
Credit Risk Management and Performing Loans Portfolio: Evidence from Quoted Commercial Banks in Nigeria

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Abstract

This study examined the effect of credit risk management on loan portfolio of quoted commercial banks in Nigeria. Cross sectional data was sourced from financial statement of commercial banks and Central Bank of Nigeria Statistical bulletin from 2009-2018. Performing loan portfolio was used as dependent variable while bank risk diversification, Basel risk compliance, risk transfer were used as independent variables. Panel data methodology was employed while the fixed effects model was used as estimation technique at 5% level of significance. Fixed effects, random effects and pooled estimates were tested while the Hausman test was used to determine the best fit. Panel unit roots and panel cointegration analysis were conducted on the study. The study found that 66.6 per cent variations in the performing loans portfolio can be accounted for by the independent variables. The random effect results found that bank risk diversification and Basel compliance have positive relationship with performing loans portfolio while risk transfer have negative relationship with performing loans of the commercial banks. From the findings, the study concludes that there is significant relationship between bank risk diversification, Basel compliance and risk transfer and commercial banks performing loan portfolio in Nigeria. we recommend that commercial banks should have loan portfolio management which will help them in making prudent decisions about loan investment mix, Level of loan asset allocation for banking institutions should be balanced against risk of the operating environment. Loan product diversification across different sectors and products has beneficial effects on the credit risk management. Commercial banks in Nigeria should put more emphasis on risk management and credit worthiness analysis, credit score analysis and internal ratings in their credit risk management practices. Risk diversification is one major way of effective credit risk management; therefore, management should enhance risk diversification policies.

Keywords: *Credit Risk Management, Performing Loans Portfolio, Quoted Commercial Banks, Nigeria*

Introduction

A performing loan is a debt on which the borrower has historically made payments on time. It is a credit facility which is not in near default. According to the International Monetary Fund, a performing loan is any credit facility that interest and principal payment is less than 90 days overdue, less than 90 days' worth of interest has been refinanced or capitalized or delayed by agreement and continued payments is anticipated. According to Prudential Guidelines for Finance Companies in Nigeria (2019) a performing loan is a credit facility is deemed to be performing if all due principal and interest have been settled or if not past due by more than 30 days. Forming loans required a critical credit management strategy such as credit appraisal, monitoring and compliance to lay down rules and regulations. The application of management concept in piloting the affairs of organizations helps in guiding, explaining, predicting and influencing the organizational behaviours. Bank management is the deliberate and concerted efforts of banks to plan organize, direct, control, and coordinate the resources of banks with a view to ensuring a healthy balance sheet (Abdulraheem, Yahaya, and Aliu, 2015). The lifeblood of each lending institution is its loan portfolio, and the success of the institution depends on how well that portfolio is managed. Loan portfolios are the major asset of banks and other lending institutions. The value of a loan portfolio depends not only on the interest rates earned on the loans, but also on the quality or likelihood that interest and principal will be paid (Loizis, 2010). In commercial banks, credit risk management is the

process of identification, analysis and acceptance or mitigation of uncertainty in investment decisions. Essentially, credit risk management occurs any time an management of commercial banks or fund manager analyses and attempts to quantify the potential for losses in an investment and then takes the appropriate action given his investment objectives and risk tolerance. Credit risk management is the quality control of commercial banks (Adebawo and Enyi, 2014). Credit risk analysis involves the consideration of the source of risk, the consequence and likelihood to estimate the inherent or unprotected risk without controls in place. It involves identification of the controls, an estimation of their effectiveness and the resultant level of risk with controls in place. It entails the systematic application of management policies, procedures and practices to the tasks of identifying, analysing, assessing, treating and monitoring risk (Haneef, et al., 2012).

Bank lending operation is characterized with risk that endangers the operation of the banks which affect negatively the economy. Recognizing this fact government over the years has put in place credit policies to leverage Nigeria banks from the dooms of non-performing loans that affect profitability. For instance the Prudential Guideline for License Banks was introduced in 1999 to monitor bank disclosure (Olawale, 2014). Nigerian Deposit Insurance Corporation (NDIC) was introduced in 1989 and the Assets management corporation of Nigeria (AMCOM) was introduced in 2010.

Factor that enhance performing loans in the banking industry remain a matter of concern for bank managers, regulators and the general public as empirical studies have shown that nonperforming loans does not only affect negatively the financial performance of banks but one of the factors that affects stability of the banking institutions. There are many studies on the effect of credit risk management, significant proportion of the studies examined credit risk management and profitability of banks (Olalere and Ahmad, 2015; Olweny and Shipho, 2011; Onaolapo, 2012). This study examined the effect of credit risk management on the loan portfolio performance in Nigeria.

