



Impact of Credit Risk Management on the Performance of Nigerian Deposit Money Banks: An Analysis from 2010 to 2020

Olurotimi Ogunwale ^{a*} and Isibor Areghan ^b

^a Babcock University, Nigeria.

^b Caleb University, Nigeria.

Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

This study examined the impact of credit risk management on the financial performance of Nigerian deposit money banks over a 10-year period from 2010 to 2020. Understanding the relationship between credit risk management and bank performance is crucial for the stability and growth of the Nigerian banking sector. The Five deposit money banks used were First Bank Plc, Zenith Bank Plc, Access Bank Plc, Guarantee Trust Bank Plc, with United Bank of Africa (UBA) Plc. Equity returns measured bank performance while credit risk was explained using non-performing credits, capital adequacy ratio, plus provision for credit loss. Fixed plus Random panel regression was used to analyze the panel data and the Hausman test selected the fixed regression for discussion. The findings revealed that capital adequacy ratio and loan loss provision had a significant positive

*Corresponding author: Email: isiborareghan@gmail.com, areghan.isibor@calebuniversity.edu.ng;

impact on bank performance, while non-performing loans had a significant negative effect. The study recommends that banks should strengthen their credit risk management practices, including effective credit assessment, monitoring, and diversification, to enhance their financial performance and stability.

Keywords: Credit management; panel regression; fixed effect, hausman test; equity returns; credit.

1. INTRODUCTION

1.1 Study Background

Credit risk act as a major part in pushing deposit money banks' competitiveness since it constituted the biggest ratio of banks' profits and from which interest is earned. According to Alshatti [1], credit risk is associated with risk of interest rate. Increasing rate of non-performing loans is harmful to achievement of deposit money banks' objectives since it reveals unserved credits for some time-period [2].

Deposit money banks play significant role to developing every economic system as they act as intermediaries between the deficit sector of the economy and the surplus sectors of the economy [3]. Deposit money banks accept deposits from the surplus sector in form of savings account, fixed deposit account and current account held by customers. These funds are made available to the deficit sectors in form of loans and overdraft while operating within the guidelines and regulation of their regulating institutions [4]. The banking sector has commonly been the main stream of financial intermediation every economies. Any economy's strength is tied to the state of its banking sector in terms of strength and ability to perform its major role of intermediation [5]. Deposit money banks are also major institutions that act as the instrument for the implementation of monetary policies [6].

Prior to the establishment of indigenous banks in Nigeria, there was a rising need for the establishment of a Nigeria owned bank during the British colonial era. This was as a result of the numerous challenges faced by Nigerians in terms of access to funds or credit facilities from the foreign banks. The colonial banks were focused on meeting the needs of the colonial government and also protecting the interest of their owners at the detriment of the indigenous business owners. These foreign banks laid down discriminating policies that had no interest of the local business owners thereby constraining the growth of domestic businesses and their ability to compete with foreign counterparts [7]. These challenges faced by citizens engendered the

demand for domestic banks to meet the needs of citizens and also make credit facilities available to domestic firms. Several domestic banks were established such as the National Bank of Nigeria and Agbomagbe Bank. A common trend during the early years of indigenous banking in Nigeria was the short span between the time of establishment of banks and the closure or failure of such banks [7]. Only few banks were able to scale through. The evolution of indigenous banking has witnessed a systematic transition from high number of undercapitalized, mismanaged, illiquid and insolvent banks to fewer numbers of highly regulated and capitalized banks.

Within the period 1930-1968 a total number of 20 banks as revealed by the Apex bank (CBN) failed [7]. According to Nigeria Deposit Insurance (NDIC) report 2002, 16 failed deposit money banks were recorded and a total of 15 Merchant banks also failed. The increase in the required paid up capital of banks to 25 million following the implementation of the banking sector reforms of 2004 reduced the total number of banks to 25 bigger banks [7]. The inability of most banks to meet the required capital led to the mergers and acquisitions of some banks in order to meet recapitalization. This lowered the number of banks from 89 till 25 [8].

In 2009 there was a combine investigation of CBN and the NDIC carried out on the 25 existing banks and it was discovered that some of the existing banks were unable to meet its obligation to lenders, had liquidity problems, had no good corporate governance and had poor credit risk management [9]. The NDIC press release in 2011 as regards the combine investigation stated that out of the 6 challenged banks in 2009, 3 bridge banks were established in 2011 to manage the asset and liabilities of 3 failed banks while the remaining 3 were taken over by other banks [9].

