables proxied by Non-performing loan ratio (NPLR), Liquidity ratio (LIQR) and Capital adequacy ratio (CAR) on the financial performance measured by Return on assets (ROA). Arising from the results of the Panel regression, the study therefore concluded that credit risk management proxied by NPLR and CAR have significant effect on the financial performance of the selected Microfinance banks in Nigeria proxied by ROA. Hence, Central bank of Nigeria should regularly monitor Microfinance bank's compliance to relevant provisions of the law as it concerns debt accumulation.

Keywords: Capital Adequacy Ratio; Liquidity Ratio; Non-Performing Loan Ratio; Return on Assets.

1.0 Introduction

Background to the study

The existence of banks are not just only to accept deposits or keep vital valuables for customers, but also to grant credit facilities. Credit creation is the main income generating activity for the banks (Kargi, 2011). The banking sector majorly source funds from surplus area of the economy to the deficit sector. These sourced funds are given out as loans and advances and this extension of credit carries with it the risk of non-repayment. This credit creation process has exposed financial institutions to high risk which also include microfinance banks (Marshall and Onyekachi, 2014). Hence, the more a bank is exposed to credit risk, the higher the probability of experiencing financial distress and vice versa (Serwadda, 2018).

The Basel Committee on Banking Supervision (1999) defined credit risk as the probability that a bank borrower or counterparty will fail to meet its obligations in accordance with agreed terms or the possibility of losing the outstanding loan partially or totally due to credit events. Credit risk is one of great concern to most authorities and banking regulators, this is because credit risk is those risks that can easily and most likely prompts bank failure (Kayode, Owoputi, and Adeyefa, 2015).

Financial performance is used as a general measure of a firm's overall financial health over a given period of time, and can be used to compare similar firms across the same industry or to compare industries or sectors in aggregation (Pandey, 2014). Ibtissem and Bouri (2013) defined financial performance as the reflection of the way in which resources of a company (Bank) are used in the form which enables it to achieve its objectives. He further identified several measures that have been used to measure the financial performance of Banks. These measures include: - Return on Equity (ROE), Return on Asset (ROA) and Net Interest Margin (NIM) and it is derived directly from the income statement.

Annual financial report of microfinance bank gives a better reflection and the most important source of information on the financial health of the bank. Microfinance banks were established in Nigeria because of the failure of the existed financial institutions such as Peoples bank and Community bank to adequately address the financing needs of the poor, unemployment and poverty alleviation (Acha, 2012).

For the purpose of this study, credit risk is assumed to be the exposure faced by banks when a borrower (customer) defaults in honoring debt obligations on due date or at maturity.

Credit risk is the independent variable in this research measured by Non-performing loan ratio, Liquidity ratio and capital adequacy ratio while the dependent variable is financial performance measured by Return on Asset.

Research Hypothesis

H₀₁: Non-performing loan ratio does not significantly affect financial performance of the selected Microfinance Banks in Nigeria measured by Return on assets (ROA)

H₀₂: Liquidity ratio does not significantly affect financial performance of the selected Microfinance Banks in Nigeria measured by Return on assets (ROA)

H₀₃: Capital adequacy ratio does not significantly affect financial performance of the selected Microfinance Banks in Nigeria measured by Return on assets (ROA).

2. Literature Review

2.1 Conceptual Review

Credit risk

Credit risk is defined as the potential that a bank borrower or counter-party will fail to meet its obligations in accordance with the agreed terms. Coyle (2000) defined credit risk as losses from the refusal or inability of credit customers to pay what is owed in full and on time.

Credit Management

Credit management is the process to ensure that customers will pay for the products delivered or the services rendered in any credit business transaction. Isah (2018) described credit management as methods and strategies adopted by a firm to ensure that they maintain an optimal level of credit and its effective management.

The Basel Accord on credit risk management

The Basel Accords were formed with the goal of creating an international regulatory framework for managing credit risk and market risk. Their key function is to ensure that banks hold enough cash reserves to meet their financial obligations and survive in financial and economic distress. They also aim to strengthen corporate governance, risk management, and transparency. As a result of high rate of non-performing loans (NPL) and its adverse effects, the Central Monetary Authorities came together with an agreement in December 1987 known as Basel I and II accord published in 1998 and 2004 respectively. Both accords underscore the relevance of capital adequacy for minimizing the adverse effects of credit risk (Basel committee on banking supervision, 2001). The regulations are considered to be the most comprehensive set of regulations governing the international banking system. The Basel Accords can be broken down into Basel I, Basel II, and Basel III (Corporate finance institutes).

Evaluation of Financial Performance of Banks

Financial performance is a subjective measure of how well a firm can use assets from its primary mode of business and generate revenues, Maleya and Willy (2013) defined firm performance as a general measure of a firm's overall financial health over a given period. Financial ratios are often used to measure the overall financial soundness of a bank and the quality of its management. The key ratios for measuring the performance of the banks are discussed below.