Literature Review

Credit Risk Management

Credit risk is generally defined as the potential that an institution borrower or counterparty will fail to meet its obligations in accordance with agreed terms. According to the Basel Committee on Banking Supervision the most common cause that leads the banks to bankruptcy is credit risk. The main sources of credit risk that have been identified in the literature include, limited institutional capacity, inappropriate credit policies, volatile interest rates, poor management, inappropriate laws, low capital and liquidity levels, massive licensing of banks, poor loan underwriting, reckless lending, poor credit assessment, laxity in credit assessment, poor lending practices, government interference, inadequate supervision by the central bank, and information asymmetry (Singh, 2013; Chen et al., 2006; Auronen, 2003). To measure credit risk is the key to manage credit risks. The credit rating assessment becomes an important part of credit risk assessment, involving risk parameters such as financial, business, industry and management areas (Gakure, Ngugi, Ndwiga and Waitthaka, 2012). In addition to measuring and controlling it, banks also try mitigating their credit risk. A variety of approaches can be adopted to mitigate its credit risks, including, among others, risk-based pricing, covenants, credit insurance, credit derivatives, collaterals, engaging in credit guarantee scheme.

Credit ratings provide an estimate of the creditworthiness of an entity, and are generally a reflection on an entity's ability to repay debt. In addition to the standard ratings provided by credit-rating agencies, firms often make use of internal ratings that they calculate themselves. Internal credit risk rating systems are becoming an increasingly important element of large commercial banks' measurement and management of the credit risk of both individual exposures and portfolios. Tetteh (2012) explained the internal rating systems presently in use at the 50 largest US banking organizations. The authors use the diversity of current practice to illuminate the

relationships between uses of ratings, different options for rating system design, and the effectiveness of internal rating systems and show that growing stresses on rating systems make an understanding of such relationships important for both banks and regulators.

Credit Risk Management Strategies - Risk Diversification

Bank loan portfolio diversification strategies are based on the modern portfolio theory of Markowitz (1952), and largely followed by experts in financial institutions. According to the idiosyncratic risk hypothesis, diversification eliminates the specific (idiosyncratic) risk which enable banks to reduce their monitoring efforts and therefore lower their operating costs, which ceteris paribus should lead to higher cost efficiency (Wangai, 2014). Furthermore, the benefit of diversification stems from economies of scope across inter alia economic sectors and geographic areas. Researchers like Auronen (2003) and Tetteh (2012) all indicate that risk reduction and performance improvement are advantages of diversification whilst agency problems are common associated disadvantages. Diversification is a portfolio strategy designed to cut back risk by combining various investments. Diversification gain from shifting into non-interest income in bank's revenue and reduced volatility of bank profits (Shingjergji, 2013). In investment planning and finance, diversification improved cost influence through lower risk from diversification if it occurred; it lowered the needed risk premiums on un-insured debt. Income supply diversification refers to banks shifting their financial gain sources into non- intercession financial gain generating activities as opposed to the normal inter-mediation financial gain generating activities.

Basel Compliance

The Basle Accord is a comprehensive documentation of international principles and regulations guiding the operations of banks in order to ensure soundness and stability (Kolapo *et al* 2015). Commenting on the features of Basel Accord, Chen and Pan (2016), upheld that, the new Basle Capital Accord explicitly places on banks, the onus to adopt sound internal credit risk management practices to assess their capital adequacy requirements. The Accord was introduced in 1988 in Switzerland, compliance with the accord means having the capacity to identify, track, collect and report on risk-related data in an integrated manner, with full auditability and transparency, thus creating the platform to improve the risk management processes of banks. The Basel Accord is international principles and regulations guiding the operations of banks to ensure soundness and stability. The Accord was introduced in 1988 in Switzerland. Compliance with the Accord means being able to identify, generate, track and report on risk-related data in an integrated manner, with full audit ability and transparency and creates the opportunity to improve the risk management processes of banks. The New Basel Capital Accord places explicitly the onus on banks to adopt sound internal credit risk management practices to assess their capital adequacy requirements (Chen and Pan, 2012).

In order to improve the flexibility of banks against the financial crisis in the global banking system, the Committee on Banking Regulations and Supervisory Practices later named as Basel Committee on Banking Supervision (BCBS) was formulated by the central bank governors of the G10 countries (Belgium, Canada, France, Germany, Italy, Japan, Netherlands, Sweden, Switzerland, the United Kingdom and the United States) after the breakdown of Bankhaus Herstatt in West Germany and Franklin National Bank in the United States in 1974 (Basel Committee, 2013). The Basel Committee has established an internationally accepted set of principles to cope with the various risks, officially known as the Basel Accords (Basel I, Basel II and Basel III). Initially, the Basel Accords were mainly designed for the G10 Countries. However, these guidelines have been planned in such a way that they might be applicable in the developed countries as well as the developing countries (Al-Tamimi, 2008). According to these principles, banks are required to maintain a prescribed level of capital against the operational and other financial risks. Somoye (2018)

proposed that the implementation of the Basel Accords might have offered a positive impact on the risk management and amplify the financial solidity by providing risk-sensitive methodologies.