Despite the regulatory guidelines and the banking reforms put in place by the CBN, there are still cases of distressed deposit money banks although it is not as rampant as it was in the early banking years. It is a clear indication that there is still the need to address the causes of

distress in Nigeria deposit banks. The case of the defunct Skye Bank and the merger of Diamond Bank Plc with Access Bank Plc with Access bank is another clear indication. The forensic audit report from the bank showed that it needed urgent recapitalization as the bank could no longer use borrowed funds with indefinite support from the CBN [9]. The events following the takeover of Non-existing Skye bank Plc ranges from unacceptable corporate governance lapses, inability of bank to meet adequacy ratios and the problem of liquidity that required the bank to rely on CBN support in order to remain in operation. The CBN made reference to the banks huge non-performing which is a major cause of bank failure. Also, "Moody's", a global advisory firm, explained the elements which led Diamond bank being merged with Access bank Plc [10]. The bank went from making profit of 28.5 billion in 2013 to making losses amounting to 9 billion in 2017. The bank also saw a sharp increase in its non-performing loans which reached about 43% in 2017. The banks provision for such loans was about 19% [10]. Non-performing loans, poor risk management, managerial incompetence, failure to adhere to CBN prudential guidelines, credit mismatch are key causes of deposit money bank failure [10].

Credit risk is one main factor that enhances the performance of banks. Hence, banks embark on high risks so as to increase their earnings degree in a highly assertive manner. Basel Committee [11] opined that credit risk involves the probability of not paying back credit due to credit risks and other risks. Also, high exposure to risk of credit would increase a bank's chance of having crisis. Hence, there was an increment in banks' non-performing loans and this has led to the focus now on management of risk of credit.

1.2 Research Problem Statement

For years, global economy faced huge banking and financial crises. Elisa & Guido [12] revealed several financial crises in 93 nations from 1970 till 2015 caused by mismanagement of credit risks among other factors. Gestel [13] discovered 30 banking crises from several nations from 1980 till 2014 caused by many factors including credit risk.

In Nigeria, many performing banks like Diamond bank, witnessed massive losses and eventual liquidation as a result of credit risks which were mismanaged.

The banking business nature makes credit risk sensitive as more than 80% of the banks'

liabilities comes from depositors' funds which are used for the loan business [12]. Banks give the deposits to their borrowers as credit and increase their earnings and thus establish a credit-creation process which most times introduce risk of credit default to the banks. However, to remain competitive, banks must still give credit to their customers to remain profitable and sustain their business.

According to Oguezie & Nwanna [9], some financial challenges that happen in emerging economies like Nigeria occur due to unguaranteed credits and numerous credit defaults.

Despite the fact that the Central Bank of Nigeria issued prudential guidelines that focus on loan asset qualities, provisions for un performing credits, and capital adequacy, and also, banks' corporate governance code ensures that the banks must disclose their credit risk management techniques in their annual reports, the banks still recorded increased non-performing loan which led to bank distress and eventual bank run for some of the banks, and this has bedeviled the Nigerian banking system for a long time. Therefore, this study wants to examine how the credit risk could be mitigated and public confidence restored back to the banking system, and finally how the mitigated credit risk could boost bank performance.

1.3 Research Hypotheses

H₀: Non-performing loans have no significant reaction on deposit money bank performance.

H₀: Capital adequacy ratios have no significant impact on deposit money bank performance.

H₀: Loan loss provision has insignificant impact on deposit money bank performance.

1.4 Significance of the Study

Managers of banks would benefit from the research as it would show them how to have an efficient loan portfolio. It would also be significant to bank loan managers as it would direct them on how to go about assessing bank customers for loan and also effectively reducing credit default risk. It would also benefit the banking public as it would reveal to them the negative impact credit default has on the banking system as a whole and therefore the need for their honesty in their

dealings with the bank on loan issues. Finally, other researchers would benefit from the study as it would direct them on how to carry out their researches in other areas of credit management.

1.5 Scope of the Study

The study would use five banks namely: First bank of Nigeria PLC, Zenith Bank PLC, Access Bank PLC, GTB PLC, and UBA PLC. The banks were selected based on a mix of old and new generation banks. The study would use a dataset that would cover from period 2010 till 2020 on variables such as capital adequacy ratio (CAR), loan or credit loss provision (LLP), non-performing loans (NPL) (independent variables) and the dependent variable bank performance (equity returns) (ROE).

