Credit Risk Management and Profitability
of Selected Deposit Money Banks in Nigeria: Panel Data Approach

Festus Oladipupo Olaoye[1], Samson Bamikole Fajuyagbe[2]

Abstract: The study investigated effects of credit risk management on the profitability of selected deposit money banks in Nigeria. Specifically, the study analyzed the impact of non-performance loans on return on assets as well as the impact of provision for doubtful debts on return on assets of the selected deposit money banks in Nigeria. The study focused on 10 deposit money banks randomly selected from 21deposit money banks listed on the Nigeria stock exchange. Data were sourced from the published annual financial reports of the selected deposit money banks over a period of 10 years, between 2008 to 2017. Single panel based model was used in the study to capture the interrelationship between credit risk management and profitability of deposit money banks. Profitability measured in terms of return on assets was specified as a function of credit risk management variables including non-performing loans, and provision for doubtful debts. Data collated were analyzed using both descriptive and inferential methods of analysis. Descriptive analysis conducted in the study included mean analysis, measure of dispersion, minimum and maximum analysis, followed by correlation analysis, pooled OLS estimation, fixed effect estimation, random effect estimation, and post estimation test such as restricted F-test, Hausman test, Pesaran cross sectional independence test, Wald test of heteroscedasticity and Wooldridge test of serial autocorrelation. Results show that non-performing loans exert insignificant positive impact on return on assets, with coefficient estimate of 0.0001223(p=0.909 > 0.05), impact of provision for doubtful debts on return on assets is positive and significant, with coefficient estimate of -0.0183529 (p=0.445 > 0.05). Reported R-square for the pooled OLS estimation stood at 0.5276, which implies that credit risk variables including non-performing loans and provision for doubtful debts can only explain about 53% of the systematic variation in return on assets, when heterogeneity effect across sampled deposit money banks is incorporated into the model. Based on the findings, the study concluded that, risk management measured in terms of non-performing loans exert insignificant negative impact on profitability of deposit money banks, while, provision for doubtful debts had positive and significant effect on the profitability of deposit money banks in Nigeria. The study recommended that, automated credit tracking mechanism should be put in place by management of deposit money banks so as to reduce the possibility of default and outstanding loans beyond the substandard loan level of between 90 to 180 days. By so doing the rate of doubtful loans will drastically reduce, such that provision for doubtful debts will be kept at a minimal level.

Keywords: Credit risk management; non-performing loans; provision for doubtful debts; return on assets; single panel based model

JEL Classification: G32; M41

1. Introduction

Traditional banking theories stated that banks should variegate their risk, given that through the addition of their credit lines to other sectors, the bank's probability of default on credit facilities will

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[1] PhD, Department of Accounting, Ekiti State University, Nigeria, Tel.: 08034059689, E-mail: oladipupo.olaoye@eksu.edu.ng.
[2] M.Sc., Doctoral Research Student, Department of Accounting, Ekiti State University, Nigeria, Tel.: 08064643303, E-mail: kolesamson@gmail.com.

be reduced (Mohammed, 2012). Banks should conduct adequate due conscientiousness to fully understand the credit risks that exist both for individual and group loan. Provident risk selection is very important to maintaining favourable loan quality. The purpose of credit risk management is to assess the likelihood of timely credit repayment. This process involves evaluating the steps banking institutions take to identify and control risk throughout the credit process. It involves the administration of credit facility to ensure orderly and full payment, monitoring of credit facilities as well as identifying strategies when credits actually deteriorate. Banks should not engage in a business that unnecessarily imposes risks upon them, nor should they engulf risk that can be effectively transferred, but rather, they should accept risks that are uniquely part of the service rendered by the banks (UNDP, 2008). Banks play an important role in a nation's economy through credit generation. Banks take savings from small and large depositors, give loans, operate payments systems, and provide a mechanism for the transmission of the monetary policy (Adewale, 2013).

