

Credit risk management and performance of deposit money banks in Nigeria

MAYOWA G AJAO* AND EHI P OSEYOMON#

*Department of Banking and Finance, Faculty of Management Sciences,
University of Benin, Benin City, Nigeria.

*Email: ajao.mayowa@uniben.edu; mayourwah@yahoo.com

#Department of Business Administration
Faculty of Management Sciences, University of Benin, Benin City, Nigeria.

Abstract

This study investigates the relationship between credit risk management and the performance of Deposit Money Banks (DMBs) in Nigeria over the period 2006-2016 using the dynamic Generalized Method of Moments (GMM) and Granger causality techniques. The empirical results revealed a direct and statistically significant relationship between DMBs credit risk management variables measured by capital adequacy ratio, liquidity ratio, non-performing loan ratio and loan loss provision ratio and performance measured by return on asset. However, there is a significant inverse relationship between liquidity ratio and DMBs performance which is an indication that excess liquidity not properly managed as credit facility will eventually leads to a reduction in the financial performance of DMBs. The study recommends that rigorous credit risk management practice is of utmost importance to ensure long term survival of banks in their turbulent operating environment. Besides, Nigeria DMBs need to devise strategies that will limit the banks' exposition to credit risk and improve their performance and competitiveness.

Keywords: Credit Risks; Performance; Deposit Money Banks; ROA; GMM.

1. Introduction

Credit risk management has been an integral part of the loan process in banking business. Among the numerous risks faced by banks when performing their financial intermediating roles, credit risk is regarded as the most important and Deposit Money Banks' (DMBs) success depends on how efficient they are in managing this risk in relation to other type of risks such as operational risk, political risk, market risk and liquidity risk (Gieseche, 2004; Cooperman, Mills and Gardener, 2000). The relevance of the banking sector to the growth of the economy through their intermediation roles between the surplus and deficit sectors cannot be overemphasized; hence they are often regarded as catalyst for growth especially in emerging economies with underperforming capital markets.

One of the indices for measuring the financial stability of any economy is the performance of the banking industry with regard to the granting of credits to the productive sectors with the objective of accelerating the speed of growth and development of the economy in the long run (Kolapo, Ayeni, and Oke, 2012). Among the multifaceted risks encountered by banks, the main and most difficult one to manage is the credit risk because it is not only linked to the problem of collaterals and defaults but also linked to the general macroeconomics conditions (especially their constant and continuous volatility) which significantly determine the financial performance of banks. Besides, the survival of Deposit Money Banks (DMBs) is significantly determined by how banks efficiently manage credit risk. Therefore, it is in need of being deliberately examined and studied.

The Nigeria banking sector has recently become more sophisticated in terms of operations due to various developments in the regulatory frameworks institutionalized by the Central monetary authority with the aim of complying with global best practices in banking operation. Notable among these developments is the consolidation and recapitalisation programmes as well as the sanctioning of erring bank officials at the top level for violating standardized banking operations with regards to credit management. Osuka and Amako (2015) opine that bad and doubtful debts were critically high and peaked at 35% in 2009 in Nigeria DMBs. These were caused by weak internal control system, substandard credit policies and non-compliance to established banking procedures. Due to increasing economic and developmental challenges, the risk exposure of Nigerian banks also increased unabated. The high rate of loan default and bad debt has been a major concern to various stakeholders in the banking industry. Despite these challenges, Nigerian banks invest substantially in credit risk modelling with the aim of mitigating banks' exposure by making adequate provision for bad

and doubtful debts. The non-availability of standard and acceptable collaterals from prospective loan seekers continues to incapacitate DMBs ability to extend more credit to the domestic economy, thereby affecting economic growth and development. This motivated the Federal Government of Nigeria to establish the Asset Management Corporation of Nigeria (AMCON) in July, 2010 with the aim of mitigating the challenges of non-performing loans that bedeviled Nigerian banks (Samuel, 2015). Ahmad and Ariff (2007) posit that banks in developing countries such as Nigeria have huge bad debt in their loan portfolio during financial and banking crises era, which led to the liquidation of several banks in such economies and also necessitated several reform programmes by the regulators for the purpose of repositioning the banking system.

The relevance of stable credit risk management for entrenching qualitative loan portfolio is of primary significance to the effectiveness of DMBs and the economy as well (Ogboi and Unuafe, 2013). The extant finance literatures emphasise that lack of effective credit risk management is a major source of banking sector crisis which also contributed to general economic depression in recent past including the 2008 global financial crisis (Onaolapo, 2012; Ogboi and Unuafe, 2013). Prakash and Poudel (2012) also state that credit risk management is a significant determinant of bank performance because the success of any bank depends on the effectiveness of extending credit facilities to the deficit sectors of the economy, among other things. Banks' goodwill and depositors' confidence can be promoted through effective credit risk management. Thus, good credit risk policy is an important pre-requisite for banks' performance and capital adequacy maintenance in any economy.