Basel I has been criticized in many aspects .One of the most significant criticism is its weighting system. As in Basel-I the risk weighting system is described as a subjective bucket and an arbitrary structure due to its broadness (Chen and Pan, 2012). Also the risk weighting system missed the sensitivity to the distinctive types of risks related to each asset held by the bank. Each bucket in the weighting system contains diverse assets with different risk level however all these asset has been contained in one bucket because these assets share same business counterparty. In the weighting system of Basel I all commercial loans are risk weighted for 100%. This weighting system is not logic and missed the reality of classifying commercial loan risk and its application (Dionne, 2013). As if the bank grant a commercial loan to a company with a very strong financial position the risk in this situation should be totally different when the bank grant a commercial loan to a newly established company. Rating of the risky assets is based on external rating agencies. The critical issue is that banks are subjected to fees by agencies that rate them. This could culminate in self-interest threat for the agencies and create a rift between the bank and the rating agency. The use of faulty methodology by the rating agencies is yet another ground for criticism (Elisa and Guido, 2016). Such error-prone methods are used to assess and rate the risky assets such as securitized assets which lead to wrong and inappropriate risk weighting. The obvious example which supports this criticism is the high rating granted to securitize asset classes of some banks before the 2008.

Based on Basel II framework, The Basel III accord has been introduced by Basel Committee and focused mainly on three main critical issues namely: Capital requirements, Leverage Ratio and Liquidity requirements. With regard to Capital requirements, The Basel Accord introduced two new capital requirements as follows: An obligatory capital Conversion ratio for 2.5% from risk weighted asset. And another 2.5 % as a counter cycle ratio that permit the national regulators to ask banks to fulfill these additional capital requirements in case of high growth of credit supply. Concerning the leverage ratio, Basel III introduced a new ratio called minimum liquidity ratio that calculated by dividing Tier one capital by average total Bank's Assets .Basel III sets 3% as a minimum leverage ratio to be maintained by banks.

The main criticism to Basel III is all about capital adequacy ratio (minimum capital Level). As the minimum accepted capital to be held by the bank has been increased from 8% to 13% after the failure of commercial banks to absorb losses happened during the recent financial crisis and its critical consequences. The most critical issue related to the minimum required level of Capital, is that as long as there is an increase in the capital level, this increase will lead to decrease in money supply in the market through commercial loans (Olweny and Shiphoo, 2011). In other words, Banks will decrease the level of loans to lenders which will result in decrease in the business activity and will have a negative impact from the macroeconomic point of view. In addition, the commercial banks may ask for high interest rate in order to compensate the difference between loan volume based on minimum required capital of Basel II and Basel III.

Risk Transfer

It is the transfer of credit risk to a factor or insurance firm and this relieves the bank from monitoring the borrower and fear of the hazardous effect of classified assets. This approach insures the lending activity of banks. The growing popularity of credit risk securitization can be put down to the fact that banks typically use the instrument of securitization to diversify concentrated credit risk exposures and to explore an alternative source of funding by realizing regulatory arbitrage and liquidity improvements when selling securitization transactions (Michalak & Uhde,2009). A cash collateralized loan obligation is a form of securitization in which assets (bank loans) are removed from a bank's financial statement and packaged (tranche) into marketable securities that are sold on to investors via a special purpose vehicle (SPV) (Marsh,2008). Once risks have been identified, they must then be assessed as to their potential severity of impact and to the probability of occurrence. These quantities can be either simple to measure, in the case of the value of a lost building, or impossible to know for sure in the case of an unlikely event, the probability of occurrence

of which is unknown. Therefore, in the assessment process it is critical to make the best educated decisions in order to properly prioritize the implementation of the risk management plan (Aluko and Arowolo, 2015). Even a short-term positive improvement can have long-term negative impacts. Take the "turnpike" example. A highway is widened to allow more traffic. More traffic capacity leads to greater development in the areas surrounding the improved traffic capacity. Over time, traffic thereby increases to fill available capacity. Turnpikes thereby need to be expanded in a seemingly endless cycles. There are many other engineering examples where expanded capacity is soon filled by increased demand. Since expansion comes at a cost, the resulting growth could become unsustainable without forecasting and management.