Capital Adequacy

Capital adequacy ratio is one of the measures which ensure the financial soundness of banks in absorbing a reasonable amount of loss. Capital adequacy represents the overall financial position of a bank. It reflects whether the bank has sufficient capital to bear unexpected losses in the future and bank leverage. It is defined as the ratio of bank's capital in relation to its current liabilities and risk weighted assets.

Assets Quality

The quality of assets is significant aspect to assess the degree of financial strength of a bank. The principal purpose to measure the assets quality is to determine the composition of non-performing assets (NPAs) as a percentage of the total assets. The quality of credit portfolio expresses the profitability of banks.

$$\text{Asset Quality} = \frac{\text{Loan loss Provisions}}{\text{Total loans}}$$

Management Efficiency

Management efficiency is another indispensable constituent of the CAMELS model that guarantees the growth and endurance of a bank. It measures a bank's profitability by revealing how much profit a company generates with the money shareholders have invested.

$$\text{Management Quality} = \frac{\text{Net Income}}{\text{Total loans}}$$

Earning Quality

Earning quality measures bank's profitability relative to its assets and thus the bank's overall performance. The quality of earnings is an extremely significant parameter which expresses the quality of profitability and capability of a bank to sustain quality and earning consistently. It primarily reflects the profitability of bank and enlightens consistency of future earnings.

$$\text{Earnings Ability} = \frac{\text{Net Income}}{\text{Total Assets}}$$

Liquidity

Liquid assets are cash and assets that can be converted to cash quickly if needed to meet financial obligations (Olagunju, Adeyanju and Olabode, 2011). Liquidity ratios indicate whether a company has the ability to pay off short-term debt obligations (debts due to be paid within one year) as they fall due.

$$\text{Liquidity Position} = \frac{\text{Deposits}}{\text{Total Assets}}$$

2.2 Theoretical Framework

The Anticipated Income Theory

The anticipated income theory was developed by H.V. Prochanow in 1944 on the basis of the practice of extending term loans by the US commercial banks. According to this theory, regardless of the nature and character of a borrower's business, the bank plans the liquidation of the term-loan from the anticipated income of the borrower. A term-loan is for a period exceeding one year and extending to less than five years (Harcourt, 2017).

The bank puts restrictions on the financial activities of the borrower while granting this loan. At the time of granting a loan, the bank takes into consideration not only the security but the anticipated earnings of the borrower. Thus a loan by the bank gets repaid out of the future income of the borrower in installments, instead of in a lump sum at the maturity of the loan (Harcourt, 2017).

Liquidity is assured to the bank when the borrower saves and repays the loan regularly in

instalments. It satisfies the safety principle because the bank grants a loan not only on the basis of a good security but also on the ability of the borrower to repay the loan. .

Commercial Loan Theory of Liquidity

Commercial loan theory of liquidity also known as real bills doctrine is the oldest theory of banking. It holds that short-term loans advanced to finance saleable goods on the way from producer to consumer are the most liquid loans the bank can make. Adam Smith described these loans as self-liquidating loans because the goods being financed will soon be sold. The loan finances a transaction and the transaction itself provides the borrower with the funds to repay the bank. He described the loans as liquid because their purpose and their collateral were liquid. The commercial loan theory holds that banks should lend only on short term, self-liquidating, commercial paper. Popularity of this doctrine among banks in Nigeria is evident.

Though, with its flaws, the commercial loan theory, or real bills doctrine has been a persistent theory of banking. Commercial loan theory is the adopted theory of theoretical framework of this research work. This is the kind of loan microfinance banks should advance to be sufficiently liquid since their loans are for short term period. Self liquidating loans are what banking institutions will want to advance mostly.

2.3 Empirical Review

Various empirical studies on the relationship between credit risk management and profitability of banks abound in extant literature and report varying dimensions of such a relationship. While some established an inverse relationship, others found a direct relationship.

Harcourt Edwin (2017) investigated credit risk management and performance of Deposit Money Banks with the use of panel data from selected commercial banks. The study revealed that, the selected credit risk management indicator significantly impact on bank performance measured as ROA and ROE.

Meanwhile, Munangi and Sibindi (2020), in their study, "An empirical analysis of the impact credit risk on the financial performance of South Africa banks". The study examined 18 South African banks for the period 2008-2018 using panel data techniques, ordinary least squares. It was established that a relationship did indeed exist which was negative and statistically significant as analyzed using the Panel data techniques.

Finally, Anounye, Ngozi, Ngwama, Uchehara, and Nkwah (2020) in their study "Credit risk evaluation and performance of Microfinance banks in Ogun State". The study adopted survey research design and data were collected through a well-structured questionnaire. Purposive sampling technique was adopted, and a sample size of two hundred respondents was drawn from the selected banks in Ota. Data were analysed through the aid of statistical package for social sciences (SPSS), and linear regression was used as a statistical tool for analysis. The study revealed that there is a significant relationship between credit risk evaluation and loan performance of selected Microfinance banks in Ogun state.