The main objectives of any financial institution is to make profit and maximize shareholders' wealth. To this end, banks manage their credit risk by holding assets and attempting to maximize their return by way of increasing market interest rate, loans, cash demands and discount rate (Davidson & Gabriel, 2009). Financial performance can be determined in a number of ways which includes: Return on Assets (ROA) and Return on Equity (ROE) (Tennant, 2003). Effective credit management keenly requires the ability to intelligently manage customers' credit lines. In other words, to minimize exposure to bad debts and bankruptcy, firms must deeply know a customer's financial strength, full business details, credit score history and fluctuating payment patterns. Previous researchers prefer using Return on Assets (ROA) as a tool to measure performance. In theory, ROA shows the capacity of a bank's management to make profits using the level of assets available (Athanasoglou, 2005).

Studies have been conducted to evaluate the effect of credit risk management on the financial performance of deposit money banks both in developed and developing nations, but their findings reveal different results. For instance, Adewale (2013) the studied examined the impact of credit risk management on banks' profitability and the study concluded that deposit money banks' profitability is inversely affected by the level of loans and advances, and non- performing loans, by it, uncover them to great risk of illiquidity and danger. Likewise, Godlewski (2004) studied the impact of credit management and deposit money bank performance, and the study concluded that, the performance of deposit money banks was negatively affected by the level of non-performing ratio. Similarly, Mohammed (2012) studied the impact of credit risk management on performance of deposit money banks and the study concluded that unsuitable credit risk management diminish the profitability of deposit money banks, affects the quality of their assets and increase loan losses. Osuka and Amako (2015) opined 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.

Distinctively, to fill the gap in literature, this study intends to investigate the relationship between credit risk management and profitability of deposit money banks in Nigeria. By using Return on Assets as dependent (profitability) variable, while the independent variable credit risk management of banks shall be proxied using non-performing loans and provision for doubtful debts.

2. Literature Review

Conceptual Literature

Credit Risk Management

Credit Risk Management (CRM) this involves the administration of credit facility to ensure orderly and full payment, monitoring of credit facilities as well as identifying strategies when credits actually deteriorate. Banks need not to involve in business in a way that unnecessarily imposes risks upon them, nor should they absorb risks that can be effectively transferred to other participants, but rather, they should accept risks that are uniquely part of their array of services (UNDP, 2008). Banks should conduct adequate due diligence to fully understand the credit risks that exist both for individual loans and for the entire portfolio. Effective portfolio management begins with the oversight of the risk in the individual loans. Provident risk selection is crucial to maintaining useful loan quality. The purpose of portfolio management is to assess the likelihood of timely credit repayment. The historical emphasis on controlling the quality of individual loan approvals and managing the performance of loans continues to be essential (Ledgerwood, 2009).

Credit Risk Management Strategies

Credit risk management strategies are tools used by banks to refute or insignificant the adverse effect of credit risk. An effective credit risk management structure is importance for banks so as to improve profitability assure and survival. The survival of any firm (including banks) depends on the credit made available to customers because it gives them strength to succeed in a competitive environment. Firms should, therefore, adopt strategies that would ensure active management of trade credit so as to reduce the risk of non-repayment. Hence, banks should strive to utilize regularly updated credit policy manuals as the sole guide to credit sales. Such credit manuals should entail the golden rules and regulations guiding the work being performed within each unit in the credit department. Credit manual is needed to properly treat the important credit issues and to ensure reasonable and accurate actions on these issues. Since the work being done by the credit department affects all other departments in an organisation, to mention a few, credit manual should contain; statutory requirements, credit procedure and approval process, documentation demanded from concerned party and department, communication channels between the different branches and the head office of the customers' business and punishments for violating agreement by defaulters and lots more.

Credit Management

Myers and Brealey (2003) defined credit management as a method and strategy adopted by a manufacturing firm to ensure that credits are kept at optimal level and also ensures its effective management. It specifically involves credit classification, credit analysis, credit rating and credit reporting. Credit management is indispensable for any firm relations with credit transactions to ensure its growth since it is impossible to have a zero default or credit risk in any situations. There is a direct connection between account receivables and their financial cost such that, the higher the amount of accounts receivables and their age, the higher the financial costs incurred in maintaining them. If a firm's default rate of repayment is high and urgent cash needs may arise that can lead to borrowing and the opportunity cost in this regard is the interest expenses incurred. Nzotta (2004) averred that credit management has great influence on the success or failure of firms financially and otherwise.