Deposit Money Banks (DMBs) in Nigeria have encountered several challenges over the years due to relaxed credit standards for borrowers. This worsens the credit standing of bank's counterparties and customers thus leading to default in honouring outstanding credit obligations. However, due to the 2005 banking system recapitalisation and reforms programme, some policies have been entrenched to enhance banks' efficiency and several strategies have been instituted to reduce the adverse effect of credit defaults on banks operations. Most Nigerian banks focused on mergers to increase capital requirements and heightened the level of competition in the industry. The existing policies and systems of credit risk management may not be sufficient enough to compete with the present financial and economic difficulties in Nigeria. There is a need to investigate whether these investments in credit risk management strategies are viable and cost-efficient to the banks.

Meanwhile, the investigations of the effect of credit risk management on banks' performance in Nigeria by previous researchers produced different results thereby leaving the academia and policy makers in dilemma due to the unresolved nature of relationship between these two variables. Some previous studies on credit risk management and bank performance show that credit risk management strategies impact on banks performance, but the direction and nature of such impacts are highly uncertain and conflicting. The implication that emerges from these studies is that the impacts of credit risk management on banks performance are theoretically and empirically ambiguous. Hence, this study seeks to investigate the impact of credit risk management on a bank's financial performance in Nigeria.

2. Literature review

2.1. Credit risk management

Credit risk management has become an important subject of discourse in the present turbulent financial environment. Consequently, the banking sector being the cardinal focal institution that is heavily depended on by other sectors of the economy as a source of short credit facility is often confronted with the challenges of effective credit management and its impact on their overall performance. The dynamic nature of the global financial system and high rate of loan defaults heightened credit risk for deposit money banks which transmit to their adverse financial performance in the long run.

Risks are the uncertainties that significantly determine the performance of banks. According to the Basel Accords, banks face various types of risk but credit risk seems to be outstanding due to its impact on performance. Credit risk is the possibility of loss arising from the default of borrower inability to settle their maturing obligation in terms of loans as at when due. Banks usually redistribute their liquidity in terms of credit to borrowers, which is needed to be paid back by the borrowers. However, the possibility of repayment as at when due by the borrowers is not fully guaranteed, hence, default in repayment is always there for the banks on lend loans due to unfavourable and turbulent business environment confronting the customers taking the loans. Sequel to the increasing incidence of huge debts profile in the banking sector, gross insider abuses, non-adherence to established credit policies, the credibility and competence of most bank management team have been subject of debate in recent time.

The major focus of risk management is targeted on minimizing earnings fluctuation and substantial loss reduction. There is need to adopt a standardized procedures of identifying, measuring and quantifying risk as well as developing strategies to manage risk effectively (Gestel and Baesens, 2008). Identifying and analysing the potential sources of risk is one of the most important steps in risk management, then there is need for statistical analysis to measure and quantify the default probability associated with the identified risk (Gestel and Baesens, 2008). The next step is treatment of risk through risk reduction and risk transfer. Risk reduction involves reducing the proportion of risk through the use of collateral to reduce the actual loss while risk transfer implies transmitting risk to other institutions such as banks (through loan syndication) and insurances (risk underwriting) (Gestel and Baesens, 2008).

2.2. The Basel accords on credit risk management

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. Both accords underscore the relevance of capital adequacy for minimizing the adverse effects of credit risk. In banking operations, capital adequacy provides securities against unexpected financial losses (Greuning and Sonja, 2003).

The Basel Accords (Basel I and Basel II), issued by the Basel Committee on Banking Supervision (BCBS), played significant roles in mitigating the adverse effect of credit defaults on bank performance. The Basel I and II were published 1988 and 2004 respectively. Despite the various provisions and guidelines of these accords, the banking system is still bedevilled with the adverse effects of inefficient credit risk management; hence, the 2007 global financial crisis indicated that the existing accords seem not to be adequate to undertake the challenges of credit risk management especially in developing economies. The need for a comprehensive accord that will strengthen the earlier provisions and guidelines by the Bank of International Settlements become inevitable. The Basel III was published in 2010 (though not yet operational until 2019) with significant innovations and detailed emphasis on not only capital adequacy, but also on moral hazard which implies events that occur after loan have been granted (Hull, 2012; Feess and Hege, 2012).

2.3. Empirical review

The fundamental business of DMBs is connected to credit risks which poses a great threat to their long run performance. In this regards, 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.

Mekasha (2011) and Felix and Claudine (2008) investigated credit risk management and its impact on the performance of Commercial Banks with the use of panel data from selected commercial banks. Both studies revealed that credit risk impact significantly on bank performance. While Mekasha (2011) study reports a significant positive effect of credit risk on the financial performance of Ethiopian banks, Felix and Claudine (2008) and Gizaw, Kebede, and Selvaraj (2015) concludes that performance was negatively related to non-performing loan thereby resulting in a decline in financial performance of Ethiopian banks. However, Kithinji (2010) study did not find any significant relationship between credit risk and profitability of Kenya commercial banks, and the study further revealed that substantial proportions of profit declared by Kenya banks were not affected by the volume of credit risks and bad debts.