Performing Loan

A loan is said to be a performing, if from available transactional records, it is not in or near default. According to the International Monetary Fund, a performing loan is any loan in which: interest and principal payments are less than 90 days overdue; less than 90 days' worth of interest has been refinanced, capitalized, or delayed by agreement; and continued payment is anticipated. All conditions must be present for a loan to be performing. However, the specific definition is dependent upon the loan's particular terms. Federal Financial Institutions Examination Council defined performing loan as a loan that is less than 90 days past due, has not been placed on nonaccrual, or is not in workout status. A performing loan is a debt on which the borrower has historically made payments on time. For example, if a homeowner takes out a mortgage and pays his home loan faithfully each month, his mortgage is considered a performing loan. In some cases, loans in which payments are less than 90 days late may be considered performing.

Theoretical Review

Modern Portfolio Theory

Markowitz (1952) Modern portfolio theory (MPT) is one of the most important and powerful economic theories dealing with finance and investment. Modern portfolio theory measures the benefits of diversification, known as not putting all your eggs in one basket. Modern portfolio theory (MPT) is an investment theory which tries to explain how investors could maximize their returns and minimize their risks by diversifying in different assets. Tobin (1958) expanded the theory of Markowitz's by adding the analysis of risk free assets which made it possible to affect portfolios on the efficient frontier. Markowitz (1952) and Tobin (1958) showed that it was possible to identify the composition of an optimal portfolio of risky securities, given forecasts of future returns and an appropriate covariance matrix of share returns.

The portfolio theory approach is the most relevant and plays an important role in bank performance studies (Atemnkeng and Nzongang, 2006). According to the Portfolio balance model of asset diversification, the optimum holding of each asset in a wealth holder's portfolio is a function of policy decisions determined by a number of factors such as the vector of rates of return on all assets held in the portfolio, a vector of risks associated with the ownership of each financial assets and the size of the portfolio. It implies portfolio diversification and the desired portfolio composition of commercial banks are results of decisions taken by the bank management. The ability to obtain maximum profits depends on the feasible set of assets and liabilities determined by the management and the unit costs incurred by the bank for producing each component of assets (Atemnkeng and Nzongang, 2006). Commercial Banks should consider diversifying investments portfolio to minimize risk of credit takers defaulting in loans repayments and causing non-performing loans portfolios that affects profitability. The concept of revenue diversifications follows the concept of portfolio theory which states that individuals can reduce firm-specific risk by diversifying their portfolios. The proponents of activity diversification or

product mix argue that diversification provides a stable and less volatile income, economies of scope and scale, and the ability to leverage managerial efficiency across products and for the case of commercial banks, reduce non-performing Loans and increase Return on Assets which is a measure of profitability.

Anticipated Income Theory

Under this theory, bank's management can plan its liquidity based on the expected income of the borrower and this enables the bank to grant a medium and long-term loans, in addition to short-term loans as long as the repayment of these loans are linked by the borrowers expected income to be paid in the periodic and regular premiums, and that will enable the bank to provide high liquidity, when the cash inflows are regular and can be expected. Deposit money banks can manage its liquidity through appropriate credit management that is directing of granted loans, and ensuring that these loans are collected as at when due in a timely manner and minimize the possibility of delays in repayment at the maturity date (Okoh, Nkechukwu and Ezu, 2016).

This theory holds that banks' management of liquidity can be enhanced by adequate phasing and structuring of the loan commitments to the customers. According to Nzotta (1997) the theory focuses on the earning capacity and borrowers' credit worthiness as the ultimate guarantee for liquidity adequacy. It drives banks' transactions in self-liquidating commitments (Nwankwo, 1991); and encourages the adoption of ladder effects in investment portfolio of commercial banks (Ibe, 2013).

Shiftability Theory

Shiftability is the approach to keep the banks liquid by supporting the shifting of assets. When a bank is short of ready money, it is able to sell its assets to a more liquid bank. The approach allows the banking system run more efficiently: with fewer reserves or investing in long-term assets. Under shiftability, the banking system tries to avoid liquidity crises by enabling banks to always sell or repo at good prices (Okoh, Nkechukwu, and Ezu 2016). The shift ability theory is premised on the argument that banks' liquidity is a function of their capacity to acquire assets that are convertible or marketable to other lenders or investors should there be imminent need for cash, noting that the banks' assets should be marketable to the Central Bank and other financial institutions at discounted values. Thus this theory recognizes marketability or transferability of a bank's assets is a basis for ensuring liquidity. This theory was proposed by H.G. Moulton who insisted that if the commercial banks continue a substantial amount of assets that can be moved to other banks for cash without any loss of material. In case of requirement, there is no need to depend on maturities. This theory states that, for an asset to be perfectly shiftable, it must be directly transferable without any loss of capital loss when there is a need for liquidity. This is specifically used for short term market investments, like treasury bills and bills of exchange which can be directly sold whenever there is a need to raise funds by banks. But in general circumstances when all banks require liquidity, the shiftability theory need all banks to acquire such assets which can be shifted on to the central bank which is the lender of the last resort.