This is because the failure of firms is highly influenced by the quality of credit decisions and thus the risk asset quality. Effective credit management keenly require the ability to intelligently manage customer credit lines. In other words, to minimize exposure to bad debts and bankruptcy, firms must deeply know a customer's financial strength, full business details, credit score history and fluctuating payment patterns.

Credit Management and Banks Growth

Credit management is the method by which banks collect and control the payments from their customers. In the area of financial management, it entails credit analysis, credit rating, credit classification and credit reporting. Therefore, a suitable credit management has the potency of lowering the idle capital with the debtors, and also impairs the possibility of getting the firm into bad debts thereby, leading to the firm's growth. However, Scheufler (2002) proposed that a credit policy should create a common set of goals for the firm and recognize the credit along with the collection department in order to serve as an important contributor to the firms' strategies for growth. Thus, if the credit policy is well understood, correctly formulated and implemented at all levels of the financial transactions, it will allow management to maintain proper standards of their bank loans and avoid unnecessary risks that can guarantee access for business opportunities, growth and development. Most firms readily incur losses by bad debts, customers going into liquidation or bankruptcy. The writing-off of bad debts through losses visibly reduces the profit of the firm as such a practice limits the firm's growth. The interest received on late payment is less visible and can go unnoticed as a cost effect. It is seldom determined separately because it is mixed with the total charges for all activities. The total interest is also impaired by the borrowing or credit cost saved due to late payment of bills. Credit managers can evaluate this interest cost separately for debtors and the results can be seen by many as shocking because the cost of waiting for payment beyond terms is usually ten times the cost of losses as a result of bad debt. The resultant effect of this hindered the expected growth of the firms. A good management practice of accounts receivables involves designing and documenting a credit policy. Many firms face liquidity and inadequate working capital problems due to lack of credit standards and inappropriate credit policies.

Credit Performance in Banks

Credit can positively or negatively influence the rate of economic activity through its influence on capital accumulation. This is especially true for developing countries where capital markets are still in infancy (AfDB, 2008). One of the biggest issues facing banks is the large stock of non-performing advances. The poor state of loan portfolios in deposit money banks have been a major cause of insolvency in Nigeria and the large stock of non-performing assets (NPA) is threatening macroeconomic stability. It has deprived the economy of a continuous flow of funds to economically viable activities, and this has had adverse effects on the growth and development of Nigeria's financial services. Poor asset quality does not only hinder a deposit money bank's ability to recycle its financial resources, it also threatens its viability. Deposit money banks in Nigeria have registered a high assets loss and if not checked, could result in the loss of confidence in banks sub-sector of the financial industry. For money deposit banks to be successful, they must manage their credit function efficiently and effectively. How effectively a financial institution manages its credit function is the basis on which its quality of assets and performance are judged (Mueller, 2003).

Profitability of Banks

Banking Profitability may also show managers attitude toward risk. Banks that make huge profits are not scared when venturing into risky activities. Profitability measure is important to the investors. The level of profitability is very significant for the shareholders of a bank, because it shows how effective managements have utilized their investments (Devinaga, 2010). In ascertaining the financial potency of a deposit money bank, the level of profitability is predominant. Codjia (2010) viewed that banks profitability performance will concentrate on the income statement which shows how much banks generated (revenue) and how much banks spent (expenses) net income. In contract to Rushdi and Tennant (2003) profitability can be evaluated in a number of ways. Which include Return on Assets (ROA), Return on Equity (ROE). But over the years, most researchers prefer using Return on Assets (ROA). Similar to Godlewski (2004) used ROA in measuring profitability. It was disclosed that; the performance of a bank was negatively affected by the level of non-performing ratio. In theory, ROA shows the strength of a bank's management to make profits using the level of assets available. It may be unfair because of the other events that take place outside the statement of financial position (Athanasoglou, 2005).