3. Research Methods

Research Design

The research is an ex-post facto research design since it makes use of existing data relating to the variables obtained from published audited financial statement of the selected National Microfinance banks In Nigeria.

Population of the study

The population of the study are all the registered Microfinance banks in Nigeria. According to Central Bank of Nigeria, the total licenced Microfinance banks in Nigeria as at October 31, 2020 is 916. Unit tier 1&2 mfbs were 764, State mfbs were 133 and National 9.

Sample size/Sampling procedure

The study adopted the purposive sampling techniques, which involves choosing the research samples based on the researcher's judgment. The sample judgment was based on the availability of audited annual financial reports of these banks, their capital base or financial strengths, years of existence and coverage areas.

Microfinance banks in Nigeria are classified under Tier 1&2, State and National by Central bank of Nigeria based on their shareholder's funds or capital base and their coverage area. The six banks were carefully selected from (National) Microfinance banks out of the 9 (National) microfinance due to the availability of their financial reports covering the period of study. One each microfinance bank from the Northern and Eastern region while four are from Western region of Nigeria. Western region has the largest concentration of (National) Microfinance banks in Nigeria.

Table 3.1: Regional Distribution of selected (National) Microfinance Banks

REGION	MICROFINANCE BANK
Northern	Baobab
Eastern	LAPO
Western	Accion NPF AB Parallex

Source: Researcher's compilation (2022)

Method of Data collection

The study used secondary data and quantitative data. The data was extracted from the published audited financial statements of the selected Microfinance Banks and Central bank of Nigeria (CBN) statistical bulletin. The data were obtained from the publication of the financial statement of six (National) Microfinance banks.

Variables Description

Bank performance in the literature, is usually measured by profitability. Also, profitability is proxied in this study by Return on assets (ROA), which is the ratio of profits to assets, while Credit risk management on the hand is measured by Non-performing loan ratio, Liquidity ratio and Capital adequacy ratio.

Return on Assets

Return on Asset (ROA) is a major ratio that indicates the profitability of a bank. It is a ratio of Income to its total assets (Kayode et al, 2015).It indicates the efficiency of the management of a company in generating net income from all the resources of the institution (Kayode et al, 2015).

$$\text{ROA} = \frac{\text{Net Income}}{\text{Total Assets}}$$

Non-Performing Loan Ratio

A non-performing loan ratio (NPL ratio) is the ratio of the amount of non-performing loans in a bank's loan portfolio to the total amount of outstanding loans the bank holds. This measures the effectiveness of a bank in receiving repayments on its loans.

$$\text{NPLR} = \frac{\text{NPLs}}{\text{Total loans}}$$

Liquidity Ratio

Liquidity ratio is a type of financial ratio used to determine a company's ability to pay its short term debt obligations. It helps determine if a company can use its current or liquid assets to cover its current liabilities. Liquidity ratio is the ratio of Total assets to Total liabilities.

$$\text{LIQR} = \frac{\text{Total assets}}{\text{Total liabilities}}$$

Capital Adequacy Ratio

Capital adequacy is the level of capital required by the banks to enable them withstand the risks such as credit, market and operational risks they are exposed to in order to absorb the potential losses and protect the bank's debtors. Capital adequacy ratio shows the internal strength of the bank to withstand losses during crisis.

$$\text{CAR} = \frac{(\text{Tier 1 Capital} + \text{Tier 2 Capital})}{\text{Risk-Weighted Assets}}$$

Model specification

The model adapted for this study is underpinned to the model of Soyemi, Ogunleye & Ashogbon(2014) in their study "Risk Management Practices and Financial Performance: Evidence from the Nigerian Deposit Money Banks (DMBS)" which measured performance with Return on Asset (ROA) as ratio of Net income to total assets. Non-performing loans ratio, Liquidity ratio and Capital adequacy ratio are used as indicators of credit risk.

The model used in evaluating the effect of credit risk management on bank performance is illustrated below

$$\text{BF} = f(\text{CRM}) \text{-----}(3.1)$$

Where,

BF = Dependent Variable which is bank performance represented by Return on asset (ROA) of the selected Microfinance banks in Nigeria

CRM = Independent Variable which is Credit risk management represented by Non-performing loan ratio (NPLR), Liquidity ratio (LIQR) and Capital adequacy ratio (CAR).

$$\text{ROA}_{it} = \beta_0 + \beta_1 \text{NPLR}_{it} + e_{it} \text{-----}(3.2)$$

$$\text{ROA}_{it} = \beta_0 + \beta_2 \text{LIQR}_{it} + e_{it} \text{-----}(3.3)$$

$$\text{ROA}_{it} = \beta_0 + \beta_3 \text{CAR}_{it} + e_{it} \text{-----}(3.4)$$

Where, β_0 = Regression Constant, β_1 = Regression coefficient, β_2 = Regression coefficient

β_3 = Regression coefficient

NPLR_{it} = Non-performing loan Ratio, LIQR_{it} = Liquidity Ratio, CAR_{it} = Capital adequacy Ratio

e_{it} = Error term, t = Time period (2010 - 2019)

Method of Data Analysis

The data collected from the audited annual financial reports of the Microfinance banks were analyzed using simple regression analysis. To examine the relationship between non-performing loan ratio and financial performance, the relationship between liquidity ratio and financial performance and finally, the relationship between capital adequacy ratio and financial performance. The data was analyzed with the use of Descriptive statistics using Microsoft Excel and E-view to test the hypotheses formulated. Finally, correlation analysis will show association between variables used in this research.