Empirical Review

Aduda and Gitonga (2011) explored a relation between the management of credit risk and the banks' lending profitability and concluded that management of credit risk has a great impact on commercial banks profitability. The effects of management of credit risk practices on profitability of SACCOs that are allowed to take deposits were investigated by (Makori, 2015). Al-Khoury (2011) assessed the impact of bank's specific risk characteristics, and the overall banking environment on the performance of 43 commercial banks operating in 6 of the Gulf Cooperation Council (GCC) countries over the period 1998-2008. Using fixed effect regression analysis, results showed that credit risk, liquidity risk and capital risk are the major factors that affect bank performance when profitability is measured by return on assets while the only risk that affects profitability when measured by return on equity is liquidity risk.

Ahmad and Ariff (2007) examined the key determinants of credit administration of commercial banks on emerging economy banking systems compared with the developed economies. The study found that regulation is important for banking systems that offer multi-products and services; management quality is critical in the cases of loan-dominant banks in emerging economies. An increase in loan loss provision is also considered to be a significant determinant of potential credit. The study further highlighted that credit risk in emerging economy banks is higher than that in developed economies. Ahmed and Malik (2017) investigated the influence of credit risk management practices on loan performance of Pakistani microfinance banks. Primary data was collected from 157 credit risk managers of microfinance banks in Islamabad and Rawalpindi, who were stratified into top, middle and lower level managers. The study used correlation and multiple regression analysis to evaluate the data collected from the managerial level credit risk management staff of the micro finance banks and established that credit appraisal and credit terms have significant effects on loan performance, while collection policy and credit risk control have positive but insignificant effect on loan performance. The study recommended that banks need to focus more on deployment of effective credit terms, credit risk control and credit policy, as part of measures aimed at enhancing loan performance.

Etale, Ayunku and Etale (2015) investigated the relationship between non-performing loans and bank performance in Nigeria for the period 1994-2014. The study employed ADF Unit Root test, descriptive statistics, and multiple regression techniques to analyze data collected for the study from the CBN, NDIC and annual reports of listed banks. The results of the study show that BAL and DOL had statistically negative significant influence on ROCE, while SUL had statistically negative insignificant impact on ROCE. These results show that high level of non-performing loans would reduce the performance of banks in the long run in Nigeria. The study therefore recommended that credit reporting agencies and supervising authorities should be strengthened in order to reduce the high level of non-performing loans in the banking sector of Nigeria. Ali (2015) conducted an investigation into the effects of credit risk management on the financial performance of commercial banks in Jordan during the period 2005 -2013. The purpose of the study was to examine the influence of credit risk management indicators (such as capital adequacy ratio (CAR), ratio of non-performing loans to gross loans (NPL/GL), ratio of credit interest to credit facilities (CI/CF), leverage ratio and the ratio of facilities loss to net facilities (FL/ NL)) on financial performance (profitability) of commercial banks. Profitability was measured by ROA and ROE. Panel regression in the form of pooled least squares and correlation analysis was carried out along with descriptive statistics. Stationarity of the variables was tested with the ADF. Secondary data from the annual reports of 13 banks were used and analyzed. Empirical findings indicate that the ratio of non-performing loans to gross loans positively related to financial performance and an inverse relationship was found between the ratio of facilities loss to net facilities and financial performance but no impact of CAR and CI/CF on financial performance was recorded. The study recommended an improvement in the credit management procedures through an establishment of appropriate policies. Alshatti (2015) assessed effect of credit risk management on Jordan commercial banks performance in financial perspective. The study sampled thirteen banks for the years 2005 – 2013 and established that management of credit risk impacts the banks' financial performance. From this study, it was resolved that management of credit risk indicators has a significant effect on banks' financial performance. The study recommended that banks should develop or adopt a credit risk management system to help them to improve or enhance their profits. The study focused on credit risk indicators including nonperforming loans, leverage and loss provision on facilities and not on the risk management practices like credit risk identification, appraisal, control and monitoring.

Aremu, Suberu and Oke (2016) studied the effect of credit processing and administration on non-performing loans in the Nigerian banking industry and found out that lending is one of the major functions of banks in all economies and that interest charged on loans constitutes a significant part of bank earnings. However, the possibility that loan repayment obligations may be defaulted creates miseries for the lender, the borrower and the economy as a whole. The study identified bad loans as a major threat to the profitability and stability of banks in Nigeria. It reviewed existing literatures on the concepts and theory of credit, and recommended strict adherence to the

tenets of prudential lending as laid down in the policies and regulatory framework. It emphasized its findings that, if the credit analysis and administration systems are weak, loan loss will always be huge, profitability of banks will be impaired and the economy as a whole will receive a hit.