Kargi (2011) and Kolapo, Ayeni and Oke (2012) examine the effect of credit risk on the financial performance of DMBs in Nigeria. Both studies conclude that credit risk management has a significant effect on the performance of Nigerian DMBs. However, other credit risk factors such as capital adequacy, loan loss provision and liquidity level significantly influenced banks performance in varying dimension. Similarly, Gbolami and Salimi (2014) and Abiola an Olausi (2014) studies on the relationship between credit risk management and the financial performance of Nigeria deposit money banks revealed significant negative impact of credit risk on banks' financial performance.

Alshatti (2015) examined the influence of management of credit risk on the financial performance of thirteen commercial banks in Jordanian for the period of 2005 to 2013. Non-performing loans to gross loans, provision for facilities loss to net facilities and the leverage ratio were used as a measure of management of credit risk. ROA and ROE were used as a measure of financial performance. Findings of the study revealed that the indicators of credit risk management have a significant influence on the financial performance of commercial banks in Jordanian. In the same vein, Kishori and Jeslin (2017) discovered various factors relevant to credit risk management and its influence on the financial performance of selected banks in India for the period of 2001-2011. Findings of the study revealed that credit risk management have a significant negative effect on the financial performance of the bank.

From the diverse set of empirical results reviewed above across different geographical boundaries, the importance of the relationship between credit risk and performance become evident for Nigeria deposit money banks in the present research. Most importantly, the divergent findings reported in the previous studies necessitate the need to investigate the actual nature of the relationship that exists between both variables in the Nigerian context. Besides, while most of the previous studies adopted the ordinary least square and panel regression model to analyse the relationship between credit risk and bank performance, this study seeks to establish such relationship with use of Dynamic Generalized Method of Moment (GMM) which is more reliable and detailed by considering dynamics in the specified model as well as accounting for omitted variables in addition to the endogeneity and heterogeneity of the data set.

3. Model specification, data and methods

This study investigates the impact of credit risk management on the performance of Deposit Money Banks in Nigeria. This study adopts a longitudinal and ex-post factor research design. By longitudinal design, the study used time series data relating to credit risk and performance of selected DMBs for a period of eleven years (2006 – 2016), while it is ex-post facto because the study used manifested data to explain the trade-off or causal relationship between bank performance and credit risk management. The population of the study consist of all the twenty Deposit Money Banks quoted on the Nigerian Stock Exchange (NSE). However, stratified sampling technique was used in this study to select a sample size of fourteen DMBs.

First, all quoted DMBs on the Nigerian Stock Exchange were stratified into two categories: old generation (banks incorporated on or before 1990) and new generation (banks incorporated after 1990). Thereafter, seven banks were selected from each stratum according to their performance rating by the central bank and they also account for more than 75% of the total deposit liabilities in the Nigerian banking sector; given us a total of fourteen sampled DMBs (see appendix for the list of sampled banks). This study made use of secondary data from the Nigerian Stock exchange, Central Bank of Nigeria (CBN) statistical bulletin, Annual reports and accounts of sampled banks. The operationalization and measurements of the variables used in this study are indicated in Table 1.

TABLE 1: OPERATIONALIZATION AND MEASUREMENTS OF VARIABLES

Variables	Description / Measurements
Return on Asset (ROA)	This is the ratio of net operating profit that a company earns from its business operations in a given period of time to the amount of the company's total asset. It is an important measure of performance (profitability).
Capital Adequacy Ratio (CAR)	This is the minimum capital requirement of the bank that safeguards it from insolvency and thus guarding the depositors and other lenders. It is the ratio of total capital to the risk-weighted sum of bank's assets. CAR is expected to positively influence performance (ROA).
Non-Performing Loan Ratio (NPLR)	These are credits which the banks perceive as possible losses of funds due to loan default. It is the ratio of non-performing loan to total loans. NPLR is expected to have an inverse relationship with ROA
Loan Loss Provision Ratio (LLPR)	This is the amount of money that a bank set aside from its annual earnings as a precaution against possible loss of non-performing or to off-set a lost credit facility. This provision is expected to positively influence performance (ROA).
Liquidity Ratio (LQR)	This is the ability of a bank to meet its short term obligation as and when due. It is the ratio of total cash to total assets. LQR is expected to have a positive relationship with ROA.

Source: Compiled by Authors (2018)

3.1. Model specification

The analytical models for this study were specified based on the theories that link credit risk management to performance. Previous researchers such as Kargi (2001), Agbada and Osuji (2013) and Alshatti (2015) also used the same models in their studies in line with extant literatures. The functional form of the relationship between credit risk management and performance is expressed generally in model 1 while the mathematical representation of the relationship is specified in model 2.

$$ROA = f(CAR, LQR, NPLR, LLPR) \quad (1)$$

where:

ROA = Return on Assets of DMBs

CAR = Capital Adequacy ratio

LQR = Liquidity ratio

NPLR = Non Performing Loan ratio

LLPR = Loan Loss Provision ratio

$$ROA_{it} = \alpha_0 + \alpha_1 CAR_{it} + \alpha_2 LQR_{it} + \alpha_3 NPLR_{it} + \alpha_4 LLPR_{it} + u_t \quad (2)$$

where: α_0 to α_4 , are estimated parameters.

u_t is the stochastic error term: i represents the Deposit Money Bank which is from 1 to 14, while t represents time period which is from 1 to 11 (2006-2016).