2. LITERATURE REVIEW

2.1 Credit Risk Management (CRM)

Many scholars explained the concept of credit risk management. Kajola, Sanyaolu, Alao, & Ojunrongbe [8] opined that credit risk involves the risk that the borrower would be unable to pay up his agreed obligations. Oguezue & Nwanna [9] explained that the purpose of CRM was extracting all amount of corrective risk-adjustment in banks by maintaining appropriate credit risk disclosure materials. According to Elisa & Guido [12], credit risk could arise, as a result of debt events (automatic risk), of losing a loan that can be partially or partially repaid. Taiwo & Abayomi [14] argued in the same way that credit risk reflected the potential difference in profit margin arising from unpaid debt claims. Nuhui, Hoti, & Bektashi [15] argued that banks use management of credit risk to grant credit to borrowers. Some elements used by the banks are examining the credit applied for, loan worker training, and fixing loan terms to boost performance. Yet, in spite of the usage of the elements used to manage the credit risk, some deposit money banks still encounter increasing non-performing credits, low capital adequacy ratios, and increased insolvency [15]. When credit management functions efficiently, it aids a bank to perform above expectation.

Management of credit starts with examining the worthiness of the customers' business viability [16]. Hence, good credit management means fixing specific criteria a customer must meet before qualifying for the credit. Also, credit management involves controlling the complete credit line to be extended to the approved clients.

Many points like the customer's current financial status and character of the customer are utilized as part of the credit management process to examine and qualify a customer for credit. An efficient credit management technique based on Olawale [3] study would include:

- 1) Monitoring the customer's compliance with the signed credit covenants,
- 2) Examining the collateral covenants based on the customer's current condition,
- 3) Identifying negligence in the repayment and classifying such credits periodically, and
- 4) Taking actions towards solving the non-repayment challenges.

2.1.1 Credit risk

Credit is vital in any economy but comes with various risks [17]. Asiedu, Oduro, & Gadzo [18] defined credit risk as the probability that credit may become bad due to the fact that the customer defaults in payment. There are, generally, three types of credit risk also according to Asiedu, Oduro, & Gadzo, [18] and they are:

- (i) Credit spread risk that happens because of fluctuations from investments' interest rates and the risk-free rate of return.
- (ii) Non-repayment risk that occurs whenever the borrower cannot make payments.
- (iii) Downgrade risk that occurs from downgrades in the risk rating of a financial institution.

Credit risk is measured based on the customer's ability to repay the credit. The measurement checks the borrowers' revenue-generating ability and collateral assets.

2.1.2 Credit risk monitoring

This is a major segment of credit risk management as they are performed by the credit risk department in conjunction with the customer's business, rating teams, and portfolio management unit. The activity could be divided into monitoring at the customer's level and at the bank credit portfolio level [2].

2.1.3 Provision for bad debt

The CBN introduced the bad debt provision in 2012 to cover for credit risk. The main reason for setting up the provision was due to the incessant bad debt. However, by September 2017, the rate of non-performing loans had risen above the

regulatory threshold of 5%, prompting CBN's Bank Examination Department, to express concern about the continuous depreciation of banks' assets and rising provisions for non-performing loans over the previous three years [19]. The combined loan loss expenditure of 14 Nigerian listed deposit money banks for the first nine months of 2015 was ₦170.48 billion, an increase of 80 percent from ₦94.71 billion the previous year. The largest of the tier one banks, First Bank, gave ₦46.66 billion (248.98% more than 2014). By 2016, eleven (11) banks, including Zenith Bank, United Bank for Africa (UBA), Guaranty Trust Bank, First Bank, Access Bank, Union Bank, Stanbic IBTC, FCMB, Fidelity Bank, Sterling Bank, and Wema Bank, had made over ₦477 billion in provision for bad loans, with First Bank funding ₦226 billion and Zenith Bank funding ₦32.3 billion [19].

Although loan loss provision fell somewhat in 2017 to ₦433.6 billion, the decrease did not affect many individual banks. For example, First Bank's loan loss provision fell by 34% to ₦150.64 billion in comparison to the previous year, while Zenith Bank's increased to ₦98.2 billion (203.64% more), Access Bank to ₦34.4 billion (57% more), UBA to ₦32.8 billion (18.83% more), and Union Bank to ₦31.7 billion (14.44% more) [19].

2.2 Stakeholders Theoretical Framework

This theory provides a suggestion that small firms are more exposed to financial crises, which could lead to their performing their risk management function [10]. Stakeholder opinion was developed in 1898 by Freeman, was seen as a management tool and as it emerged from the company's concept it has great interpretive power [20]. The stakeholder role focused more on stakeholder equity of interest as a key component of corporate policy and that their contributions to promising disaster risk management is an extension of the contract-based concept from work to another contract. Stakeholder feedback aids at addressing the importance of customer trust and financial problems.

