

IMPLICATION OF FINANCIAL INTERMEDIATION ON CREDIT RISK MANAGEMENT IN NIGERIAN BANKING INDUSTRY

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ABSTRACT

This study examined the implication of financial intermediation on credit risk management in Nigerian banking industry. Particular focus was given to the implication of loan to deposit ratio, operating expense to operating income and capital adequacy ratio on non-performing loans of deposit money banks (DMBs) in Nigeria. The quantitative research design was adopted in the study. Panel data spanning 2016-2021 was gathered for Tier 1 DMBs First Bank, United Bank for Africa, Guarantee Trust Bank, Access Bank and Zenith Bank (FUGAZ) in Nigeria. Data gathered was estimated using descriptive statistics, correlation analysis, multicollinearity test, pooled OLS, fixed and random effect analysis and other post estimation tests. Discoveries from the study indicated that capital adequacy ratio exerts negative significant impact on nonperforming loan ratio of Nigerian deposit money banks with coefficient estimate of -6.5150 ($p=0.006<0.05$); loan to deposit ratio exerts positive and significant effect on nonperforming loan ratio of Nigerian deposit money banks with coefficient estimate 2.1753 ($p=0.098>0.05$); operating expense to operating income exerts negative and significant effect on nonperforming loan ratio of Nigerian deposit money banks with coefficient estimate -1.4189 ($p=0.017<0.05$) and firm size exerts positive insignificant impact on nonperforming loan ratio of Nigerian deposit money banks with coefficient estimate .2424 ($p=0.208>0.05$). Hence, the study concluded that financial intermediation maintains noticeable implication on credit risk management of deposit money banks in Nigeria. Based on findings established in the study, it was suggested amongst others that Management of DMBs should deploy measures to raise funds and keep its liquidity position up as this guarantees their sustainable survival, while the CBN should improve regulatory control that guarantees relatively sound credit risk approach for DMBs.

Keywords: NonPerforming Loan, Loan to Deposit Ratio, Operating Expense to Operating Income, Capital Adequacy Ratio, Firm Size

1.0 INTRODUCTION

Risk is inevitable in every business establishment; it is referred to as uncertainties that threaten the survival and the role of business firms and most importantly sectors like financial institutions that drives the growth of Nigerian economy (Onyefulu, Okoye & Orjinta, 2020). There exist numerous risks that are inherent in the nature of business undertaken by banking industry and they include credit risk, liquidity, risk, market risk, foreign exchange risk, interest rate risk, operational risks among others; albeit, credit risk which also refers to as default risk describes the risk that a borrower would not meet the payment obligation as established with the lender. There is usually a chance that the borrower would for a reason or the other default from the establishment agreements thereby exposing the bank to credit risks and posing uncertainties to the effectiveness of the financial intermediation role of banks (Ebrahim, Khalil, Kargbo, & Xiangpei, 2015). Adeusi and Dada (2017) established that the intermediation role undertaken by banks occasions several risks for banks especially credit risk and Kolapo, Ayeni and Oke, (2012) maintained that

this risk constrains business prosperity for banks as the performance of the banks depends on the management of this risks.

Financial intermediation describes the series of action in which financial institutions accepts liabilities on its own account towards possessing financial assets by involving in financial transactions that aids the flow of funds in the economy; however, the sole aim of financial intermediation is towards mobilizing funds from the surplus unit (lender) to the deficit unit (borrower) (Gurr, 2021). Individuals and corporate firms with surplus funds deposits some as savings with the bank and receives interest payments on these funds despite requesting for the withdrawal of these funds when necessary; on another hand, individuals and corporations in dire need of funds approaches the bank to borrow money and repay the loan with interest. Although the bank may be considered efficient and effective in the discharge of its roles but the recovery of these loan and advances has been a critical issue that has per time dragged down the profitability of the banks as the payment of interest and loan principal has often been an issue which evidence the gap in the credit risk management of Nigerian banks (Serwadda, 2018).

In the bid to effectively give banks the capacity to manage issues concerning credit risk more successfully in Nigeria, the Central Bank initiated an agreement in 1987 referred to as the Basel I and Basel II accords; these agreements revealed the significance of capital adequacy in alleviating credit risks as well as subduing the effects of unexpected financial losses on banks (Iwedi & Onuegbu, 2014). Similarly, the height of non-performing loans in the banking sector has caused investors to lose confidence in the banks and has also sent adverse signal to stakeholders in the banking sector (Nawaz, Munir, Siddiqui, Tahseen, Asif & Ateeq, 2012). In fact, between 1999 and 2009, nonperforming loan remained on the increase as it reached the highest level particularly for deposit money banks in Nigeria; the uncontrollable increase in nonperforming loans in these banks were triggered by the poor credit administration approach and the utter disregard for credit management practices which threatened the ability of banks to sustain the discharge of its intermediation role thus casting doubt on the ability of most of these banks to continue as a going concern (Taiwo, Achugamonu, Okoye & Agwu, 2017).