4. Data Presentation, Analyses and Interpretations

Descriptive Statistics

Table 4.1 below summarizes the descriptive statistics of the variables included in the regression models as presented. It represents the variables of 9 (National) microfinance banks operating in the Nigeria whose financial statements were available for the years 2010-2019. For each variable, the table reports the mean, median, standard deviation, minimum, maximum values and Jarque-Bera value.

Table 4.1: Descriptive statistics

	ROA	NPLR	LIR	CAR
Mean	0.098260	0.058920	1.509030	0.579960
Median	0.096950	0.061700	1.515750	0.568850
Maximum	0.143000	0.095000	2.250100	0.940900
Minimum	0.071400	0.027400	0.804000	0.251200
Std. Dev.	0.020914	0.019756	0.455100	0.181853
Skewness	0.718875	0.031733	0.056624	0.091931
Kurtosis	2.877620	2.220921	1.726753	2.960926
Jarque-Bera	5.205257	1.527480	4.084960	0.088331
Probability	0.074079	0.465921	0.129707	0.956796

Source: Researcher's Compilation (2022)

The table 4.1 above reveals that Return on Asset has an average value of 10% with highest performance of 14% and least performance of 7% among the selected Microfinance banks over the period. The median is 10% and standard deviation value of 2%. This means that for every 1 naira in average total assets, the firm earns net operating income of 10 kobo. These statistics suggest a low usage of assets to generate profits among the sampled banks during the study period. A poor returns on the asset of a company will usually discourage investors and limit expansions. This may be part of the reasons why the MFBs sub-sector in Nigeria has not witnessed the desired growth and made the expected impact on the economy.

The Non-performing loans (NPLs) shows an average of 6% for the selected Mfbs with minimum mean of 3% and maximum of 10%. The median has value of 6%, this shows that the selected Mfbs on the average enjoyed a relatively low credit risk during these periods and it implies that the firm incurs N0.0589k on average as non-performing loans for every N1 advanced for loans to customers or for every loan given 6% is non-performing. Also, the variance of this credit risk measure does not vary significantly across sampled banks, as indicated by their low standard deviations (0.0197).

The Liquidity risk, proxied through banks' liquidity ratio shows a mean of 1.50903 (151%) with minimum value of 0.804 and maximum value of 2.250 among the banks. The median value is 1.516. This is far above the CBN threshold of 20% for microfinance banks, implying that all the selected (National) Mfbs during the period are sufficiently liquid with mean of 151% far above the CBN directive with a variance of 0.455.

In addition, all the Microfinance banks used in the study were adequately capitalized having shown a mean value of 58%, which is far above the minimum 10% benchmark set by the Central bank of Nigeria for Microfinance banks. This further indicates that most Microfinance banks in Nigeria during the period under study were financed by approximately 58% equity holdings. The minimum and maximum values of CAR from the statistics are 25% and 94% respectively with median value of 57%. Capital Adequacy is very essential for the solvency and profitability of banks. This is because the business of banking is risky due to the possibility that loans may not be paid back leading to financial losses to the bank. Banks are therefore required to have adequate capital, not only to remain solvent, but to avoid the failure of the financial system.

To confirm if the data set assume a pattern of standard normal distribution, we utilized the Jarque - Bera statistics. Table 4.2 reveals that all the variables are normally distributed as the p-value are greater than

the critical value of 0.05 and all right tailed with skewness that ranged between 0.03 and 0.72 and peakedness of between 1.72 and 2.96.

Correlation Analysis

Correlation analysis is to determine the degree of association between variables. The magnitude of the association (+ or -) indicates the nature of association (positive or negative association). Correlation is significant at 0.05. The results are therefore as presented in table 4.2 below

Table 4.2: Correlation Analysis

	ROA	NPLR	LIQR	CAR
ROA	1			
NPLR	-0.3107	1		
LIQR	0.0372	0.5521	1	
CAR	0.6043	-0.4336	-0.5723	1

Source: Researcher's compilation (2022).

NPLR from the above correlation analysis has a negative relationship with ROA. A correlation coefficient -0.3107 suggests about 31% degree of relationship between them. The negative relationship between Non-performing loans and ROA of the selected Microfinance banks indicates that as Non-performing loans are increasing Return on assets will also be decreasing. The apriori expectation is that NPLR will have an inverse relationship with ROA as indicated here.