2.3 Empirical Review

Omankhanlen, Ilori, & Isibor [21] examined how monetary policy tools especially interest rate impact bank performance. Using regression analysis, they found that interest rate significantly impact the bank loan portfolio which in-turn affects the banks' profitability.

Maryam & Murtala [19] studied the nexus between credit risk management and some selected and listed Nigerian banks' performances using dataset from 2014 till 2018. Utilising panel regression, they discovered that non performing loans had a negative association with the banks' asset returns while performing loans had a positive association.

Asiedu, Oduro & Gadzo [18] conducted an analysis on credit risk and financial performance utilizing data extracted from quoted banks in Ghanaian stock market. The results of the research showed that profitability, net interest margin, plus capital adequacy have an inverse relationship to credit risk.

According to a study by Jessie, Vincent, & Maryann [22] on credit and liquidity management in Nigeria, they found that good credit appraisal positively and significantly impact non-performing credits as it reduces the rate of non-performing loans.

Kalui, [23] studied credit management and its effect on Kenyan microfinance bank performance and found credit risk environment, loan appraisal process, credit administration, measurement, and monitoring were significant in explaining the credit performance of Kenyan microfinance banks.

Obalemo [24] on their study of risk of credit in Nigerian banks revealed that credit risk management using Return on Assets, Capital Adequacy ratio, Liquidity ratio, Non-Performing Loan ratio and Loan Loss Provision ratio as variables found out using Panel GMM model that all variables except for Liquidity ratio affects the performance of the DMB.

Kargi [7] examined credit risk on Nigerian deposit money banks using secondary data from 2004 – 2008 of some selected banks. Findings revealed that credit risk management significantly affect Nigerian bank profitability. This has caused the banks to be affected differently by interest rates and loans, unpaid loans and fixed fees.

Nuhiu, Hoti, & Bektashi [15] explained that banks start with their primary objective of offering credit to their customers. They believed that as the customers; deposit was still with them, investing in credit loans would put such idle deposit funds into use to bring more earnings for the bank.

Kolapo, Ayeni, & Oke [25] investigated the significance of credit risk management

on Nigerian banks' profitability using primary data through questionnaire. A coefficient of correlation was used to determine whether credit risk management affected profits or not. The results showed that credit risk reduced revenue and must be core to bank managers.

Bhattarai [26] examined Nepals' loan risk and earnings performance relationship using an analytical approach. The finding revealed that management of credit risk significantly impact Nepal banks' earnings outcomes.

Ashlatti [1] assessed thirteen deposit money banks in Jordan with a view of ascertaining management of credit risk and their revenue performance. Finding revealed a significant positive effect on their performance as a result an effective credit management.

2.4 Gaps in Literature

The aim of the paper was to investigate the impact of credit risk management on deposit money bank performance in Nigeria. In the course reviewing some literatures, it was found out that most researchers concentrated on one or several countries and their findings have revealed different and conflicting results. Hence, this study wants to bridge the conflicting gap.

Also, most of the reviewed studies explored the subject matter but on a data time frame that ended in 2018. Thus, there is the existence of time gap which this study would also cover by extending the data end to 2020.

3. METHODS

This study used the panel data regression as the data consist of time series data from 2010 till 2020 and cross sectional data that cuts across five banks which are United Bank of Africa (UBA) Plc, First Bank Plc, Access Bank Plc and Guarantee Trust Bank Plc, and Zenith Bank Plc. In the course of analyzing the data, the fixed and random effect panel estimation was employed and the selection decision was determined by Hausman test. The null hypothesis of the Hausman test mean accepting fixed-effect regression.

3.1 Model Specification

The research adopted and modified a model from Bordeleau and Graham [27] and it was defined as:

$$ROE = f(CAR, NPL, LLP) \dots\dots\dots (i)$$

$$ROE = \beta_0 + \beta_1 CAR + \beta_2 NPL + \beta_3 LLP + \varepsilon \dots (ii)$$

Where,

β_0 = Constant

ε = Error Term

$\beta_1 - \beta_3$ = Estimation Parameters

ROE = Equity Returns

NPL = Non-performing loan credit

CAR = Capital Adequacy Ratio

LLP = Loan Loss Provision

In order to convert the data on each variable to rates in order to carry out the panel regression against the dependent variable ROE that was already in rate, all the independent variables were logged. Hence the new model specification was:

$$ROE = \beta_0 + \beta_1 LCAR + \beta_2 LNPL + \beta_3 LLLP + \varepsilon \dots (iii)$$

Where

LNPL = Log of Non-performing credit

LCAR = Log of Capital Adequacy Ratio

LLLP = Log of Loan Loss Provision

4. DESCRIPTIVE STATISTICS

This gives vital information about variables concerning its median, mean, minimum and maximum values, standard deviations, kurtosis, skewness, probability, Jarque-Berra, and the sum of square deviations. The variables examined were log of loan loss provision (LLLP), log of performing loans and advances (LLON), log of non-performing loans (LNPL), and return on equity (ROE).