Furthermore, the banking sector has been reported to be faced with poor quality loan assets, this which could be related to the increased macroeconomic uncertainties in the country which is further exacerbated by the numerous economic challenges including COVID-19 caused banks to intermediate at a greater level thereby increasing its loan-to-deposit ratio (Iwedi, & Onuegbu, 2014). However, the poor credit management approach maintained by most banks has made financial intermediation less lucrative as interest payments are usually defaulted by borrowers thus occasioning increased operating expense to operating income. Shockingly, the resulting low debt recovery has to a high extent constrained deposit money banks from allocating credit at the expected height into the economy which suggests that their intermediation role has been severally affected and hence suboptimal productivity of the sector (Taiwo *et al.*, 2017).

The stability of the banking sector has been in doubt as the existence of increasing nonperforming loans in the loan portfolios has in the course of time constrained banks from observing their basic role of intermediating and efficiently allocating funds in the economy for optimal usage towards enhancing the growth of the economy; this is despite the Basel Accord which was introduced to enhance the effectiveness of the banking sector as it remains the stronghold of the economy of Nigeria (Serwadda, 2018). The increasing height of nonperforming loans of banks is no doubt premised upon the poor management of credit risk, this risk which ought to receive peculiar attention from the management of banks as it stems from the primary role of the banking sector which is financial intermediation noticeably leaves the survival of banks in doubt especially as they tend to halt the allocation of funds as expected but consider a trade-off between risk and

return on investment thus occasioning practically total disregard for financial intermediation which the economy requires to be prosperous (Ogbol & Okallo, 2013).

The trend of nonperforming loan in Nigeria has been more as the economy of the country is characterized by very high uncertainty; however, the Central Bank of Nigeria have in the bid to ensure that the credit risk consequently faced by banks are appropriately manage, the apex bank in 2010 introduced guidelines that by compulsion required banks especially deposit money banks to examine their loan portfolios more frequently (at least once in three months) so as to track such risks in the loan portfolio and avert it (Etale, Ayunku & Etale, 2016). This is despite other robust guidelines proffered by the apex bank towards ensuring that from the management of this risk, banks will be fit to carry out their all-important roles and cause stability in the banking sector as well as the economy of Nigeria. But notwithstanding the CBN regulations, nonperforming loans still keeps rising; evidently, in 2012, the Nigeria Deposit Insurance Corporation (NDIC) revealed in 2012 and 2013 nonperforming loan reached 286.09 and 321.66 billion naira respectively (NDIC, 2013). More recently, in 2018, the international monetary fund (IMF) discovered an increase in nonperforming loan up to 10.6% between 2015 and 2017; the adverse implication of this challenge on financial intimidation also holds grave implication for the growth of the banking sector as banks tends to incur more expense despite reduced interest income (IMF, 2018; Echobu & Okika, 2019).

Furthermore, the capital adequacy of deposit money banks which evident their financial strength and the ability of the bank to soften the effect of nonperforming loan has also been problematic per time in the sector as the Central Bank of Nigeria reported that capital adequacy ratio cascaded by 3.3% between December 2016 and June 2017 thereby causing credit risk to take a toll on banks and leaving the sector in a precarious state (Echobu & Okika, 2019). In giving aid to the banking sector and sustaining its significance in the growth of the economy several studies have been carried out on credit risk management in the banking sector (Asima, Mohammed & Zeeshan, 2021; Echobu & Okika, 2019; Osakwe, Ananwude & Nduka, 2019; Serwadda, 2018; Taiwo, Achugamonu, Okoye & Agwu, 2017; Adeusi & Dada, 2017; Agu & Okoli, 2013; Kolapo, Ayeni & Oke, 2012); but none of these studies assessed the implication of financial intermediation on credit risks which threatens the continuity of banks and the performance of the banking sector. Although Buchory (2015) examined the associations between financial intimidation and credit risk but the study despite focusing on Indonesian banks employed pooled OLS regression which does not capture the dynamic relationship of the variables; again Garr (2021) carried out a study on financial intermediation in Ghana but investigated its effect of bank performance, it is without doubt that optimal credit management in the banking sector is a great precursor to sound performance. Hence, this study sets out to examine the implication of financial intermediation on credit risk management in Nigerian banking industry.