The a priori expectations in the model is that all the explanatory variables are expected to have a positive relationship on bank performance measured by ROA except non-performing loan ratio which is expected to have a negative relationship with bank performance. Capital Adequacy Ratio (CAR) is expected to positively impact bank performance because a bank with strong capital adequacy will be able to absorb possible loan losses and thus avoids insolvency and failure (Admati *et al*, 2010). Aruwa and Musa (2014), Kurawa and Garba (2014) found a significant positive relationship between capital adequacy and banks' financial performance. Liquidity Ratio (LR) indicates the ability of a bank to meet its maturing financial obligation. Generally, in term of theory and empirical evidence, the effect of liquidity ratio on bank performance is expected to be positive (Smirlock, 1985). Bikker and Hu (2002) established a significant positive relationship between liquidity and bank performance. Non-Performing Loan Ratio (NPLR) indicates how banks manage their credit risk because it defines the proportion of loan losses in relation to the total loan amount. Gizaw *et al* (2015) opine that non-performing loan ratio is the major indicator of banks credit risk. Felix and Claudine (2008), Kithinji (2010), Kargi (2011) and Kodithuwakku (2015) all find a negative relationship between non-performing loan and bank performance. In view of theory and empirical literature, a negative relationship is expected between NPLR and ROA. Loan Loss Provision Ratio (LLPR) is the amount of money that a bank set aside from its annual earnings as a precaution against possible loss of non-performing loan or to off-set a lost credit facility. It serves as a buffer against future bad debt that may not be recovered. Molyneux and Thornton (1992) and Goddard, Molyneux and Wilson (2004) found positive relationship between loan loss provision and bank performance. Hence, a positive relationship is expected between LLPR and ROA.

The GMM specification of the models 1 and 2 is as specified in model (3):

$$ROA_{it} = \alpha_t + \sum_{j=t}^m \beta_j ROA_{i,t-j} + \sum_{j=1}^m \gamma_j CAR_{i,t-j} + \sum_{j=1}^m \delta_j LQR_{i,t-j} + \sum_{j=1}^m \delta_j NPLR_{i,t-j} + \sum_{j=1}^m \varphi_j LLPR_{i,t-j} + f_j + \varepsilon_{it} \quad (3)$$

Model (3) contains specific effect $f(j)$ which is not specified as being fixed or random. To eliminate the individual effect, the model is transformed to first differences. The resulting equation is specified in model (4):

$$\Delta ROA_{it} = \omega_t + \sum_{j=t}^m \beta_j \Delta ROA_{i,t-j} + \sum_{j=1}^m \gamma_j \Delta CAR_{i,t-j} + \sum_{j=1}^m \delta_j \Delta LQR_{i,t-j} + \sum_{j=1}^m \delta_j \Delta NPLR_{i,t-j} + \sum_{j=1}^m \varphi_j \Delta LLPR_{i,t-j} + \mu_{it} \quad (4)$$

Where $\Delta ROA_{it} = ROA_{it} - ROA_{i,t-1}$ and so on while $\mu_{it} = \varepsilon_{it} - \varepsilon_{i,t-1}$. This removes the group effect and leaves the time effect. Because the time effect was restricted to begin with, $\Delta \alpha_t = \omega_t$ remains an unrestricted time effect, which is treated as fixed and modelled with a time specific dummy variable.

In order to determine whether changes in one variable are a cause of changes in another, we employed Dumitrescu and Hurlin (2012) model designed to detect causality in panel data. The underlying model is as specified in model (5)

$$\pi_{it} = \beta_0 + \beta_1' IND_t + \beta_2' X_{it} + u_{it} \quad (5)$$

Where x_{it} and y_{it} are the observations of two stationary variables for individual i in period t . Coefficients are allowed to differ across individuals (note the i subscripts attached to the coefficients) but are assumed time-invariant. The lag order K is assumed to be identical for all individuals and the panel must be balanced.

4. Results and discussion

TABLE 2: DESCRIPTIVE STATISTICS

	ROA	CAR	LQR	NPLR	LLPR
Mean	1.341	14.653	13.901	0.051	-0.017
Median	1.586	14.317	11.980	0.021	-0.010
Maximum	9.536	30.978	59.102	0.424	0.116
Minimum	20.232	23.294	1.648	0.001	-0.122
Std. Dev.	2.761	7.076	10.088	0.067	0.025
Observations	145	145	145	145	145

Source: Authors' computation (2018) with Eview

The descriptive statistics for the variables used in this study is presented in Table 2. The table reports that the average value of DMBs performance (ROA) is 1.34% indicating that during the period under consideration (2006-2016), on the average, the total returns generated by the sampled DMBs in Nigeria is 1.34%. The standard deviation of ROA is 2.76%, which reveals minor substantial variation in the performance of sampled DMBs. The minimum Capital Adequacy Ratio (CAR) is 23.29% which is higher than the regulatory requirements of 10% which is an indication of the selected banks' compliance with CBN directives and Basel II requirements. The liquidity ratio (LQR) of the sampled DMBs varied from 1.64% to 59.10% with a mean of 13.9% and standard deviation of 10.08% which indicates very high volatility among banks' ability to meet their short term maturing obligations. The non-performing loan ratio among the selected Nigeria DMBs ranges between 0.00058% and 0.42% with the mean and standard deviation of 0.051% and 0.067% respectively which indicates a low level of volatility among the banks' ability in managing credit risk. There is also low variation among DMBs in their Loan Loss Provision (LLPR) ratio as evidenced by the low standard deviation of LLPR of 0.025%.