Mean and Median: The mean and median are measures of central tendency. The mean of a data is derived by summing up all the values in the data set and dividing by the total number of the values in the set. The median is the middle number when a data set is arranged in ascending or descending order. From Table 1 LCAR had the highest mean and median figures of 21.57733 and 21.69444 respectively while LLLP, LNPL, ROE had a mean of 2.959945, 19.23878, 15.54770 and a median of 2.965260, 19.17623, and 14.84500 respectively.

Standard deviation: Standard deviation is a measure of the variations in a set of values. Standard deviation is given as the addition of squared deviations from the mean. From Table 1 LCAR also had the highest figure of 0.906174 while LLLP, LNPL, and LROE had a figure of 0.190671, 0.684458, and 0.818173 respectively.

Table 1. Summary statistics

	LLLPL	LCAR	LNPL	ROE
Mean	2.959945	21.57733	19.23878	15.54770
Median	2.965260	21.69444	19.17623	14.84500
Maximum	3.405853	22.97391	20.70690	32.75000
Minimum	2.438863	20.48932	17.89386	5.160000
Std. Dev.	0.190671	0.906174	0.684458	0.818173
Skewness	0.105608	0.101431	0.418695	0.640247
Kurtosis	2.816403	2.969712	2.764809	2.724266
Jarque-Bera	0.241486	1.351782	2.332656	5.290058
Probability	0.046262	0.048703	0.031509	0.011003
Sum	219.0359	1596.722	1423.670	1150.530
Sum Sq. Dev.	2.653945	26.82365	34.19926	3393.586
Observations	74	74	74	74

Source: Researchers compilation using E-views 9

Skewness: The skewness measures the asymmetry of the distributions of the series around its mean. The skewness of a normal distribution is usually zero. Therefore, a negative skewness indicates that the distribution of the data has a long left tail whereas a positive skewness indicates that the distribution of the data has a long right tail. Therefore, all the variables i.e. LLLP, LNPL, LCAR, and LROE had a positive skewness of 0.105608, 0.418695, 0.101431, and 0.640247 respectively to show that they had a long right tail.

Kurtosis: Kurtosis shows the flatness or peakness of the spreads of the series. The variable is said to be peaked to the normal if the kurtosis exceeds 3, and the distribution is said to be flat to the normal if the kurtosis does not exceed 3. From the Table 1, the kurtosis of all the variables, that is LLLP, LNPL, LCAR, LROE were 3 and above to prove that they are peaked to the normal.

Jarque-Bera: It was used to determine if the series are distributed normally. The difference between the kurtosis and skewness from the normal distribution is processed using the t-statistic. The null (H_0) hypothesis for normal distribution explains that the Jarque-Bera statistic is spread as with χ^2 degree of freedom. The null hypothesis that shows a normal distribution was not accepted when the probability value is less than 5% (0.05). Examining the Jarque-Bera Probability figures for all the variables, LLLP, LNPL, LCAR, LROE figures were all significant at 5% significance level with values of 0.046262, 0.031509, 0.048703, and 0.011003 respectively to accept the null hypothesis of a normal distribution.

4.1 Pearson Correlation Analysis

Correlation analysis examined the relation among all the variables in the model. It showed whether the relationship is a linear one or not and whether the linear relationship is positive or negative or zero. The study used Pearson Correlation to examine the linear relationship among the variables. A correlation of one and above showed a perfect positive correlation and relationship between both variables, while a correlation of 0 showed zero or no relationship. A negative correlation value of minus 1 (-1) and below showed a perfect and negative linear relationship between both variables. The Table 2 showed the value of Pearson Correlations for all the independent variables (LNPL, LCAR, and LLLP) against the dependent variable (ROE) in the model.

From Table 2, the correlation of return on equity (ROE) against log of non-performing loans (LNPL) was 0.510166 and approximately 1 to show a perfect and positive linear relationship between both variables.

For log of capital adequacy ratio (LCAR), it had a positive and linear correlation with ROE with value of 0.724990 which was approximately 1 from Table 2.