Financial Performance Measures

Financial performance is a management initiative to upgrade the accuracy and timeliness of financial information to meet required standards while supporting day to day operations (Bessis, 2008). According to Lyman and Carles (2008), financial performance is the operational strength of a firm in relation to its revenue and expenditure as revealed by its financial statements. Financial performance is characterized by a bad debt policy, sales turnover, profitability level, client's dropout rate, growth, reduction in fixed assets, and physical visitation by commercial staff, debt age analysis, and public media. Generally, the financial strengths of banks and other financial institutions have been evaluated using a merger of financial ratios analysis, benchmarking, determining performance against budget or a mixture of these research methods (Avkiran, 2005).

Financial performance is that the extent to which the aims of the firm is are met (Yahaya & Lamidi, 2015). Banafa, Muturi and Ngugi, (2015) explained that the bank's financial performance is refers to how effectively a bank uses its assets from its principal role of conducting business and its subsequent generation of revenues. Also, financial performance means the overall well-being of a bank as far as finance cares over a particular period of your time. (Yahaya & Lamidi, 2015)

Theoretical Review

Credit Risk Theory

Cantor and Frank (1996) posited that credit risk theory is the first readily available portfolio model for determining credit risk. The credit risk approach enables a firm to consolidate credit risk across its entire organization and provides a statement of value-at-risk due to credit caused by upgrading, downgrading and defaulting. Credit risk model is useful to all firms that are exposed to credit risk in the course of their business. Powell (2004) explained that credit risk statistical concepts such as probability, means, standard deviation and correlation were developed with three objectives which include to develop a value-at-risk framework that is applicable to all the institutions worldwide that are involved in credit risks during the course of their businesses, develop a portfolio view showing the

credit event correlation which can discern the costs of concentrations, and the gains of diversification in a mark to market framework and to apply it in making investment decisions, and risk mitigating actions that are determining the risk based credit limits across the portfolio and rational risk based capital allocations. The firm should have an integrated credit risk management system for assessing portfolio risk due to changes in debt value caused by changes in obligating credit quality (Rajan, 1995).

Prakash and Poudel (2012) believed that there are different programs which are to impair the portfolio risk by reevaluating obligations with the largest absolute size. They argued that a single default among these would have the greatest impact, reevaluate obligations with the highest percentage level of risk. They held that these would most likely contribute to portfolio losses, reevaluate obligations as well as contribute to the largest absolute amount of risk. In their opinion these are the single largest contributors to portfolio risk.

Credit Risk Modeling

Stiglitz and Weiss (1981) proposed that credit risk management can be a very analytical and statistical process. Theoretical models used to evaluate and direct credit risk are often complex and highly quantitative. It must be noted that before credit risk can be well managed, it must first be measured. Davidson (2009) examines the two broad ways to credit risk analysis: classical option pricing models and direct modeling of the default probability of issuers. Insights offered can be drawn from each approach with demonstration that the distinguish between the two approaches is not at all clear-cut.

Walsh (2010) revealed in his approach that the model strikes a fruitful balance by quickly presenting the basic ideas of the models and offering enough details so that firms wishing to implement this model can derive and implement the models themselves. Jose and Riestra (2002) stated that credit risk model is used by firms to evaluate and direct credit risk thus, the model perform three main functions which are: the models are used to approximate the likelihood that counterparty will default or fail to pay what it owes; the model needs to be able to evaluate the dollar amount that might be lost if a counterparty defaults and the model should have the capability to measure the correlation of default risks across the entire credit exposure to manage portfolio. As such, the models are designed to help financial institutions in quantifying, aggregating and managing risk across geographical and product lines.

The outputs of these models also play increasing and important roles in risk management and the performance measurement processes of financial institutions and manufacturing firms including performance-based compensation, customer profitability analysis, risk-based pricing and to a lesser (but growing) degree, active portfolio management and capital structure decisions. Credit risk modeling may certainly turn out to result in better internal risk management and may have the ability to be used in the monitor oversight of financial institutions.