2.0 LITERATURE REVIEW

Credit Risk Management

Lending operations are core banking activities and the most profitable asset of credit institutions. In many markets, banks have to operate in the economic environment that is characterized by the existence of obstacles to good credit management. Where credit is not properly channeled, controlled and administered, it leads to a devastating effect on the banks, reducing its performance, profitability and further into bank distress and failure (Berger & Christa, 2009). Credit risk emanates from a bank's dealing with individuals, corporations, financial institutions or a sovereign. Deposit money banks are exposed to credit risk through their trading, financing and investing activities and in cases where they acts as an intermediary on behalf of customers or

other third parties or it issues guarantees. The amount of credit risk exposure in this regard is represented by the carrying amounts of the loans and advances on the balance sheet (Drigă, 2012).

Pânzaru (2011) noted that credit risk include three risks: default risk, exposure risk and recovery risk, while Arunkumar and Kotreshwar (2005) explained that in a bank's loan portfolio, credit risk includes the transaction Risk, intrinsic Risk and concentration Risk. For each of these aggregations, the bank should define appropriate and reasonable portfolio concentrations necessary to mitigate against the exposure. Credit risk management thus serve as a process of identifying, evaluating, monitoring and control of risk arising from the possibility of default in loan repayments by some borrowers and results in decrease in banks income due to the need to establish allowance for these bad debts. Credit risk management arises any time bank funds are extended, committed, invested, or otherwise exposed through actual or implied contractual agreements, whether reflected on or off the balance sheet (Abiola & Olausi, 2014). Credit risk management incorporates decision-making process; before making the credit decision, follow up of credit commitments is done including all monitoring and reporting process. The credit decision depends on the financial data and judgmental evaluation of the whole market, borrower financial status, management and shareholders. The two distinct dimensions of credit risk management can be identified as preventive measures and curative measures. Preventive measures is ensuring better credit portfolio diversification through providing early warning signals of future defaults, it include risk evaluation, risk measurement and risk pricing. On the other side, the aim of curative measures is to minimize post-sanction loan losses through steps such as securitization, hedging trading, risk sharing, legal enforcement (Arunkumar & Kotreshwar, 2005).

Credit Risk of Deposit Money Banks

According to Chen and Pan (2012), it is the degree of value fluctuations in debt instruments and derivatives due to changes in the underlying credit quality of borrowers and counterparties. Banks are increasingly facing credit risk (or counterparty risk) in various financial instruments other than loans, including in the banking book, in the trading book, and both on and off the balance sheet thus acceptances, interbank transactions, trade financing, foreign exchange transactions, financial futures, swaps, bonds, equities, options, and in the extension of commitments and guarantees, and the settlement of transactions. Credit risk can be divided into three risks: default risk, exposure risk and recovery risk.

Causes of Credit Risk

Credit risk can be caused by a variety of reasons of both internal and external sources. The main sources of credit risk recognised in the literature (Nijskens and Wagner, 2011; Breuer, Jandacka, Rheinberger and Summer, 2010; Qian and Strahan, 2007; Saunders and Allen, 2002) include, for example, poor governance and management control, inappropriate laws, limited institutional capacity, inappropriate credit policies, volatile interest rates, low capital and liquidity levels, directed lending, massive licensing of banks, poor loan underwriting, reckless lending, poor credit assessment, poor loan underwriting, laxity in credit assessment, poor lending practices, government interference and inadequate supervision by the central bank. The literature has identified these reasons that could lead to potential credit risk. The extent of credit risk incurred varies across sectors and countries.

Financial Intermediation

To ensure that investible funds are made available for economic activities, social and community services sector inclusive in the urban and rural areas and the quest for overall development of the economy informed the decision of financial system focusing more financial intermediation. Financial intermediation is typically an institution that facilitates the channeling of funds between lenders and borrowers indirectly. That is, savers (lenders) give funds to an intermediary institution (such as a bank), and that institution gives those funds to spenders (borrowers). Gorton and Winton (2002) define financial intermediaries as firms that borrow consumers/savers and lend same to companies that need resources for investment. Financial intermediaries can be classified into institutional investors, pure intermediaries like investment banks and Deposit Money Banks. Among all the financial intermediaries, banks are the major financial intermediaries that accept deposits and make loans directly to the borrowers (Quilym, 2012).

2.2 Empirical Review

Garr (2021) investigated the impact of financial intermediation on bank performance. The causal research design was used in the study. Time series data covering 1996 to 2018 was gathered in the study. Data gathered was analysed using Augmented Dickey-Fuller (ADF) unit root test and multiple regression analysis. Findings from the study demonstrated that bank performance in Ghana is significantly influenced by the operating cost, reserve and bank borrowing rate; increase in operating cost would enhance bank efficiency, while a lower reserve would improve performance and an increase in borrowing rate would increase profitability. Hence, the study suggested that banks must spend more money to become more efficient in managing loans and for that matter enhance loan quality, and be more solvent and eliminating or reducing the reserve requirement would have a positive impact on bank solvency and profitability.