TABLE 3: STATIONARITY TEST OF THE VARIABLES

Variables	Tests	LLC	IPS	ADF Fisher	PP Fisher
ROA	Level	-2.114**	-0.963	32.340	80.583*
	<i>First Diff</i>	-13.404*	-4.952*	73.732*	186.334*
CAR	Level	-7.234*	-3.121*	58.572*	50.063*
LLPR	Level	-10.499*	-3.240*	56.230*	69.148*
NPLR	Level	-27.893*	-7.602*	78.839*	65.539*
LQR	Level	-10.069*	-3.907*	72.237*	36.070
	<i>First Diff</i>	-9.514*	-3.489*	63.768*	83.503*

* & ** indicate significance at 1% and 5% respectively

LLC: Levin, Lin & Chu test

IPS: Im, Pesaran & Shin W-stat

ADF: Augmented Dickey-Fuller test

PP: Philip Peron test

Table 3 indicates the stationarity test of the panel data using four different types of tests to test the null hypothesis (Ho) of the presence of unit root. At level, LLC test indicates the absence of unit root since all the variables were significant, however, the results of IPS, ADF and PP tests, reveal that some variables (ROA and LQR) were not stationary at level as their non-significant results indicate the presence of unit root, hence fail to reject the null of a unit root test. To correct the

non-stationarity of the variables (ROA and LQR) at level, their first differences were considered using the four tests. Our test results indicate the absence of unit root (as shown by the significance of the variables) for all the variables. Hence, while CAR, LLPR and NPLR are used at levels, ROA and LQR will be used at first differences.

TABLE 4: CORRELATION ANALYSIS

Correlation (Probability)	ROA	CAR	LQR	NPLR	LLPR
ROA	1 -----				
CAR	0.345 (0.00)	1 -----			
LQR	0.056 (0.496)	-0.062 (0.458)	1 -----		
NPLR	-0.335 (0.00)	-0.044 (0.595)	-0.214 (0.009)	1 -----	
LLPR	0.541 (0.00)	0.065 (0.437)	0.094 (0.261)	-0.331 (0.00)	1 -----

P-values in parenthesis;

Source: Author’s computation (2018) with Eview

To analyse the nature of relationship between the dependent and the explanatory variables and also to confirm whether or not multicollinearity exists due to correlation among variables, the correlation analysis was computed as shown in Table 4. The results show that DMBs performance (ROA) is positively correlated with all the explanatory variables except Non-Performing Loan Ratio (NPLR) which is negatively correlated with bank performance. The significance of the correlation among the variables is indicated in the parenthesis. The probability values indicate that the correlation between ROA and all the explanatory variables are significant except LQR which has insignificant correlations with ROA. Besides, all the correlation coefficients among the independent variables are less than 0.5, ruling out the possibility of multicollinearity in the regression estimates.

TABLE 5: PANEL GMM MODEL RESULTS (LAGGED DEPENDENT VARIABLE)

Variable	Coefficient	t-Statistic	Prob.
ROA(-1)	0.189	0.160	0.873
ROA(-2)	1.353	0.462	0.645
CAR	5.672	4.497	0.029
LQR	-0.689	-0.632	0.528
NPLR	128.656	3.257	0.056
LLPR	316.997	6.606	0.040
@LEV(@ISPERIOD("2009"))	-5.518	-0.430	0.667
@LEV(@ISPERIOD("2010"))	-1.269	-0.326	0.744
@LEV(@ISPERIOD("2011"))	15.538	4.378	0.016
@LEV(@ISPERIOD("2012"))	-4.690	-0.333	0.739
@LEV(@ISPERIOD("2013"))	3.515	0.468	0.640
@LEV(@ISPERIOD("2014"))	-21.514	-3.612	0.089
@LEV(@ISPERIOD("2015"))	-0.241	-0.062	0.950
@LEV(@ISPERIOD("2016"))	-1.400	-0.411	0.681
J-statistic	7.425	Instrument rank	14
Prob (J-stat)	0.046	2nd Order Serial Correlation test	0.097*

Source: Author’s computation (2019) with Eview

TABLE 6: PAIRWISE GRANGER CAUSALITY TESTS

Null Hypothesis:	Obs	F-Statistic	Prob.
CAR does not Granger Cause ROA	125	0.447	0.640
ROA does not Granger Cause CAR		5.570*	0.004
LQR does not Granger Cause ROA	125	0.381	0.683
ROA does not Granger Cause LQR		1.437	0.241
NPLR does not Granger Cause ROA	108	1.115	0.331
ROA does not Granger Cause NPLR		0.877	0.418
LLPR does not Granger Cause ROA	123	8.618*	0.003
ROA does not Granger Cause LLPR		7.263*	0.001