Liquidity ratio in ROA shows a positive but weak relationship. The positive gradient means that when liquidity ratio increases ROA also increases. Liquidity ratio has a degree of relationship of about 4% with ROA. A bank that maintains a higher liquidity does it at the expense of good performance since a lot of funds that would have been advanced as loans to earn income is tied up.

Capital adequacy has a positive gradient in relation to ROA. The correlation coefficient between ROA and CAR is 0.6043. Capital Adequacy indicates about 60% degree of relationship with ROA. Their degree of relationship is fair. Higher capital may improve the stability of bank against shocks in the economy this may in turn increase depositors confidence, attract many and more of deposits at low cost, reducing expenditure and improving performance leading to a higher ROA.

Panel Regression Analysis

Table 4.3: Panel Regression analysis (NPLR)

Dependent Variable (ROA)	Fixed Effect Model	Random Effect Model
(Constant)	0.1176 (0.0000)	0.1176 (0.0000)
Nonperforming Loan Ratio (NPLR)	-0.3289 (0.0209)	-0.3289 (0.0206)
R ²	0.0965	0.0965
F-statistics	0.9439 (0.4718)	6.1980
Durbin-Watson stat	1.9456	1.9456
Hausman Test		0.0000 (1.0000)
Observation	60	60

Source: Researcher's compilation (2022)

Hausman Specification Test

The Hausman specification test was used to determine the best model between the fixed and random effects. The null hypothesis was that the random effect model was desirable, while the alternative hypothesis was that the fixed effect model was accepted. The result from the test shows that the Chi-square value of the Hausman test was 0.0000 with p-value of 1.0000, the null hypothesis was rejected, and the fixed effect model was preferred to the random effect model and was adopted.

Fixed Effect Model

The results listed in Table 4.3 presented the findings obtained from the fixed-effect model and random-effect model. Based on the results from the table, the fixed-effect model estimation shows that the coefficient of the constant is 0.1176 with p-value < 0.05, which was statistically significant at a 5% significance level. The result implies that even in the case of a zero non-performing loan ratio, each Microfinance bank under review is expected to have approximately 12% of return on assets. It can also be seen from the table that NPLR has a coefficient of -0.33 which suggests a negative effect of NPLR on ROA which implies that 1% increase in NPLR, the banks' return on assets is expected to decrease by about 33%.

The R^2 value is 0.0965, which explained that the regressor accounted for approximately 10% of the variability in return on assets. Furthermore, it showed that other variables not considered in this study would account for precisely 90% of the variability in return on assets.

Durbin-Watson statistics (DW) approximate value of 1.95 for ROA is within 2 from table 4.3, this shows that there is a trace of negative serial auto-correlation.

Thus, this provides enough evidence to reject the null hypothesis that NPLR does not significantly affect the return on assets. It can therefore be concluded that NPLR has a significant effect on financial performance of the selected Microfinance banks in Nigeria proxied by Return on Assets (ROA).

Table 4.4: Panel Regression analysis (LIQR)

Dependent Variable (ROA)	Fixed Effect Model	Random Effect Model
(Constant)	0.095683 (0.000)	0.095683 (0.000)
Liquidity Ratio (LIQR)	0.001708 (0.7877)	0.001708 (0.7876)
R^2	0.0014	0.0014
F-statistics	0.0122 (0.9999)	0.0802 (0.7780)
Durbin-Watson stat	1.6943	1.6943
Hausman Test	0.0000 (1.0000)	
Observation	60	60

Source: Researcher's compilation (2022)

Hausman Specification Test

The result from the test shows that the Chi-square value of the Hausman test is 0.0000 with p-value of 1.0000, the null hypothesis was rejected, and the fixed effect model was preferred to the random effect model and was adopted.

Fixed Effect Model

LIR has a coefficient of 0.00178 and a probability value of 79% from the regression table 4.4 above. This suggests a positive effect of LIR on ROA and not significant since LIR probability is greater than 0.05 significant level. Furthermore, for a 1% increase in liquidity, the banks' return on assets is expected to increase by about 0.178 %, holding all other variables constant ($p > 0.05$).

R-squared statistic shows that the explanatory variable in the model (LIR) account for about 0.14% of the variation in the dependent variable (ROA). Thus, the explanatory power of the model is low and appears to suggest that the included variable is not a predictor of ROA.

The F-statistics being significant ($p < 0.05$) with p-value of 0.99 implies that the overall goodness of fit of the

model is not satisfactory.

Durbin-Watson statistics (DW) approximate value of 1.69 for ROA is within 2 from table 4.4, this shows that there is a trace of negative serial auto-correlation.