Mekonnen (2021) analysed firm-specific, industry-specific and macroeconomic determinants of commercial banks' lending in Ethiopia. The study used the qualitative and quantitative research design. Secondary panel data covering 2011-2019 was gathered for fifteen (15) commercial banks in Ethiopia. Data gathered was estimated using descriptive statistics and random effect analysis. Findings from the study suggested that bank-specific factors such as; volumes of deposit, capital adequacy, and bank size have a positive and statistically significant effect on bank lending; industry-specific factors such as; cash reserve requirement, bank concentration, and average lending rate have a negative and statistically significant effect on bank lending. Likewise, one of the macro-economic variables gross domestic products has a negative and statistically significant effect on bank lending. Hence, the study suggested that commercial banks in Ethiopia have to manage their lending by giving more attention to the internal factors, which the management has control over in line with the banking industry rules and regulations recalling the implication of the general economic dynamic.

Asima, Mohammed and Zeeshan (2021) examined the effect of credit risk management and bankspecific factors on the financial performance of the South Asian commercial banks. The qualitative and quantitative research design was used in the study. Secondary panel datasets covering 2009-2018 was gathered for nineteen (19) commercial banks. Data gathered was analysed using generalized method of moment. Findings from the study demonstrated that nonperforming loans, cost efficiency ratio and liquidity ratio have significantly negatively related to financial performance while capital adequacy ratio and average lending rate have significantly positively related to the financial performance of the Asian commercial banks. Premised on the

findings, the study suggested that policymakers of Asian countries should create a strong financial environment by implementing that monetary policy that stimulates interest rates in this way that automatically helps to lower down the high ratio of nonperforming loans (tied monitoring system) and liquidity position should be well maintained so that even in a high competition environment, the commercial is able to survive in that environment.

Gupta, Sarker and Rahman (2021) empirically assessed the relationship among cost of financial intermediation, risk and efficiency among Bangladeshi commercial banks. The study adopted the qualitative and quantitative research design. Secondary data covering 2000-2016 was pooled for thirty two (32) commercial banks in Bangladesh. Data gathered was estimated using Two-Step System GMM (2GMM) estimators of unbalanced dynamic panel data. Findings from the study revealed that efficiency, market concentration, non-performing loans, size, and macroeconomic factors have the greatest economic implication on intermediation and cost of financial intermediation is negatively associated with bank risk and cost-efficiency. Hence the study suggested that commercial banks should be properly guided, monitoring or supervision and above all a deficiency of good intentions and cost efficiency can minimize the intermediation spread as evidenced proved in developed countries or else will be responsible for higher risk-taking, hence the interdependencies should be addressed simultaneously for the steady state of financial market development.

Oyebowale (2020) assessed the determinants of bank lending in Nigeria. The study specifically adopted the qualitative and quantitative research design. Secondary data spanning 1960-2016 was gathered in the study. Data gathered from the study was estimated autoregressive distributed lag (ARDL) bounds testing approach and Granger causality. Findings from the study revealed that growth in broad money Granger-causes growth in bank lending, while there is no causality from other explanatory variables to bank lending in Nigeria; that growth in bank lending Grangercauses growth in loan-to-deposit ratio and growth in inflation in Nigeria. Hence this study suggested that commercial banks in Nigeria should exhibit stern concern for their liquidity and capital adequacy positions while acting as financial intermediaries and the CBN should enjoy instrument independence along with operational independence in order to ensure the appropriate use of monetary policy tools to achieve policy goals.

Echobu and Okika (2019) assessed credit risks and financial performance of Nigerian banking industry. The study adopted the correlation and ex-post facto research design. Secondary panel data covering 2006-2017 was gathered for fifteen (15) deposit money banks in Nigeria. Data gathered was analysed using descriptive statistics, correlation analysis and multiple regression analysis. Findings from the study revealed that nonperforming loans and impairment loan charge-off have negative and significant impact on the financial performance of banks and impact of capital adequacy on financial performance is negative but statistically insignificant. Hence, the study suggested that DMBs should improve their risk management strategy to reduce the increase of default loans and a short-term periodic review of prudential guidelines and other regulations governing the issuance of credit facilities by DMBs is advocated, so that current realities and intrigues about credit risks will be captured in policies