Finally, log of loan loss provision (LLLPL) had a positive and linear relationship with ROE with value of 0.545387 and which was approximately 1 from Table 2. Therefore, the conclusion of the correlation analysis was that all the independent variables (LNPL, LLON, and LLLPL) had a linear and positive relationship with dependent variables (ROE) from Table 2.

4.2 Panel Unit Root Test

The study used the panel unit root test to examine the stationarity of the data. According to Levin, Lin & Chu [28], the stationarity of the data means that the data has the property that its mean, variance and autocorrelation structure do not change over time. Hence, the ability to analyze such data due to its stationarity features. Also Levin, Lin & Chu [28] opined that panel unit root test should be carried out on panel data which has the attributes of both time series and cross sectional data.

The null and alternate hypothesis for the panel unit root test is:

- H₀: There is the presence of a unit root.
- H₁: There is no unit root.

The probability values of the Levin, Lin & Chu t-statistics and the Augmented Dickey-Fuller - Fisher Chi-square (ADF - Fisher Chi-square) would be examined to determine the stationarity at both levels and first difference. If the probability values are less than 0.10 or significant at 10 per cent level of significance, then the null hypothesis would be accepted and it would be agreed that there is the presence of a unit root and the data is stationary. However, if the probability values are more than 0.10 or insignificant at 10 per cent level of significance, the null hypothesis would not be accepted [29-32].

Examining the panel unit root result in Table 3, all the variables were stationary at levels and therefore integrated to the order of 0. Thus, the null hypothesis is accepted.

4.3 Fixed-Effect Regression

This technique was used to check if there was a significant impact between the dependent variable (return on equity) and all the independent variables which are log of loan loss provision (LLL), log of capital adequacy ratio (LCAR), and log of non-performing loans (LNPL)

based on the panel unit root result. The result is shown in Table 4.

From the presented result in Table 4, it was evident that there existed a positive relationship between bank performance (ROE) and log of loan loss provision (LLL) and log of capital adequacy ratio (CAR) while it had a negative relationship with log of non-performing loans. The nature of the relationship was both positive and negative based on the signs of the entire coefficients. This implies that an increase in any of the independent variables with the positive sign would lead to an increase in the dependent variable and for the negative sign; an increase in the independent variable would lead to a decrease in the dependent variable [33,34].

Beyond the nature of the relationship, the regression output also shows the significance of each independent variable in the model, which is used to test the study hypothesis. Based on the rule of thumb and the significant level of 0.05, the probability value of log of Loan Loss Provision (LLL), log of Capital Adequacy Ratio (LCAR), and log of Non-Performing Loan (LNPL) were all significant at 10 per cent level of significance with probability values of 0.0276, 0.0208, and 0.0157 respectively. This showed that the three independent variables all significantly have an effect on bank performance (ROE) based on the fixed effect panel regression. However, while log of Loan Loss Provision (LLL) and log of Capital Adequacy Ratio (LCAR) had a positive and significant impact on the dependent variable, log of Non-Performing Loan (LNPL) had a negative significant impact on the dependent variable ROE.

The coefficient of determination (R-squared) of the model under consideration which measures the goodness of fit of the model had a value of 0.58. This indicated that all the independent variables explain about 58% of the variations in the dependent variable (bank performance). After adjusting for degree of freedom, the adjusted R-squared was 0.54 (54%).

Table 2. Pearson Correlation Analysis

	ROE	LNPL	LCAR	LLL
ROE	1.000000	0.510166	0.724990	0.545387
ROA	0.773393	0.498929	0.543988	0.492254
LNPL	0.510166	1.000000	0.075975	0.223088
LLON	0.724990	0.075975	1.000000	0.301896
LLL	0.545387	0.223088	0.301896	1.000000

Source: Authors' Computation Using E-views 9

Table 3. Panel unit root test

Variable	Levin, Lin & Chu t* statistics	Levin, Lin & Chu t* statistics (probability value)	ADF - Fisher Chi-square	ADF - Fisher Chi-square (probability value)	Stationarity	Remark
LROE	-1.56932	0.0583	14.7114	0.0429	Stationary at levels	I(0)
LLL	-2.32509	0.0100	17.1735	0.0706	Stationary at levels	I(0)
LCAR	0.01973	0.0079	9.95469	0.0445	Stationary at levels	I(0)
LNPL	-2.06478	0.0195	17.4851	0.0643	Stationary at levels	I(0)

Source: Researchers Compilation using E-views 9

Table 4. Fixed-effect regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-112.9316	28.70643	-3.934016	0.0002
LLL	8.059539	3.579132	2.251814	0.0276
LCAR	2.583957	1.091628	2.367068	0.0208
LNPL	-2.542366	1.025914	-2.478146	0.0157
R ² = 0.58	Adjusted R ² = 0.54	Durbin-Watson Test = 1.72		