Source: Authors’ computation (2018) with Eview;

* indicates significance at 1% level

Table 5 reports the Panel Generalized Method of Moments (GMM) results for the specified model following the Arellano-Bond method. The J-statistic checks whether the over-identifying instruments are uncorrelated with the residuals. The J-statistic value of 7.425 and its relative low p-value of 0.046 from this test

indicate that there is evidence that these instruments are correlated and this is quite worrisome as it may render the instruments used invalid, but the null of no second order correlation cannot be rejected at 5% level; hence the model is fairly satisfactory for the purpose of this study. The results revealed a varying degree of relationship between the performance of DMBs and credit risk variables. All the explanatory variables analysed in this study positively influenced banks' performance except Liquidity Ratio (LQR). This inverse LQR and positive NPLR relationships with DMB performance both contradict our a priori expectations about these two variables. This may be attributed to specific Central Bank of Nigeria (CBN) reforms and directives to Nigeria deposit money banks on credit ceilings and reserves requirements during the period under consideration. This indicates that a unit change in any of these credit risk variables led to increase in DMBs performance by the coefficients of each of these variables. However, LQR is the only variable that has a negative relationship with performance; this implies that a unit change in LQR led to a reduction in DMBs performance by 0.689 during the periods under consideration.

On the basis of the individual statistical significance of the variables as indicated by the t-ratios, CAR, NPLR and LLPR passed their test of significance at 5% levels with their respective calculated t-values greater than the critical t-values. The positive and significant relationship between CAR and ROA is theoretically consistent with a priori expectation, and this implies that availability of adequate capital to DMBs is not only significant for their survival but will also enhance their performance over time. This finding supports the findings of Abiola and Olausi (2014) whose study revealed that credit risk management measured by Non-Performing Loans Ratio (NPLR) and Capital Adequacy Ratio (CAR) has a significant impact on the profitability measured by Return on Assets (ROA) of commercial banks' in Nigeria. LQR did not pass the test of significance at any level because the calculated t-values of -0.632 is less than the critical value at 1%, 5% or 10% level of significance. Thus, LQR has no significant impact on DMBs performance despite its negative relationship with DMBs performance measured by ROA. The negative coefficient of LQR contradict the a priori expectation because theoretically, adequate liquidity is an essential requirement for the profitability of any bank, the findings from this study imply that Nigerian DMBs did not have adequate liquidity during the period under consideration hence the inverse and insignificant relationship between LQR and ROA. The positive relationship between NPLR and ROA contradict the a priori expectation, although the finding corroborates the findings of Alshati (2015) and

Li and Zou (2014) who also established positive relationship between NPLR and ROA while it contradicts the findings of Felix & Claudine (2008) whose study revealed that Return on Assets (ROA) measuring performance were inversely related to the ratio of non-performing loan to total loan of financial institutions thereby leading to a decline in profitability. The relationships between NPLR and ROA is mixed which suggest the need for the adoption of strong credit risk management for the purpose of keeping the NPLR very low in order to maintain high profitability level by Nigerian DMBs. However, the Loan Loss Provision Ratio (LLPR) which is a forward looking measure of credit risk is significantly and positively related to performance and also consistent with theoretical expectation. This implies that though the business of granting credit by banks is very risky but it can be profitable if properly managed. Besides, banks should always make provision (out of their earned profit) for possible loan loss in the future which may arise out of bad and doubtful debt. This finding corroborates the findings of Gizaw *et al* (2015) who also find a positive and significant relationship between LLPR and performance of Ethiopian commercial banks. Besides, this finding also signals the use of LLPR for cash flows and liquidity management as concluded by Muhammad *et al* (2012).

The results in Table 6 show the Pairwise Granger causality test between the dependent variable and the explanatory variables analysed. The causality result shows that only Loan Loss Provision Ratio (LLPR) granger cause Return on Asset (ROA) at 1% level of significance, which indicates that as LLPR increases, ROA of Nigerian DMBs increases. All other explanatory variables (CAR, LQR, and NPLR) did not Granger cause ROA as revealed by the insignificant level of their respective F-Statistics. Therefore, this result corroborates the results in Table 5 under the panel GMM analysis for these variables except for CAR which has a direct and significant relationship with ROA in the former.

5. Conclusion and recommendation

This study investigates the impact of credit risk management on the financial performance of Deposit Money Banks (DMBs) in Nigeria using panel data of fourteen deposit money banks for the period of 2010 to 2016. The generalized method of moment results revealed that non-performing loan ratio (NPLR) has a negative and statistically significant impact on bank performance which exposes Nigerian DMBs to greater risk of illiquidity and distress while loan loss provision ratio (LLPR) has a positive and statistically significant impact on bank performance which mitigates the adverse effect of non-performing loan.

The negative coefficient of NPLR and positive coefficient of LLPR with bank performance indicates that there is a higher level of loan loss provision charged against profit and eventually leads to reduction in performance as measured by Return on Asset (ROA). Thus, Nigeria DMBs should strictly adhere to the prevailing regulatory directive of the Central Bank of Nigeria as well as Basel Accords while managing credit risk. Compliance with the Basel Accords means adhering to the global standard of handling credit risk and this ultimately will improve bank performance.