3.0 METHODOLOGY

In examining the implication of financial intermediation on credit risk management in Nigerian banking industry, the quantitative research design would be considered. The model of Buchory (2015) was adopted. Buchory (2015) assessed banking intermediation, operational efficiency and credit risk in the banking profitability; the study broadly assessed the associations between banking intermediation, credit risk and other crucial performance indicators of banks in Indonesia captured credit risk with nonperforming loan and bank intermediation with loan to deposit ratio

and operating expenses to operating income. For simplicity, the model of Buchory (2015) is presented in equation in equation 3.1

$$Y = f(a + \beta X_1 + \beta X_2 + \beta X_3 + e) \dots\dots\dots 3.1$$

Where:

- Y = Return on Assets (ROA)
- a = A constant which is the value of the variable Y when the variable X is 0 (zero) β
- = Coefficient of the regression line
- X1 = Loan to Deposits Ratio (LDR)
- X2 = Operating Expense to Operating Income (OEOI)
- X3 = Non Performing Loans (NPLs) e
- = Error term

However, the above study adapted pooled ordinary least regression in estimating the 3.1 model thereby giving no attention to the dynamic relationship of variables in the model; furthermore, capital adequacy with a significant of sound financial intermediation of banks was not considered in the above mode. Hence, this study presents a modified model as shown below:

$$NPL = f(LDR, OEOI, CAR, FIS) \dots\dots\dots 3.2$$

Equation representing the models:

$$NPL_{it} = \delta_0 + \delta_1 LDR_{it} + \delta_2 OEOI_{it} + \delta_3 CAR_{it} + \delta_4 FIS_{it} + \mu_{it} \dots\dots\dots 3.3$$

Where:

- NPL = Non-Performing Loan
- LDR = Loan to Deposit Ratio
- OEOI = Operating Expense to Operating Income
- CAR = Capital Adequacy Ratio
- FIS = Firm Size
- μ = Error term

Sources of Data and Estimation Techniques

Data spanning seven years (2016-2020) shall be culled from the annual reports of the sample Tier 1 deposit money banks that is First Bank, United Bank for Africa, Guarantee Trust Bank, Access Bank and Zenith Bank (FUGAZ). The availability of annual reports directed the selected scope of the study. Descriptive and panel estimation methods was employed; the descriptive analysis will demonstrate the measure of central location and measure of dispersion, normality status, skewness, kurtosis of all the variables included in the model of the study. However, as the study intends to adopt fixed effect analysis and random effect analysis of panel statistical estimations; it will conduct pooled ordinary least square (OLS) regression analysis (random effect, fixed time specific and firm specific effect) and other post estimation tests.

4.0 DATA ANALYSIS AND DISCUSSION

4.1 Descriptive Analysis of Variables

Table 4.1 Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
NPL	30	.9934	1.0467	.12	3.67

CAR	30	.2929	.3373	.08	.98
LDR	30	.1469	.0798	.033	.29
OEOI	30	.5705	.1679	.118	.829
FSI	30	22.562	2.1130	19.77	26.43

Sources: Author's Computation, (2022)

Descriptive statistics reported in table 4.1 revealed that the mean non-performing loan, capital adequacy ratio, loan-deposit ratio, operating expense to operating income and firm size for 2015-2020 across five deposit money banks sampled in the study stood at: .9934 percent, .2929 percent, .1469 percent, .5705 percent, 22.562 billion naira respectively. Reported minimum and maximum values stood at: .12 and 3.67 percent for non-performing loan ratio, .08 and .98 percent for capital adequacy ratio, .033 and .29 percent for loan-to-deposit ratio, .118 and .829 percent for operating income to operating expenses, 19.77 billion naira and 26.43 billion naira for firm size respectively.

4.2 Correlation Analysis

Table 4.2 Correlation Matrix

		CAR	LDR	OIEI	FSI
NPL	NPV				
	1.0000				
CAR	-0.1572	1.0000			
LDR	-0.7880	-0.5684	1.0000		
OEOI	0.1674	-0.5282	0.4724	1.0000	
FSI	0.0239	0.9134	-0.3642	-0.3106	1.0000

Sources: Author's Computation, (2022)

Table 4.2 shows the correlation coefficients between explanatory variables in pairwise style. A maximum of two variables can maintain perfect linear association. However, it can be ascertained that there exists mixed correlation between pairs of variables. Results evidenced negative correlation between pairs of variables except for non-performing loan and operating income to operating expenses, non-performing loan and firm size with coefficient of 0.1674 and 0.0239. Again, negative correlation was obtained for non-performing loan and capital adequacy ratio, non-performing loan and loan-to-deposit ratio with coefficient estimate of -0.1572 and -0.7880 for the respective pairs. Observably, these results suggest that none of the pair of variables has a perfect relationship which indicates that there is likelihood of multicollinearity issue as affirmed by Gujarati and Porter (2009) that when correlation coefficient of two variables does not exceed 0.8, multicollinearity problem becomes inevitable.