The results from Fixed effect Panel regression indicate that the estimate of the coefficient of Liquidity ratio (LIR) is positive and statistically insignificant at 5% level. Thus This implies that credit risk management proxied by LIR has a positive and insignificant effect on the Return on Assets (ROA) of the selected Mmicrofinance banks in Nigeria for the period under investigation We therefore fail to reject the null hypothesis that Liquidity ratio does not significantly affect financial performance of the selected Microfinance Banks in Nigeria measured by Return on assets (ROA)

Table 4.5: Panel Regression analysis (CAR)

Dependent Variable (ROA)	Fixed Effect Model	Random Effect Model
(Constant)	0.0579 (0.0000)	0.0579 (0.0000)
Capital Adequacy Ratio (CAR)	0.0694 (0.0000)	0.0694 (0.0000)
R ²	0.3652	0.3652
F-statistics	5.0809 (0.0003)	33.3619 (0.0000)
Durbin-Watson stat	1.4094	1.4094
Hausman Test	0.0000 (1.0000)	
Observation	60	60

Source: Researcher's compilation (2022)

Hausman Specification Test

The result from the test shows that the Chi-square value of the Hausman test is 0.0000 with p-value of 1.0000, the null hypothesis was rejected, and the fixed effect model was preferred to the random effect model and was adopted.

Fixed Effect Model

Table 4.5 indicates that CAR has a coefficient value of 0.0694 and suggests a positive effect of CAR on ROA. The independent variable CAR has a probability of 0.00% which is significant since it has probability less than 0.05 significant level. R-squared of the ROA regression is 0.37. This means that 37% variations in ROA are explained by the independent variable (CAR) and the remaining 63% are explained by variables not included in the model.

The F-statistics for ROA from table 4.5 is 5.0809 with probability of 0.03% is also statistically significant at the 5% level, suggesting that the independent variables jointly and significantly explain the variations in the model.

Durbin-Watson statistics (DW) approximate value of 1.41 for ROA is within 2 from table 4.5, this shows that there is a trace of negative serial auto-correlation.

Since Capital Adequacy ratio has positive and significant effect on ROA of the selected Microfinance banks in Nigeria for the period examined. We therefore conclude that Capital Adequacy ratio has significant effect on financial performance of the selected Microfinance banks in Nigeria measured by Return on Assets.

5. Summary of Findings, Conclusion and Recommendations

The overall objective of this study was to examine the effects of credit risk management on the financial performance of selected Microfinance banks in Nigeria. The study has examined individually the effect of Non-performing loan ratio, Liquidity ratio and Capital adequacy ratio on Return on Assets of the selected Microfinance banks in Nigeria from 2010 - 2019.

Test of hypothesis one from the panel regression results show that NPLR has significant effect on financial performance of the selected Microfinance banks in Nigeria proxied by ROA. The regression test for hypothesis two indicates that credit risk management measured by LIR has a positive insignificant effect on the financial performance of the selected Microfinance banks in Nigeria proxied by ROA for the period under investigation. While hypothesis three results show that Capital Adequacy ratio (CAR) has positive and significant impact on the financial performance of the selected Microfinance banks in Nigeria measured by ROA.

We therefore conclude that credit risk management measured by Non-performing loan ratio and Capital adequacy ratio have significant effect on the financial performance of selected Microfinance banks in Nigeria proxied by Return on assets for the period under review.

From the conclusion drawn, the results recommend that:

Microfinance banks need to enhance their credit risk management techniques not only to earn profit but also to maintain a qualitative asset portfolio.

The banks are encouraged to utilize more of their assets to generate income and finally, the Central bank of Nigeria should regularly monitor Microfinance bank's compliance to relevant provisions of the law as it concerns debt accumulation, through her relevant agencies with tougher punishments and stiffer penalties to erring Microfinance banks.

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Appendix A. Panel Data Set

Bank	Year	ROA	NPLR	LIQR	CAR
Accion	2010	0.1007	0.0742	2.2501	0.2512
Accion	2011	0.143	0.0479	1.1471	0.9409
Accion	2012	0.1043	0.0449	1.279	0.725
Accion	2013	0.0985	0.0274	1.0222	0.6735
Accion	2014	0.1224	0.0613	2.0173	0.6458
Accion	2015	0.0804	0.0717	1.7919	0.3664
Accion	2016	0.0714	0.0714	0.804	0.5766
Accion	2017	0.0926	0.0950	1.8062	0.5611
Accion	2018	0.0954	0.0333	1.22	0.5008
Accion	2019	0.0739	0.0621	1.7525	0.5583
NPF	2010	0.0788	0.0389	1.1435	1.1867
NPF	2011	0.1047	0.0302	1.0461	0.8999
NPF	2012	0.136	0.0598	0.9973	0.8051
NPF	2013	0.0548	0.0255	1.2222	0.7045
NPF	2014	0.036	0.0267	1.3012	0.6250
NPF	2015	0.0417	0.0205	1.5260	0.3394
NPF	2016	0.0449	0.0130	1.5650	0.4903
NPF	2017	0.0396	0.0206	1.4241	0.5275
NPF	2018	0.0611	0.0306	1.3547	0.4386
NPF	2019	0.0407	0.0098	1.3737	0.3867
LAPO	2010	0.0859	0	3.0402	1.1767
LAPO	2011	0.0701	0	4.0101	1.1688
LAPO	2012	0.0395	0.011	3.2592	0.5071
LAPO	2013	0.0399	0.0081	3.0544	1.208