Arko (2012) on the causes and effects of NPLs on MFIs' operations in Ghana, it was asserted that the lender should ensure that good decisions are made relative to granting of loans with the object of minimizing credit risk. In other words, the lender ought to always aim to assess the extent of the risk associated with the lending and try to minimize factors that could otherwise compromise repayment. The scholar further asserts that, needless to say, the lender should gather information regarding the prospective borrower that will assist in reaching a sound credit decision. It was noted that in order to mitigate NPLs which are occasioned by non-repayment of loans, MFIs in Ghana have adopted a standard loan request procedure and requirements that are usually contained in credit policy manual with the object of guiding loan officers and customers.

Asantey and Tengey (2014) studied the effects of bad loans on banks' lending ability and financial performance using secondary data from the annual reports of four listed commercial banks (Eco bank, GCB Bank, CAL Bank, and Agricultural Development Bank) for a 5 year period covering 2008 to 2013. The aim of the paper was to examine the effects of bad loans on the lending ability and net profit (return on investment) of the banks. Pearson correlation test and OLS were used to examine the data. The study discovered a high negative correlation between bad loans and lending ability at 0.05 alpha levels and a high negative correlation between bad loans and financial performance, measured as return on investment or net profit at 0.05 levels.

Literature Gap

The effect of credit risk management on banking business has well been documented in literature. Existing literature focused more on the effect of the variables on performance measuring various indicators of profitability. There is dearth of literature on the relationship between credit risk management and loan portfolio of commercial banks most especially the emerging financial markets of African countries and Nigeria specifically. This study focused on the existing relationship between credit risk management and loan portfolio of quoted commercial banks in Nigeria.

Methodology

The study employed the ex-post factor research design which entails the utilization of historical data to forecast future trends employing econometric or analytical techniques. The use of ex-post facto design enables researchers to analyse past trends and explain the relationship between the dependent and independent variables. The population of the study covers 24 reporting commercial banks to Central Bank of Nigeria. However, the sample size covered 13 quoted commercial banks in Nigeria existing within the time scope of this study. Panel data used in the study were collected from annual reports and various databases of the banks for financial statement for the period 2009 to 2018.

Data Analysis Method

The method of data analysis to be used in this study was the panel data multiple linear regressions using Ordinary Least Square (OLS) method. Moreover, in order to undertake a statistical evaluation of our analytical model, so as to determine the reliability of the results obtained and the coefficient of correlation (r) of the regression, the coefficient of determination (r^2), the student T-test and F-test will be employed.

1. **Coefficient of Determination (r^2) Test** –This measures the explanatory power of the independent variables on the dependent variables. For example, to determine the proportion of economic growth in our model, we used the coefficient of determination. The coefficient of determination varies between 0.0 and 1.0. A coefficient of determination says 0.20 means that 20% of changes in the dependent variable is explained by the independent variable(s).
2. **F-Test:** This measures the overall significance. The extent to which the statistic of the coefficient of determination is statistically significant is measured by the F-test. The F-test can be done using the F-statistic or by the probability estimate. We use the F-statistic estimate for this analysis.
3. **Student T-test:** measures the individual statistical significance of the estimated independent variables at 5% level of significance.
4. **Durbin Watson Statistics:** This measures the colinearity and autocorrelation between the variables in the time series. It is expected that a ratio close to 2.00 is not auto correlated while ratio above 2.00 assumed the presence of autocorrelation.
5. **Regression coefficient:** This measures the extent in which the predictor variables affect the dependent variables in the study.
6. **Probability Ratio:** It measures also the extent in which the predictor variables can explain change to the dependent variables given a percentage level of significant.

Model Specification

The study adopts the panel data method of data analyses which involve the fixed effect, the random effect and the Hausman Test.

Pooled Effect Model

$$PLP_{it} = f(\beta_1RD + \beta_2BC + \beta_3TR + \epsilon_{it}) \tag{1}$$

Fixed Effects

The fixed effects focus on whether there are differences by using a fixed intercept for each of the different cross-sectional structures. If we assumed that the dummy variable for a conglomerate company is 1 or 0, then D_i , which is the dummy variable for firm i , can be expressed as:

$$D_i = \begin{cases} 1, & i-1 \\ 0, & otherwise \end{cases} \quad D_2 = \begin{cases} 1, & i-2 \\ 0, & otherwise \end{cases} \quad \dots \quad D_N = \begin{cases} 1, & i-1 \\ 0, & otherwise \end{cases} \dots \tag{2}$$

The regression of total samples can be expressed as:¹

$$Y_{it} = \sum_{i=1}^N \beta_{oi} D_i + \beta_i D_s + \beta_2 D_{ma} + \beta_3 s_1 + \beta_{oi} D_4 s_2 + \varepsilon_{it} \dots\dots\dots(3)$$

The dummy variables are expressed as follows: if $j = i$, then $D_i = 1$; otherwise $D_i = 0$.²

To further investigate the fraud effect, Adebayo (2012) analysed whether the independent variables affect the dependent variable, this regress the effect of the independent variables on the dependent variables.

$$PLP_{it} = f(\beta_1 RD + \beta_2 BC + \beta_3 TR + \varepsilon_{it} \dots\dots\dots 4$$

Because the fixed effects account for both cross-sectional and time-series data, the increased covariance caused by individual-firms differences is eliminated, thereby increasing estimation-result efficiency.