Empirical Evidence

Hosna, Manzura and JuanJuan (2009) studied credit risk management and the profitability of deposit money banks in Sweden using multiple regression analysis and found out that non-performing loans hav significant and negative relationship with return on investment, while it is also positive and insignificantly related to return on equity. Also, Kithinji (2010) investigated the effect of credit risk

management on the profitability of deposit money banks in Kenya. Secondary data were used, data were collected on the amount of credit, level of non-performing loans and profits, the study covered 2004 to 2008 and was analysed using regression technique. The results showed that, the mass of the profits of deposit money banks are not influenced by the amount of credit and non-performing loans.

Similarly, Muthee (2010) conducted a research on the connection between credit risk management and profitability of deposit money banks in Nigeria. The regression analytical technique was used to established the relationship between NPL and RO. The findings of the study showed that credit risk management has an effect on profitability of all the selected deposit money banks understudy.

Abiola and Olausi (2014) examined the Impact of Credit Risk Management on the Deposit Money Banks' Performance in Nigeria. Panel regression analytical model was employed in the study. Return on Equity (ROE) and Return on Assets (ROA) were used as the performance indicators while Non-Performing Loans (NPL) and Capital Adequacy Ratio (CAR) as credit risk management indicators. Findings revealed that, credit risk management has a significant impact on the profitability of deposit money banks in Nigeria.

Ogbuagu, Udoh and Udoh (2016) investigated Loan Risk (LR), Loan Risk Management (LRM) and Deposit Money Bank Profitability: A Panel Analysis of Nigerian Banks. Data were sourced from published annual financial statements of fifteen deposit money banks, the Central Bank of Nigeria statistical bulletin and the Nigerian Stock Exchange. The study used standard econometric techniques of balanced panel regression. The finding of the study showed that, loan risk and loan risk management have a high causality and significant relationship with parameters of bank profitability. 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

Isah Serwadda (2018), analysed the impact of credit risk management on the financial performance of commercial banks in Uganda for a period of 2006 – 2015 using panel data for a sample of 20 commercial banks. The study employed descriptive statistics, regressions and correlation analysis. The study revealed that credit risk management impacts on the performance of Ugandan commercial banks. The results portrayed that banks' performance was inversely influenced by non‑performing loans which may expose them to large magnitudes of illiquidity and financial crisis. Thus given such results, the study recommended that banks need to enhance their credit risk management techniques not only to earn more profits but also to maintain a qualitative asset portfolio and attention be given to non‑performing loans, loan loss provision to total loans and growth in interest earnings that were found to be significant

In the work by Mayowa and Ehi (2019), the study investigated 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 study revealed a direct and statistically significant relationship between DMBs credit risk management variables measured by capital adequacy 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.

Primarily, based on empirical reviewed above across different geographical boundaries, the importance of the relationship between the credit risk management and financial 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 regression model to analyzed the relationship between credit risk management and financial performance of deposit money banks, this study seeks to establish such relationship with aids of panel data analytical technique which is more reliable and detailed.

3. Research Method

Source of Data

The study relied heavily on secondary data, which were sourced from the published annual reports and financial statements of the selected banks. The population for the study is twenty-one (21) existing deposit money banks in Nigeria. Ten (10) banks were randomly selected from the population. The selected banks are First Bank Plc, Guaranty Trust Bank Plc, Zenith Bank Plc, Union Bank Plc, Wema Bank Plc, Sterling Bank Plc, Diamond Bank Plc, Fidelity Bank Plc; United Bank for Africa Plc and Access Bank Plc. The study covered 10 years, spanning from 2008 to 2017.