4.3 Multicollinearity Test

The presence of strongly correlated variables in a model tends to create a multicollinearity problem. Therefore, the Variance Inflation Factor (VIF) test can be used to confirm the existence

of multicollinearity among the independent variables. Based on the rule of thumb, the VIF must be less than 10 to confirm that the estimates of the regression would not be biased due to the presence of multicollinearity.

Table 4.3 Result of Multicollinearity Test

Variable	VIF
CAR	13.69
FSI	9.59
LDR	1.88
OEOI	1.84
Mean VIF = 6.75	

Sources: Author's Computation, (2022)

Table 4.3 shows that all the variables have a VIF value of less than 10, thus implying that there is no strong evidence of collinearity among the independent variables.

4.4 Hausman Test

Table 4.4 Hausman Test

Null hypothesis	Chi-square stat	Probability
Difference in coefficient not systematic	46.57	0.000

Source: Author's Computation, (2022)

Table 4.4 reveals a chi-square value of 46.57 alongside a probability value of 0.000. The result shows that there is enough evidence to reject the null hypothesis that differences in coefficients of fixed effect estimator and random effect estimation is not systematic. Therefore, given the fact the difference between fixed effect estimates and random effect estimates is significant, the most consistent and efficient estimation for the investigation conducted in the study is the fixed effect bank specific estimate presented in table 4.6 below.

4.5 Pooled OLS Estimation

Table 4.5: Pooled OLS Parameter Estimates

Series: NPL (Dep), CAR, LDR, OEOI, FSI

Variables	Coefficient	Standard Error	T-Test Values	Probability
C	-3.2986	2.9033	-1.14	0.267
CAR	.2304	1.1602	0.20	0.844
LDR	13.1565	1.8164	7.24	0.000
OEOI	-1.1563	.8552	-1.35	0.188
FSI	.1308	.1550	0.84	0.407
R-square				0.7446
Adjusted R-square				0.7038
F-statistics				18.22
Prob(F-stat)				0.000

Source: Author’s computation, (2022).

Pooled OLS panel estimation demonstrated in table 4.5 reported coefficient estimate of .2304, 13.1565, -1.1563 and .1308 for capital adequacy ratio, loan to deposit ratio, operating expenses to operating income and firm size with probability values of 0.844, 0.000, 0.188 and 0.407. The result showed that capital adequacy ratio exerts positive insignificant impact on non-performing loan ratio of the sampled deposit money banks, loan to deposit ratio exerts significant positive impact on non-performing loan ratio, operating expense to operating income ratio affected non-performing loan ratio negatively and insignificantly while firm size exerts positive insignificant impact on non-performing loan ratio of deposit money banks in Nigeria. R-square value reported in table 4.4 revealed that about 70% of the systematic variation in the credit risk management of deposit money banks measured in terms of nonperforming loan ratio can be explained by capital adequacy ratio, loan-deposit ratio, operating expense to operating income and firm size. Reported f-statistics of 18.22 and the probability value of 0.000 validates the fact that all the explanatory variables of financial intermediation jointly influence credit risk management of deposit money banks sampled in the study.

4.6 Fixed Effect Panel Analysis

Table 4.6 Fixed Effects Estimates (Bank Specific and Period Specific)

BANK SPECIFIC EFFECT			PERIOD SPECIFIC EFFECT		
Variables	Coefficients	Prob	Variables	Coefficients	Prob
C	.9624	0.874	C	-.8523	0.807
CAR	-6.5150	0.006*	CAR	1.7029	0.265
LDR	2.1753	0.098***	LDR	14.5198	0.000
OEOI	-1.4189	0.017**	OEOI	-.2842	0.788
FSI	.2424	0.208	FSI	-.0508	0.799
Effects			Effects		
UBA	-2.2392	0.379	2016	.5209	0.189
GTB	-4.4951	0.096	2017	.6392	0.126
ACCESS DIAMOND	-4.3958	0.077	2018	.6155	0.150
ZENITH	-4.0698	0.092	2019	.8781	0.061
			2020	.4854	0.807
R-square=0.9622			R-square=0.7919		
Adjusted R-square=0.9478			Adjusted R-square=0.6983		
F-statistics=66.81			F-statistics=8.46		
Prob(F-stat) = 0.000			Prob(F-stat) = 0.000		

Notes: *, ** and *** denotes statistically significant at 1%, 5%, and 10% significance levels, respectively.