Random Effects

Random effects focus on the relationship with the study sample as a whole; thus, the samples are randomly selected, as opposed to using the entire population. The total sample regression (a function of the random effect) can be expressed as:

$$PLP_{it} = \sum_{j=1}^N \beta_0 + f(\beta RD + \beta_2 BC + \beta_3 TR + \varepsilon_{it} \dots\dots\dots 5$$

If this is represented with random variables, then $\beta_{oj} = \bar{\beta}_0 + \mu_j$, which indicates that the difference occurs randomly, and the expectation value of β_{oi} is $\bar{\beta}_0$.⁵
(6)

Where

PLP = Performing loan portfolio proxy by log of performing loans

BRD = Bank Risk diversification proxy by log value of sectorial credits

BC = Basel Compliance proxy by risk weight assets to total capital

TR = Risk transfer proxy by log of insurance in deposit insurance corporate

A-Priori Expectations of the Variables

$$BRD_{it} > 0 \quad BC_{it} > 0 \quad \text{and} \quad TR_{it} > 0$$

the model had performing loans of the commercial banks as the dependent variables, credit risk management is expected to have a positive relationship with performing loans of the commercial banks.

Hausman Test

The Hausman test YairMundlak (1978) is the most commonly used method for evaluating fixed and random effects. If variables are statistically correlated, then the fixed-effects estimation is consistent and efficient, whereas the random-effects estimation is inconsistent, and the fixed-effects model should be adopted. Conversely, if the variables are statistically uncorrelated, then the random-effects estimation is consistent and efficient, whereas the fixed-effects estimation is consistent but inefficient, and the random-effects model should be adopted.

Pooled Regression

In testing pooled regression by using ordinary least squares (OLS) first as it is the simplest to do with panel data. We stipulated that the error term should be independently and normally distributed with zero mean and constant variance and more importantly must not correlated with the independent variables pooled OLS linear regression is given as follows:

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{4it} + \beta_4 X_{5it} + U_{it} \tag{7}$$

Where Y_{it} is the dependent variable; β_0 is a constant term; X_1 , to X_4 , are the independent variables; β_1 to β_4 are slope parameters; $i \dots n$ refer to the cross-sectional units and t is the time period.

Redundant Fixed Effect Test

The study used redundant fixed effect test, also called likelihood ratio test, to test whether the data can simply be pooled and estimated using a standard ordinary least squares regression model or affixed effects panel regression approach can be employed. The fixed effects model is simply a linear regression model in which the intercept terms vary over the individual units' i.e.

$$y_{it} = \alpha_j + x_{it}^1 \beta + \varepsilon_{it} \quad \varepsilon_{it} \approx HD(0, \sigma^2) \tag{8}$$

Where it is usually assumed that all x_{it} are independent of all ε_{it} it can write this in the usual regression framework by including a dummy variable for each unit in the model. That is

$$y_{it} = \sum_{j=1}^N \alpha_j d_{ij} + x_{ij} \beta + \varepsilon_{it} \quad \varepsilon_{it} \tag{9}$$

Where $d_{ij} = 1$ if $i = j$ and 0 elsewhere. We thus have a set of N dummy variables in the model. The parameters $\alpha_1, \dots, \alpha_N$ and β can be estimated by ordinary least squares.

The Random Effect Model

It is commonly assumed in regression analysis that all factors that affect the dependent variable, but that have not been included as repressors, can be appropriately summarized by a random error term. In our case, this leads to the assumption that they α_i are random factors, independently and identically distributed over individuals. Thus we write the random effects model as

$$y_{it} = \mu + x_{it}\beta + \alpha_i + \varepsilon_{it} \tag{10}$$

Where $\alpha_i + \varepsilon_{it}$ is treated as an error term consisting of two components: an individual specific component, which does not vary over time, and a remainder component, which is assumed to be uncorrelated over time. That is, all correlation of the error terms over time is attributed to the individual effects α_{it} . It is assumed that α_{it} and ε_{it} are mutually independent and independent of x_{js} (for all i and s). This implies that the OLS estimator for μ and β from (10.15) is unbiased and consistent.