Model Specification

This study adopted the model of Kolapo, Ayeni and Oke (2012), they studied "Credit Risk and the Performance of Nigerian Banks" and their study measured profitability with Return on Assets (ROA) as a function of Bank Reserve (BR), Total Assets (TA), Non-Performing Loan (NPL), Interest Rate (IR) and Total Debt (TD)

$ROA_{it} = \alpha_0 + \alpha_1 BR_{it} + \alpha_2 TA_{it} + \alpha_3 NPL_{it} + \alpha_4 IR_{it} + \alpha_5 BD_{it} + e$

Where;

ROA = Return on Asset

$\alpha_0 - \alpha_2$ = Coefficients

BR = Bank Reserves

TA = Total Asset

NPL= Non Performing Loans

IR = Interest Rate

BD= Bank Deposits

e   = error term

i   = cross sections i.e banks

t   = years

However, the study re- modified the model by incorporating different variables like Non-Performing Loan (NPL) and Provision for Doubtful Debts (PDD) as indicators of credit risk management. This is

backed up by the plethora of evidence given in various literatures and theoretical framework that underlies the concept of credit risk management. In respect of this, the model that is aimed at determining the level of credit risk management with profitability to the deposit money banks in Nigeria is given below:

$$ROA = f(NPL, PDD, \mu) \tag{I}$$

This model for the purpose of simplicity can be stated in equation terms as depicted below: -

$$ROA = \delta + \alpha NPL + \lambda PDD + \mu \tag{II}$$

Where:

ROA   -   Return on Assets

NPL   Non-Performing Loan

PDD   Provision for Doubtful Debts

F   -   Funtional Notation

μ   -   Error Term

α and ⅄ -   Coefficients of Estimates

To avoid spuriousity in estimation, the model can also be stated in it log-linearized form as depicted below: $Log (ROA) = \delta + \alpha Log(INV) + \lambda Log(NCA) + \mu$ (III)

Where: -
Log   -   Natural Logarithm

From equation III above, the model can further be stated in time series form as depicted below: -

$$Log(ROA)_t = \delta + \alpha Log(NPL)_t + \lambda Log(PDD)_t + \mu \tag{IV}$$

Estimation techniques

The study adopts Constant and Fixed panel data analysis, which is prone to spuriousity of result and short-run, oriented to test the relationship between the explanatory variables and dependent variables of ten (10) selected deposit money banks in Nigeria.

4. Results and Discussions

This section shows the correlation of the characteristic of the variables ranging from descriptive analysis, Correlation analysis, Pooled OLS analysis, Fixed effect estimation, Random effect estimation and Hausman test.

Descriptive Analysis

Table1. Descriptive Statistics of Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	100	1.677088	2.522939	-9.2741	13.96257
NPL	100	225.4861	254.1473	0	804.5566
PDD	100	10.56588	11.23045	0	43.36656

Note: ROA=Return on Assets (%), NPL=Non-Performing Loan (billion naira), PDD=Provision for Doubtful Debts (billion naira)
Source: Data Analysis, 2019.

Table 1 presents descriptive statistics of observation pooled from 10 deposit money banks over a period of 10 years spanning from 2008 to 2017. As reported in table 1, average return on assets stood at 1.67%, with minimum and maximum values of about -9.27% and 13.96%. Average non-performing loan for the period covered in the study across firms selected stood at 225.4861 billion, with minimum and maximum values of 0 and 804.5566 billion. Average provision for doubtful debt stood at 10.56588 billion, with minimum of 0 and maximum of 43.36656 billion. Measure of dispersion of observation from the mean values (i.e standard deviation) stood at 2.522939, 254.1473 and 11.23045 for return on asset, non-performing loan and provision for doubtful debt respectively.

Correlation Analysis

Table 2. Correlation Statistics

	ROA	NPL	PDD
ROA	1.0000		
NPL	0.0109	1.0000	
PDD	-0.0872	0.3069	1.0000

Source: Data Analysis, 2019

Table 2, revealed the existence of positive correlation between return on assets and non-performing loans, while correlation between return on assets and provision for doubtful debts is negative. The result showed that return on assets moves predominantly in the same direction with non-performing loans but in opposite direction with provision for doubtful debts. In specific terms correlation statistics stood at 0.0109, -0.0872 for ROA and NPL, ROA and PDD respectively.