Source: Researchers Compilation using E-views 9

Table 5. Random-effect regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-76.38379	26.90315	-2.839213	0.0059
LLL	11.45627	3.388182	3.381242	0.0012
LCAR	1.577566	1.037778	1.520138	0.1329
LNPL	1.248881	0.952440	1.311243	0.1940
R ² = 0.55	Adjusted R ² = 0.51	Durbin-Watson Test = 1.89		

Source: Researcher's compilation using E-views 9

Finally, the durbin-watson test was used to show the presence or absence of autocorrelation in the model. Autocorrelation means that all or some of the independent variables are related this makes the regression result spurious. The value of the durbin-watson variable must be estimated at 2 to ensure that there is no autocorrelation in the model. The durbin-watson value of 1.72 is approximately 2 to show that there was no autocorrelation in the model.

4.4 Random-Effect Regression

The random-effect regression output in Table 5 also showed the significance of each independent variable in the model, which was used to test the study hypothesis. The coefficient sign language showed that all the three independent variables had a positive impact on return on equity (ROE). Based on the rule of thumb and the significant level of 10 per cent, the probability value of log of Loan Loss Provision (LLLP) was only significant in impacting the dependent variable return on equity (ROE) with probability value of 0.0012. Both logs of Capital Adequacy Ratio (LCAR) and Non-Performing Loan (LNPL) were insignificant at 10 per cent significant level with probability values of 0.1329 and 0.1940 respectively. This showed that only log of loan loss provision (LLLP) positively and significantly had an effect on bank performance (return on equity).

The coefficient of determination (R-squared) of the model under consideration which measures the goodness of fit of the model had a value of 0.55. This indicates that all the independent variables explain about 55% of the variations in the dependent variable (bank performance). After adjusting for degree of freedom, the adjusted R-squared was 0.51 (51%).

Finally, the durbin-watson test was 1.89 to show that there was no autocorrelation in the model.

4.5 Post-Estimation Tests

4.5.1 Hausman test

To determine the right model to examine between the fixed effect model and the random regression model, the Hausman test was adopted. The criteria to take the decision was to reject the null hypothesis if the probability value of the Chi-square Statistic of the Hausman test

was significant at 5 per cent level of significance and vice versa, that is, accept the null hypothesis if the probability value of the Hausman test is significant at 5%. The null and alternate hypothesis adopted to test the Hausman test is:

H_0 = Random Effect (Probability greater than 0.05)

H_1 = Fixed Effect (Probability less than 0.05)

From Table 6, the Chi-Square Statistic probability value of 0.0004 was significant at 5 per cent level of significance. The significant result showed that the null hypothesis would be rejected and this means that the fixed-effect model was appropriate for this study.

4.5.2 Redundant fixed effects test

This test was used to examine the joint significance of all the independent variables on the dependent variable. It was used to corroborate the f-statistic significance figure of the regression. The probability values of the cross-section F must be significant at 10% level of significance to show that the F-statistics is significant and all the independent variables were jointly significant in impacting the dependent variable. The F in the cross-section F represents F-statistics and its probability value of 0.0000 was significant at 10% level of significance to show that all the independent variables were jointly significant in impacting the dependent variable ROE.

4.5.3 Breusch pagan LM test

This was used to test for autocorrelation in the panel data. Although the durbin-watson test already showed that there was no autocorrelation in the model, this test was used to confirm this assertion. The null hypothesis showed no presence of autocorrelation and vice versa.

H_0 : There is no presence of autocorrelation in the model

H_1 : There is the presence of autocorrelation in the model

From the result in Table 8, the probability value of 0.1000 was not significant at 10% level of significance to show that there was no autocorrelation in the model.

Table 6. Hausman test result

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	18.191722	3	0.0004

Source: Researchers compilation using E-views 9

Table 7. Redundant fixed effects test result

Effects Test	Statistic	d.f.	Prob.
Cross-section F	15.248428	(4,67)	0.0000
Cross-section Chi-square	48.546639	4	0.0000

Source: Researchers compilation using E-views 9

Table 8. Breusch pagan LM test result

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	41.15004	10	0.1000

Source: Researchers Compilation using E-views 9

4.6 Hypotheses Testing

Hypothesis 1

H₀: Capital adequacy ratio has no significant effect on deposit money bank performance.