LAPO	2014	0.3237	0.0082	2.2134	1.2214
LAPO	2015	0.1585	0.0025	3.2261	1.249
LAPO	2016	0.1639	0.0206	0.8194	1.2581
LAPO	2017	0.1695	0.0207	1.6090	0.7028
LAPO	2018	0.1071	0.0462	2.0776	1.3262
LAPO	2019	0.1019	0.0867	2.4302	1.814
AB	2010	0.0755	0.0178	1.3913	0.2937
AB	2011	0.0869	0.0076	1.0221	0.4692
AB	2012	0.0252	0.0093	1.2651	0.4484
AB	2013	0.0279	0.0153	1.3224	0.4265
AB	2014	0.0253	0.0671	1.3022	0.4066
AB	2015	0.0083	0.0267	1.3025	0.3806
AB	2016	0.0291	0.0389	1.2902	0.3462
AB	2017	0.0176	0.0189	1.4480	0.4097
AB	2018	0.0952	0.0650	1.4513	0.4181
AB	2019	0.0441	0.0106	1.3604	0.3654
Baobab	2010	0.0817	0.0135	1.1331	0.506
Baobab	2011	0.0737	0.0256	1.0142	0.8296
Baobab	2012	0.0552	0.0323	1.2550	0.4484
Baobab	2013	0.053	0.0108	1.6013	0.8436
Baobab	2014	0.057	0.0005	1.3091	0.7763
Baobab	2015	0.0735	0.0005	2.2199	0.4973
Baobab	2016	0.0028	0.0005	1.2357	0.7104
Baobab	2017	0.0421	0.0095	1.7760	0.5079
Baobab	2018	0.0845	0.0124	1.7615	0.4930
Baobab	2019	0.0933	0.0127	1.6918	0.4561
Parallex	2010	0.0784	0.0051	1.3078	1.1961
Parallex	2011	0.1018	0.0171	1.103	1.2551
Parallex	2012	0.052	0.0113	1.0302	0.6612
Parallex	2013	0.0509	0.0105	1.9013	0.5605
Parallex	2014	0.074	0.0969	1.6362	0.4427
Parallex	2015	0.0792	0.0090	1.5103	0.3953
Parallex	2016	0.0905	0.0092	1.4335	0.3714
Parallex	2017	0.0486	0.0077	1.5050	0.4176
Parallex	2018	0.0511	0.0088	1.5699	0.3825
Parallex	2019	0.0529	0.0088	1.4624	0.3705

Appendix B. Descriptive Statistics

Panel Data Set

	ROA	NPLR	LIQR	CAR
Mean	0.098260	0.058920	1.509030	0.579960
Median	0.096950	0.061700	1.515750	0.568850
Maximum	0.143000	0.095000	2.250100	0.940900
Minimum	0.071400	0.027400	0.804000	0.251200
Std. Dev.	0.020914	0.019756	0.455100	0.181853
Skewness	0.718875	0.031733	0.056624	0.091931
Kurtosis	2.877620	2.220921	1.726753	2.960926
Jarque-Bera	5.205257	1.527480	4.084960	0.088331
Probability	0.074079	0.465921	0.129707	0.956796
Sum	5.895600	3.535200	90.54180	34.79760
Sum Sq. Dev.	0.025806	0.023028	12.21985	1.951154
Observations	60	60	60	60

Appendix C. Correlation Analysis

	ROA	NPLR	LIQR	CAR
ROA	1	-0.3107176699657866	0.03715733634807839	0.6042868319094345
NPLR	-0.3107176699657866	1	0.5520648720701073	-0.4336088208454589
LIQR	0.03715733634807839	0.5520648720701073	1	-0.5722967553242594
CAR	0.6042868319094345	-0.4336088208454589	-0.5722967553242594	1

Appendix D. Panel Regression Output

D.1.

Dependent Variable: ROA
 Method: Panel Least Squares
 Date: 10/08/21 Time: 15:55
 Sample: 2010 2019
 Periods included: 10
 Cross-sections included: 6
 Total panel (balanced) observations: 60

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NPLR	-0.328925	0.138212	-2.379856	0.0209
C	0.117640	0.008582	13.70810	0.0000

Effects Specification

Cross-section fixed (dummyvariables)

R-squared	0.096545	Mean dependent var	0.098260
Adjusted R-squared	-0.005732	S.D. dependent var	0.020914
S.E. of regression	0.020974	Akaike info criterion	-4.781820
Sum squared resid	0.023314	Schwarz criterion	-4.537480
Log likelihood	150.4546	Hannan-Quinn criter.	-4.686245
F-statistic	0.943953	Durbin-Watson stat	1.945606
Prob(F-statistic)	0.471848		

D.2.