Sources: Author’s Computation, (2022)

Table 4.6 presents results of the fixed effect estimation (bank and period specific effect). Notably, result presented in table 4.6 shows that when bank specific effect is incorporated into the model the impact of capital adequacy ratio is negative and significant, impact of loan to deposit ratio is negative and significant, operating expense to operating income exerts negative significant impact and firm size impacts positively and insignificantly on nonperforming loan of deposit money banks in Nigeria. On the other hand, when period

specific effect was incorporated into the model, explanatory variables including operating expense to operating income and firm size exert negative insignificant impact on non-performing loan ratio of Nigeria deposit money banks respectively while capital adequacy ratio and loan deposit ratio exerts positive insignificant impact on the non-performing loan of deposit money banks in Nigeria.

Deviation intercept terms reported in table 4.6 stood at -2.2392 (0.379), -4.4951 (0.096), -4.3958 (0.077) and -4.0698 (0.092) for United Bank for Africa Plc, Guaranty Trust Bank Plc, AccessDiamond Plc and Zenith Bank Plc respectively, with the intercept term of the reference firm being First Bank Plc recorded to be .9624 (0.874). Deviation intercept terms for period effects stood at: .5209 (0.189), .6392 (0.126), .6155 (0.150), .8781 (0.061), .4854 (0.807) for 2016, 2017, 2018, 2019, and 2020 respectively, with intercept term of reference years being 2016 recorded to be -.8523 (0.807). Reported R-square values stood at 0.94 for bank specific estimation and 0.69 for period specific estimation, reflecting that about 94% of the systematic variation in nonperforming loan can be explained by capital adequacy ratio, loan-deposit ratio, operating expense to operating income and firm size when heterogeneity effect across firms is incorporated into the model, while 69% of the systematic variation can be explained when period heterogeneity effect is given consideration in the

4.7 Random Effect Analysis

Table 4.7 Random Effect Estimation

Series: NPL (Dep), CAR, LDR, OEOI, FSI

Variable	Coefficient	Standard Error	Z-Test Values	Probability
C	-3.2986	2.9033	-1.14	0.256
CAR	.2304	1.1602	0.20	0.843
LDR	13.1565	1.8164	7.24	0.000
OEOI	-1.1563	.8552	-1.35	0.176
FSI	.1308	.1550	0.84	0.399
R-square				0.7446
Wald chi-square				72.90
Prob>chi-square				0.000

Source: Author’s computation, (2022).

Table 4.7 presents the random effect estimates. Result showed that the effect of capital adequacy ratio on credit risk management measured by non-performing loan ratio is positive and significant when heterogeneity effect is incorporated into the model. Meanwhile, loan deposit ratio exerts positive and significant impact on non-performing ratio. Also, impact of operating expense to operating income on nonperforming loan ratio when heterogeneity is incorporated into the error term is negative and insignificant. Furthermore, firm size affects non-performing loan ratio negatively and significantly. Specifically, coefficient estimates reported for capital adequacy ratio, loan-deposit ratio, operating expense to operating income and firm size stood at .2304, 13.1565, -1.1563 and .1308 with probability values of 0.843, 0.000, 0.176 and 0.399 respectively. R-square statistics reported in table 4.7 stood at about 0.74 which connote that about 74% of the systematic variation in credit risk management of

deposit money banks captured with non-performing loan ratio in the study can be jointly influenced by changes in capital adequacy ratio, loan-deposit ratio, operating expense to operating income and firm size respectively, incorporating heterogeneity effect across deposit money banks over time into the error term and holding every other thing constant.

4.8 Post Estimation Test

Table 4.8 Restricted F Test of Heterogeneity (Cross-Sectional and Time Specific)

	F-statistics	Probability
Cross sectional	30.21	0.000
Time specific	0.91	0.495

Source: Author's Computation, (2022)

Table 4.8 reveals result of the heterogeneity test conducted with respects to both crosssectional and period specific effect. Reported in table 4.7 are f-statistics values of 30.21 and 0.91 with probability values of 0.000 and 0.495 for firm and period specific effect respectively. Hence, the table revealed that there is enough evidence to reject the null hypothesis that all differential intercept corresponding to the cross-sectional specific units are equal to zero, but otherwise for the period specific intercepts. Therefore, it can be concluded that there is only cross-sectional heterogeneity/uniqueness effect among the selected deposit money banks which is captured with the random effect model and appeared too significant to be ignored.