From Table 4, the result of the fixed effect panel regression showed a probability value of 0.0208. The criteria to take the decision was to reject the null hypothesis if the probability value is higher than 0.05 and to accept the alternative hypothesis if the probability value is less than 0.05. Based on this decision we reject the null hypothesis and accept the alternative hypothesis as there was found a significant relationship between capital adequacy ratio and returns on equity (bank performance). Therefore, for the five banks, the null hypothesis was rejected as there was a significant relationship between capital adequacy ratio and deposit money bank performance.

Hypothesis 2

H₀: Non-performing loans has no significant impact on deposit money bank performance.

From Table 4, the result of the fixed effect panel regression showed a probability value of 0.0157. The criteria to take the decision was to reject the null hypothesis if the probability value is higher than 0.05 and to accept the alternative hypothesis if the probability value was less than 0.05. Based on this decision we reject the null hypothesis and accept the alternative hypothesis as there was found a significant effect of non-performing loans and advances on both on

returns on equity and assets (bank performance) although the significance was a negative one based on the coefficient sign value of (-2.542366). Therefore, for the five banks, the null hypothesis was rejected as there was a negative and significant relationship between non-performing loans and advances and deposit money bank performance.

Hypothesis 3

H₀: Loan loss provision has no significant impact on deposit money bank performance.

From Table 4, the result of the fixed effect panel regression showed a probability value of 0.0276. The criteria to take the decision was to reject the null hypothesis if the probability value is higher than 0.05 and to accept the alternative hypothesis if the probability value is less than 0.05. Based on this decision we reject the null hypothesis and accept the alternative hypothesis as there was found a significant effect of Loan loss Provision on both returns on equity and assets (bank performance). Therefore, for the five banks, it is agreed that there is a significant relationship between loans loss provision and bank performance.

5. DISCUSSION

The panel unit root confirmed the order of integration of each variable. The result from the panel unit root revealed that all the variables are stationary at levels, hence, the use of the fixed effect and the random effect panel regression. The Hausman test from Table 6 suggested the adoption of the fixed effects only. The reason is

that their probability values of 0.0004 and 0.0000 were significant at 5% level of significance to reject the null hypothesis of using random effect and accept the alternate hypothesis of using the fixed effect.

For the fixed effect panel regression result on Tables 4, there was a significant long run relationship between capital adequacy ratio, non-performing loans, loan loss provision, and bank performance which was measured by return on equity. Therefore, for the three independent variables, there was a significant long run relationship with bank performance for the five banks. For both capital adequacy ratio and loan loss provision, the significant impact was positive while for non-performing loan, it was a negative effect from Table 4. This confirmed the importance of credit risk management with respect to bank performance.

Capital adequacy ratio adds to the bank profitability portfolio as it shows how liquid a bank is to adequately grant credit. A high CAR reveals that a bank can increase its lending portfolio to boost performance and vice versa for a low CAR.

For non-performing loans, it also impacts the performance of banks as seen in the fixed effect regression result from Table 4 but in a negative way. When loans are non-performing, it inversely and negatively affects the performance of banks in areas of profitability and liquidity by hampering both variables. This in turn affects asset returns and equity returns.

Loan loss provision helps in reducing bad and doubtful debts and also significantly boosts bank performance as it positively impacts equity returns of banks. The fixed-effect panel regression result on Table 4 confirmed this.

6. CONCLUSION

According to the estimated results in the previous section and focusing primarily on five selected deposit money banks (DMBs), loan loss provision and capital adequacy ratio were both positively significant in impacting equity returns. However, it is also revealed that non-performing loans was significant negatively to performance of DMBs. From the findings, the researcher concluded that management of credit risk affects plus improves performance of DMBs in Nigeria. Notwithstanding, as most DMBs have not been able to perform as expected because of increased loan defaults, strong DMBs are still able to create credits from customers' deposits

using high deposit interest rate to attract the deposit.

7. RECOMMENDATIONS

1. When giving out credit facilities, bank management particularly credit officers must exercise due care by following prudential guidelines.
2. Banks must have a solid credit granting procedure and use effective methods in measuring and monitoring loans and placing adequate strategies to manage the risk of credit default.
3. The bank credit officers strictly abide by the bank's corporate governance, due diligence, prevailing regulatory directive of the Central Bank of Nigeria, as well as the Basel Accords while given out credit facilities.
4. Deposit Money banks must ensure that they diversify loans to various sectors of the economy in order to avoid credit concentration and also to serve as a means of controlling credit risks.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

DATA USAGE AND SOURCES

The study utilized data from the financial statement of the selected five banks of First Bank, UBA, GTB, Access Bank, and Zenith Bank. The financial statements were gotten from the official website of each bank.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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