This study also finds a significant and positive impact of capital adequacy ratio (CAR) on DMBs performance in the specified model which implies that Nigeria DMBs (to a certain extent) have adequate capital to withstand the adverse effects of credit risk. This notwithstanding, it is recommended that rigorous credit risk management practice is of utmost importance to ensure long term survival of banks in their turbulent operating environment. Most importantly, Nigeria DMBs need to devise strategies that will reduce their excessive exposures to the adverse effect of credit risk and strive for continuous improvement of their financial performance in the highly competitive banking industry.

Biographical notes

Ajao, Mayowa G. is a senior lecturer in finance and management at the University of Benin, Nigeria. He holds an M.Sc. degree in Finance from University of Benin and Ph.D. in Management from University of Nigeria Nsukka. His research specializations are on organization performance evaluation and risk management as well as financial and portfolio management.

Oseyomon, Ehi P. is a senior lecturer in marketing and management at the University of Benin, Nigeria. He holds an M.Sc. degree in Marketing and Ph.D. in Business Administration both from University of Benin. His research interests are focused on consumer behaviour and organization performance evaluation.

Acknowledgements

We are sincerely indebted to various anonymous referees who reviewed this manuscript at different stages, their objective comments and useful suggestions improved the quality of this work. We are also grateful to the editor and associate editors of this journal for their painstaking handling of this paper and tolerance while we effect corrections and comments.

References

- Abiola, I. & Olausi, A. S. (2014) The impact of credit risk management on the commercial banks performance in Nigeria. *International Journal of Management and Sustainability*, 3(5): 295-306.
- Admati, A.R., DeMarzo, P.M., Hellwig, M.F., Martin, F. & Pfleiderer, P. (2010) Fallacies, irrelevant facts and myths in the discussion of capital regulation: why bank equity is not expensive. Stanford GSB Research Paper No 2063, 1-56, Stanford University.
- Agbada, A.O. & Osuji, C. C. (2013). The efficacy of liquidity management and banking performance in Nigeria. *International Review of Management and Business Research*, 2(1), 223-233
- Ahmad, N.H. & Ariff, M. (2007) Multi-country study of bank credit risk determinants. *International Journal of Banking and Finance*, 5(1),135–152.
- Alshatti, A. S. (2015). The effect of credit risk management on financial performance of the Jordanian commercial banks. *Investment Management and Financial Innovations*, 12(1): 338-345.
- Aruwa, S.A. & Musa, O.A. (2014) Risk components and financial performance of deposit money banks in Nigeria. *International Journal of Social Sciences and Entrepreneurship* 1(11); 1-11.
- Bikker, J.A. & Hu, H. (2002) Cyclical patterns in profits, provisioning and lending of banks and procyclicality of the new Basel capital requirements. *BNL Quarterly Review* 221: 143-175.
- Cooperman E., Mills D., & Gardner J. (2000); *Managing financial institutions: An asset / liability approach*. Orlando, The Dryden Press, Harcourt College Publishers,
- Dumitrescu, E.I. & Hurlin, C. (2012). Testing for Granger non-causality in heterogeneous panels. *Economic Modelling*, 29(4):1450-1460.
- Feess, E. & Hege, U. (2012) The Basel accord and the valuation of bank differentiation. *Review of Finance*, 16(4): 1043-1092
- Felix, A.T & Claudine, T. N. (2008). Bank performance and credit risk management: Unpublished Masters Dissertation in Finance, Skovde: University of Skovde.
- Gbolami, A., & Salimi, Y. (2014). Investigate the relationship between credit risk management and liquidity management and the profitability in banking sector. *Academic Journal of Research in Business & Accounting*, 2(3), 2311-2326.

- Gestel, T. V. & Baensens, B. (2008). Credit risk management. [E-book]: Oxford, Oxford University Press.
- Gieseche, K. (2004). Credit risk modelling and valuation: An introduction. *Credit Risk: Models and Management*, 2: 1-40.
- Gizaw, M., Kebede, M. & Selvaraj, S. (2015). The impact of credit risk on profitability performance of commercial banks in Ethiopia. *African Journal of Business Management*, 9(2): 59-66.
- Goddard, J., Molyneux, P., & Wilson, J.O.S. (2004) Dynamics of growth and profitability in banking. *Journal of Money, Credit and Banking* 36: 1069-1090.
- Greuning, H. & Sonja, B. (2003) Analyzing and managing banking risk. Washington, The World Bank Press.
- Hull, J. (2012). Risk Management and Financial Institutions, London. John Wiley & Sons.
- Kargi, H. S. (2011). Credit risk and the performance of Nigerian banks, An Unpublished Thesis Department of accounting, Faculty of Administration, Ahmadu Bello University, Zaria, Nigeria.
- Kishori, B. & Jeslin, S. J. (2017) A study of the impact of credit risk on the Profitability of Indian Banks. *International Journal of Science Research and Technology* 3(1), 37-45.
- Kithinji, A. M. (2010). Credit risk management and profitability of commercial banks in Kenya, School of Business, University of Nairobi.
- Kodithuwakku, S. (2015) Impact of credit risk management on the performance of commercial banks in Sri Lanka. *International Journal of Scientific Research and Innovative Technology* 2(7): 1-6.
- Kolapo, T.F, Ayeni, R. & Oke, M. O. (2012) Credit risk management and commercial banks performance in Nigeria: A panel model approach. *Australian Journal of Business Management Research* 2(2), 31-38.
- Kurawa, J.M. & Garba, S. (2014) An evaluation of credit risk management on the profitability of Nigerian banks. *Journal of Modern Accounting and Auditing* 10(1): 104-115.
- Mekasha, G. (2011) Credit risk management and its impact on performance of Ethiopian banks. Unpublished M.Sc Thesis, Addis-Ababa University.
- Molyneux, P. & Thornton, J. (1992) Determinants of European bank profitability: A note. *Journal of Banking and Finance* 16(6): 1173-1178.