Pooled OLS Analysis

Table 3. Pooled OLS Estimation Result

Series: ROA NPL PDD

Variable	Coefficient	Std Error	T-Test	Probability
C	1.423684	0.4828198	2.95	0.004
NPL	0.0001223	.0010715	0.11	0.909
PDD	-0.0183529	.0239486	-0.77	0.445

R-square=0.5276, Adjusted R-square=0.5028, F-statistics=10.91, Prob(F-stat)= 0.0097

(*) connotes significance at 5% level of significance.

Source: Data Analysis, 2019.

Table 3, revealed the impact of credit risk management variables on return on assets of the selected banks, when uniqueness across the banks is not incorporated into the model. Result showed that Non-performing loans exert insignificant positive impact on return on assets, with coefficient estimate of 0.0001223(p=0.909 > 0.05), impact of provision for doubtful debts on return on assets is significantly positive, with coefficient estimate of the -0.0183529 (p=0.445 > 0.05). Reported R-square for the pooled OLS estimation stood at 0.5276, which implies that credit risk variables including non-performing loans and provision for doubtful debts can only explain about 53% of the systematic variation in return on assets, when heterogeneity effect across sampled deposit money banks is incorporated into the model.

Fixed Effect Estimation

Table 4. Fixed Effects Estimates (Cross-sectional and Period specific)

Series: ROA NPL PDD

CROSS-SECTIONAL SPECIFIC EFFECT			TIME SPECIFIC EFFECT		
Variables	**Coefficients**	**Prob**	**Variables**	**Coefficients**	**Prob**
C	1.490154	0.127	C	1.023859	0.193
NPL	-.0028642	0.291	NPL	.0001715	0.867
PDD	-.0017933	0.972	PDD	-.0235795	0.330
Effects			**Effects**		
DIAMOND BANK	.5653603	0.717	2009	.8041157	0.458
FIRSTBANK	-.3118978	0.787	2010	1.322502	0.224
GTB	1.579608	0.193	2011	-.8038242	0.463
FCMB	.5759174	0.642	2012	2.443799	0.029
UBA BANK	1.595261	0.429	2013	-1.76912	0.112
UNION BANK	-.203596	0.896	2014	.974513	0.389
ZENITH BANK	2.113719	0.264	2015	.9012731	0.439
WEMA BANK	-1.903271	0.104	2016	.9646873	0.416
FIDELITY BANK	.5439695	0.675	2017	.6723248	0.574
R-square=0.5370 Adjusted R-square=0.5180 F-statistics=11.15 Prob(F-stat)= 0.0010			R-square=0.7205 Adjusted R-square=0.7129 F-statistics=2.05 Prob(F-stat)= 0.0288		

Sources: Data Analysis, 2019.

Table 4, showed that when heterogeneity effect across the sampled deposit money banks is incorporated into the model as intercept term, impact of non-performing loans on return on assets is negative but insignificant, with reported coefficient estimate which stood at -0.0028642 (p=0.291 > 0.05), while the impact of provision for doubtful debts on return on assets remain negative and insignificant -0.0017933(p=0.972 > 0.05). R-square value reported for cross-sectional specific estimation presented in table 4 stood at 0.5370, which reflect that about 54% of the systematic variation in return on assets can be explained jointly by non-performing loans and provision for doubtful debts.

Fixed effect revealed, that when heterogeneity effect over the period covered in the study was incorporated into the model as intercept term, impact of non-performing loans is positive and insignificant with reported coefficient estimate of 0.0001715 (p=0.867 > 0.05), while provision for doubtful debts maintained negative insignificant impact with reported coefficient estimate of -0.0235795(p=0.330 > 0.05). Reported R-square statistics showed that about 72% of the systematic variation in return on assets can be explained jointly by non-performing loans and provision for doubtful debts.