Dependent Variable: ROA
 Method: Panel EGLS (Cross-section random effects)
 Date: 10/08/21 Time: 16:01
 Sample: 2010 2019
 Periods included: 10
 Cross-sections included: 6
 Total panel (balanced) observations: 60
 Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NPLR	-0.328925	0.138212	-2.379856	0.0206
C	0.117640	0.008582	13.70810	0.0000
Effects Specification				
			S.D.	Rho
Cross-section random			0.000000	0.0000
Idiosyncratic random			0.020974	1.0000
Weighted Statistics				
R-squared	0.096545	Mean dependent var		0.098260
Adjusted R-squared	0.080969	S.D. dependent var		0.020914
S.E. of regression	0.020049	Sum squared resid		0.023314
F-statistic	6.198029	Durbin-Watson stat		1.945606
Prob(F-statistic)	0.015678			
Unweighted Statistics				
R-squared	0.096545	Mean dependent var		0.098260
Sum squared resid	0.023314	Durbin-Watson stat		1.945606

D.3.

Equation: Untitled
 Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.000000	1	1.0000

* Cross-section test variance is invalid. Hausman statistic set to zero.

** WARNING: estimated cross-section random effects variance is zero.

D.4.

Dependent Variable: ROA

Method: Panel EGLS (Cross-section random effects)

Date: 10/08/21 Time: 03:24

Sample: 2010 2019

Periods included: 10

Cross-sections included: 6

Total panel (balanced) observations: 60

Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LIQR	0.001708	0.006308	0.270696	0.7876
C	0.095683	0.009935	9.630514	0.0000

Effects Specification		S.D.	Rho
Cross-section random		0.000000	0.0000
Idiosyncratic random		0.022051	1.0000

Weighted Statistics			
R-squared	0.001381	Mean dependent var	0.098260
Adjusted R-squared	-0.015837	S.D. dependent var	0.020914
S.E. of regression	0.021079	Sum squared resid	0.025770
F-statistic	0.080189	Durbin-Watson stat	1.694316
Prob(F-statistic)	0.778049		

Unweighted Statistics			
R-squared	0.001381	Mean dependent var	0.098260
Sum squared resid	0.025770	Durbin-Watson stat	1.694316

Correlated Random Effects - Hausman Test

Equation: Untitled

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.000000	1	1.0000

* Cross-section test variance is invalid. Hausman statistic set to zero.

** WARNING: estimated cross-section random effects variance is zero.

D.5.

Dependent Variable: ROA

Method: Panel Least Squares

Date: 10/08/21 Time: 03:29

Sample: 2010 2019

Periods included: 10

Cross-sections included: 6

Total panel (balanced) observations: 60

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LIQR	0.001708	0.006308	0.270696	0.7877
C	0.095683	0.009935	9.630514	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.001381	Mean dependent var	0.098260
Adjusted R-squared	-0.111671	S.D. dependent var	0.020914
S.E. of regression	0.022051	Akaike info criterion	-4.681672
Sum squared resid	0.025770	Schwarz criterion	-4.437332

Log likelihood	147.4502	Hannan-Quinn criter.	-4.586098
F-statistic	0.012213	Durbin-Watson stat	1.694316
Prob(F-statistic)	0.999991		

D.6.

Dependent Variable: ROA
 Method: Panel Least Squares
 Date: 10/08/21 Time: 03:36
 Sample: 2010 2019
 Periods included: 10
 Cross-sections included: 6
 Total panel (balanced) observations: 60

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CAR	0.069495	0.012587	5.521408	0.0000
C	0.057955	0.007644	7.581411	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.365163	Mean dependent var	0.098260
Adjusted R-squared	0.293294	S.D. dependent var	0.020914
S.E. of regression	0.017581	Akaike info criterion	-5.134677
Sum squared resid	0.016382	Schwarz criterion	-4.890337
Log likelihood	161.0403	Hannan-Quinn criter.	-5.039102
F-statistic	5.080990	Durbin-Watson stat	1.409410
Prob(F-statistic)	0.000349		

D.7.

Dependent Variable: ROA
 Method: Panel EGLS (Cross-section random effects)
 Date: 10/08/21 Time: 14:38
 Sample: 2010 2019
 Periods included: 10
 Cross-sections included: 6
 Total panel (balanced) observations: 60
 Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CAR	0.069495	0.012587	5.521408	0.0000
C	0.057955	0.007644	7.581411	0.0000

Effects Specification		S.D.	Rho
Cross-section random		0.000000	0.0000
Idiosyncratic random		0.017581	1.0000

Weighted Statistics			
R-squared	0.365163	Mean dependent var	0.098260
Adjusted R-squared	0.354217	S.D. dependent var	0.020914
S.E. of regression	0.016806	Sum squared resid	0.016382
F-statistic	33.36197	Durbin-Watson stat	1.409410
Prob(F-statistic)	0.000000		

D.8.

Hausman Test
 Correlated Random Effects - Hausman Test

Equation: Untitled
 Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.000000	1	1.0000

* Cross-section test variance is invalid. Hausman statistic set to zero.

** WARNING: estimated cross-section random effects variance is zero.