- Muhammad, F., Ammara, S., Abrar, H.C., & Fareeha, K. (2012) Economic determinants of non-performing loans perception of Pakistani bankers. *Euro Journal of Business Management* 4(19), 122-136.
- Ogboi, C. & Unuafé, O.K. (2013). Impact of credit risk management and capital adequacy on the financial performance of commercial banks in Nigeria, *Journal of Emerging Issues in Economics, Finance and Banking*, 2 (3), 703-717.
- Onaolapo, A.R. (2012) Nigeria commercial banking sector (2004-2009). *Far East Journal of Marketing and Management* 2(1): 45-68.
- Osuka, B.M. & Amake, J. (2015) Credit risk management in Nigeria deposit money banks: A study of selected deposit money banks. *International Journal of Education and Innovation* 1(3), 66-103.
- Prakash, P. & Poudel, S. (2012) The impact of credit risk management on financial performance of commercial banks in Nepal. *International Journal of Arts and Commerce*. 1(5): 9-15.
- Samuel, O.L. (2015) The effect of credit risk on the performance of commercial banks in Nigeria. *African Journal of Accounting, Auditing and Finance*, 4(1).29–52.
- Smirlock, M. (1985) Evidence of non-relationship between concentration and profitability in banking. *Journal of Money, Credit, and Banking* 17: 69-83.

Appendix I: Sampled Banks

Union Bank Plc	Fidelity Bank Plc
United Bank for Africa	Guaranty Trust Bank Plc
Unity Bank Plc	Skye Bank Plc
Wema Bank Plc	Sterling Bank Plc
Zenith Bank Plc	Access Bank
Diamond Bank	First City Monument Bank
First Bank Plc	Stanbic IBTC Plc

Ajao and Oseyomon: Credit risk management and performance of deposit money banks in Nigeria

Dependent Variable: ROA

Method: Panel Generalized Method of Moments

Transformation: First Differences

Date: 03/10/19 Time: 05:28

Sample (adjusted): 2009 2016

Periods included: 8

Cross-sections included: 14

Total panel (unbalanced) observations: 105

White period instrument weighting matrix

White period standard errors & covariance (d.f. corrected)

WARNING: estimated coefficient covariance matrix is of reduced rank

Instrument specification: @DYN(ROA,-2) ROA(-1) ROA(-2) CAR LQR NPLR

LLPR @LEV(@SYSPER)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROA(-1)	0.189	1.185	0.160	0.873
ROA(-2)	1.353	2.928	0.462	0.645
CAR	5.672	1.261	4.497	0.029
LQR	-0.689	1.089	-0.632	0.528
NPLR	128.656	39.496	3.257	0.056
LLPR	316.997	47.984	6.606	0.040
@LEV(@ISPERIOD("2009"))	-5.518	12.812	-0.430	0.667
@LEV(@ISPERIOD("2010"))	-1.269	3.885	-0.326	0.744
@LEV(@ISPERIOD("2011"))	15.538	3.548	4.378	0.016
@LEV(@ISPERIOD("2012"))	-4.690	14.078	-0.333	0.739
@LEV(@ISPERIOD("2013"))	3.515	7.499	0.468	0.640
@LEV(@ISPERIOD("2014"))	-21.514	5.955	-3.612	0.089
@LEV(@ISPERIOD("2015"))	-0.241	3.877	-0.062	0.950
@LEV(@ISPERIOD("2016"))	-1.400	3.402	-0.411	0.681
Effects Specification				
Cross-section fixed (first differences)				
Period fixed (dummy variables)				
Mean dependent var	0.068	S.D. dependent var	4.335	
S.E. of regression	9.349	Sum squared resid	7953.903	
J-statistic	7.425	Instrument rank	14	
Prob (J-stat)	0.046			

Arellano-Bond Serial Correlation Test

Equation: Untitled

Date: 03/26/19 Time: 07:45

Sample: 2006-2016

Included observations: 105

Test order	m-Statistic	rho	SE(rho)	Prob.
AR(1)	-1.745	-0.0007	0.0004	0.082
AR(2)	-1.678	-0.0005	0.0003	0.097