Deviation from the intercept term (1.490154) corresponding to the reference bank (Access Bank Plc) stood at 0.5653603, -0.3118978, 1.579608, 0.5759174, 1.595261, -0.203596, 2.113719, -1.903271, 0.5439695 for Diamond Bank Plc, First Bank Plc, Guaranty Trust Bank Plc, First City Monument Bank Plc, United Bank for Africa Plc, Union Bank Plc, Zenith Bank Plc, Wema Bank Plc, and Fidelity Bank Plc respectively. Also deviation from the intercept term (1.023859) of the reference period (2008) stood at 0.8041157, 1.322502, -0.8038242, 2.443799, -1.76912, 0.974513, 0.9012731, 0.9646873 and 0.6723248 for 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016 and 2017 respectively.

Random Effect Estimation

Table 5. Random Effect Estimation

Series: ROA NPL PDD

Variable	Coefficient	Standard Error	Z-Test Values	Probability
C	1.472315	0.5477184	2.69	0.007
NPL	-0.0001205	0.0012623	-0.10	0.924
PDD	-0.0177847	0.0275814	-0.64	0.519

R-square=0.6271

Wald chi2 (5) = 12.17

Prob> chi2 = 0.0001

Source: Data Analysis, 2019.

Table 5, revealed that when heterogeneity effect across sampled bank was incorporated into the model via the error term, non-performing loan exert insignificant negative impact on return on assets of the selected banks, with coefficient estimate of -0.0001205(p=0.924 > 0.05), and that provision for doubtful debts exert insignificant negative impact on return on assets to the tune of -0.0177847 (p=0.519 > 0.05). Reported R-square for random effect estimation presented in table 4.5 stood at 0.6271 which implies that about 63% of the systematic variation in return on assets can be explained jointly by non-performing loans and provision for doubtful debts when heterogeneity effect is subsumed into the random term.

Post Estimation Test

Table 6. Restricted F Test of Heterogeneity (Cross-Sectional and Time Specific)

	F-statistics	Probability
Cross sectional	1.23	0.2900
Time specific	2.39	0.0180

Source: Data Analysis, 2019.

 F-statistics reported in table 6, stood at 1.23 and 2.39 with probability values of 0.2900, and 0.0180 for cross sectional and period specific effect respectively. Result found that there is adequate evidence to reject the null hypothesis that differential intercept corresponding to each period is equal to zero, but otherwise for the differential intercept corresponding to the cross sections. Result implies that there is significant period specific heterogeneity effect thus invalidating the restriction of pooled OLS estimation in favour of period specific fixed effect estimation.

Table 7. Hausman Test

Null hypothesis	Chi-square stat	Probability
Difference in coefficient not systematic	0.59	0.8983

Source: Data Analysis, (2019)

Table 7 reported chi-square statistic of 0.59 and probability value of 0.8983. The result showed that there is no adequate evidence to reject the null hypothesis that differences in coefficients of fixed effect estimation and random effect estimation is not significant. Therefore, the most consistent and efficient estimation for analyzing the impact of credit risk management variables (including non-performing loans and provision for doubtful debts) on profitability of deposit money banks (measured in terms of return on assets) is the random effect estimation as presented in table 5.

5. Implication of the Findings, Conclusion and Recommendations

The study investigated the effect of credit risk management on profitability of selected deposit money banks in Nigeria. The profitability was measured by return on asset. The study revealed that when credit risk management reflect reduction in provision for doubtful debt, this has substantial influence on the profitability of deposit money banks, when measured in terms of return on asset. This result was in congruence with the Ogbuagu, Udoh and Udoh (2016) that established that provision for doubtful debts has causality relationship with parameters of banks' profitability. Based on the findings, the study concluded that, risk management measured in terms of non-performing loans exert insignificant negative impact on profitability of deposit money banks, while, provision for doubtful debts had positive and significant effect on the profitability of deposit money banks in Nigeria. The study recommended that, automated credit tracking mechanism should be put in place by the management of deposit money banks so as to reduce the possibility of default and outstanding loans beyond the substandard loan level of between 90 to 180 days. By so doing the rate of doubtful loans will drastically reduce, such that provision for doubtful debts will be kept at a minimal level.

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