Table 4.9 Other Post Estimation Test

Wald test		
Null hypothesis	Statistics	Probability
<i>Panel homoscedasticity</i>	72.90	0.000
Pesaran test		
Null hypothesis	Statistics	Probability
<i>No cross-sectional dependence</i>	0.126	0.900
Breusch-Pagan Lagrange Multiplier test		
Null hypothesis	Statistics	Probability
<i>Panel Normality</i>	25.12	0.000

Source: Author's Computation (2022)

Table 4.9 reported result of post estimation test conducted to confirm if the specified model is in turn with basic assumptions underlining the panel estimation conducted in the study. The result showed that there is no evidence to reject the null hypothesis on panel homoscedasticity and null hypothesis of no cross-sectional dependence and accept the hypothesis of panel normality. Hence, the established result of post estimation test reported in table 4.9 validates assumptions of equal variance of residual terms, cross sectional independence and normality of the model. Which reflect that the model is fit for inferential analysis.

4.10 Discussion of Findings

The result shown in table 4.6 is the most obtainable and accurate estimation and it revealed that capital adequacy ratio exerts negative significant effect on non-performing loan ratio of deposit money banks (DMBs) in Nigeria. This suggests that as capital adequacy ratio increases, nonperforming loan ratio which is used as measure of credit risk management of DMBs in Nigeria tend to fall. Capital adequacy ratio provides the bank with the edge it requires to remain in business, this follows the adequacy of cash which is no doubt required for DMBs to deliver sustainably on unending business operations and to guarantee that the bank would satisfy the needs of its teeming customers as well as boost the confidence the public has reposed in the banking sector; it is based on this premise that the Apex Bank in Nigeria requires that bank maintain certain level of its capital and anything short of the standard may threaten the performance of the bank. Similarly, findings established that loan to deposit ratio exerts positive significant impact on nonperforming loan ratio of DMBs in Nigeria which suggests that as loan to deposit ratio increases, the performance of DMBs may also shoot upward, the height of nonperforming loan maintained by DMBs has per time discouraged bank from going extra miles to obtain funds for borrowers as this may threaten the survival of the bank.

Furthermore, operating expense to operating income has negative and significant relationship with nonperforming loan ratio which implies that as operating expense to operating income falls, non-performing loan may increase. Loans provided to individuals, businesses and households forms the assets of DMBs, the interest bank receives on these assets - loan is critical to their revenue, profit and survival; and the risk of the loan becoming a nonperforming loan - that is, non-payment of the loan is the basic risk faced by banks. This poses severe issues for the bank as a higher credit risk reduces the quality of its loan or asset quality; that is the outflow from the bank tends to be more than its inflow, this affirms the cause for maintaining increased capital adequacy level to cushion the effect of high nonperforming loan which may ultimately affect adversely the soundness of the bank especially when it fails to manage nonperforming loans proactively.

Similarly, the Central Bank of Nigeria often ensure that DMBs to satisfy a given level of capital adequacy on a consistent basis; this standard which is usually pegged by the CBN reduces the exposure of banks to the adversities of the economic that can increase nonperforming loan and crumbling the banking sector with the specific effect on each bank. Discoveries from this study further supports the continuous review of such regulation as operational and credit risks inherent in the banking business per time, there becomes an urgent need for the regulatory authority to moderate the standard capital required by banks to adequately and satisfactorily operate while completely utilizing its potentials and resources and in effect guaranteeing its existence in business for the foreseeable future. Findings from the study also suggests that nonperforming loan will increasingly shoots up if DMBs and liquidity may be critically affected except management of these banks guarantee proper examination of loan applications while keeping every operation about loan and related expenses in check as this guarantees the maintenance of an idea level of asset quality.

5.0 CONCLUSION AND RECOMMENDATIONS

Credit risk management remains an issue as it to a noticeable extent drives the level of asset quality of DMBs measured with nonperforming loans which directly constrains the bank from observing its basic functions sustainably and ultimately threaten the prosperity of the economy of Nigeria. Premise upon the results obtained in this study, it is evident that capital adequacy ratio exerts negative significant impact on nonperforming loan ratio of Nigerian deposit money banks; loan to deposit ratio

exerts positive and significant effect on nonperforming loan ratio of Nigerian deposit money banks; operating expense to operating income exerts negative and significant effect on nonperforming loan ratio of Nigerian deposit money banks and firm size exerts positive insignificant impact on nonperforming loan ratio of Nigerian deposit money banks. Hence, this study established that financial intermediation maintains noticeable implication on credit risk management of deposit money banks in Nigeria. Based on these findings, it is thereby urgent that the following suggestions be made:

- i. Management of DMBs should deploy measures to raise funds and keep its liquidity position up
- ii. Other management staffs of DMBs - supervisors of DMBs should be consistent in assessing banks' risk to capital towards evaluating its credit process by ensuring relatively low nonperforming loan position.
- iii. The CBN should observe frequently the operations of DMBs in Nigeria towards making satisfactory efforts to moderating and improving banking regulations

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