Granger Causality Test

This study tested for causality to examine the relationship between the variables. Although regression analysis deals with the dependence of one variable on other variables, it does not imply causation. Thus, Granger causality test helps in adequate specification of model. In Granger causality, test, the null hypothesis is that no causality between two variables. The null hypotheses is rejected if the probability of F* statistics given in the Granger causality result is less than 0.05. The pair-wise granger causality test is mathematically expressed as:

$$Y_t \pi_o + \sum_{i=1}^n x_1^y Y_{t-1} \sum_{i=1}^n \pi_1^x x_{t-1} + u_1 \tag{11}$$

and

$$x_t dp_o + \sum_{i=1}^n dp_1^y Y_{t-1} \sum_{i=1}^n dp_1^x x_{y-1} + V_1 \tag{12}$$

Where x_t and y_t are the variables to be tested while u_t and v_t are the white noise disturbance terms. The null hypothesis $\pi_1^y = dp_1^y = 0$, for all I 's is tested against the alternative hypothesis $\pi_1^x \neq 0$ and $dp_1^y \neq 0$. If the co-efficient of π_1^x are statistically significant but that of dp_1^y are not, then x causes y . If the reverse is true then y causes x . However, where both co-efficient of π_1^x and dp_1^y are significant then causality is bi-directional.

Panel Data Co-Integration Test

A substantial number of these tests are based on testing for a unit root in the residuals of a panel co-integrating regression. The possibility of co-integration between the series from different alternative estimators is available. With different small and large sample properties (depending upon the type of asymptotic that is chosen).

$$y_{it} = \alpha_i + \beta_i x_{it} + \varepsilon_{it} \tag{13}$$

Where both y_{it} and x_{it} are integrated or order one. Co-integration implies that ε_{it} is stationary for each i . Homogeneous co-integration. In addition requires that $\beta_i = \beta$ if the co-integrating parameter is heterogeneous. And homogeneity is imposed. One estimate

$$y_{it} = \alpha_i + \beta_i x_{it} + [(\beta_i - \beta)x_{it} + \varepsilon_{it}] \tag{14}$$

And in general the composite error term is integrated of order one even if ε_{it} is stationary. However, the problem estimator will also average over i , so that the noise in the equation will be attenuated. In many circumstance, when noticed that it is necessary to examine the stationary of data since the use of non-stationary data can lead to spurious regressions. Unit root tests such as DF test, ADF tests etc., are weak and tend to accept the null hypothesis. Besides, individual unit root tests have limited power. Since we have panel data, Levin, Lin and Chu's (LLC) model is recommended as it allows for both entity-specific and time-specific effects. The null hypothesis is unit root exists, indicating the data is non-stationary. To introduce panel data unit root tests, consider the autoregressive model

$$y_{it} = \alpha_i + \gamma_i y_{it-1} + \varepsilon_{it} \tag{15}$$

Which we can rewrite as

$$\Delta y_{it} = \alpha_i + \pi_i y_{it-1} + \varepsilon_{it} \tag{16}$$

Where $\pi_i = \gamma_i - 1$. The null hypothesis that all series have a unit root then becomes $H_0 : \pi_i = 0$ for all i . a first choice for the alternative hypothesis is that all series are stationary with the same mean-reversion parameter, that is, $H_1 : \pi_i = \pi < 0$ for each country i , and is used in the approaches of models. The combined test statistics is given by:

$$P = -2 \sum_{i=1}^N \log p_i$$

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For fixed N , this test statistics will have a Chi-squared distribution with $2N$ degrees of freedom as $T \rightarrow \infty$,

Results and Discussion

Table 1: Presentation of Panel Unit Root Test

Method : Series: PLP	Statistic	Prob.**	Cross-sections	Obs
Panel Unit Root At Level				
Levin, Lin & Chu t*	-4.71770	0.0000	13	104
Im, Pesaran and Shin W-stat	-1.12077	0.1312	13	104
ADF - Fisher Chi-square	32.5198	0.1765	13	104
PP - Fisher Chi-square	23.5538	0.6015	13	117
Series: D(TR)				
Levin, Lin & Chu t*	-5.11504	0.0000	13	91
Im, Pesaran and Shin W-stat	-0.85614	0.1960	13	91
ADF - Fisher Chi-square	37.2186	0.0714	13	91
PP - Fisher Chi-square	74.0302	0.0000	13	104
Series: BRD				
Levin, Lin & Chu t*	-1.12963	0.1293	13	104
Im, Pesaran and Shin W-stat	0.60320	0.7268	13	104
ADF - Fisher Chi-square	20.2254	0.7808	13	104
PP - Fisher Chi-square	31.5601	0.2081	13	117
Series: BC				
Levin, Lin & Chu t*	-5.51959	0.0000	13	104

Im, Pesaran and Shin W-stat	-3.04147	0.0012	13	104
ADF - Fisher Chi-square	55.4629	0.0007	13	104
PP - Fisher Chi-square	47.7859	0.0057	13	117

Panel Unit Root at First Difference

Series: D(PLP,2)				
Levin, Lin & Chu t*	-11.9900	0.0000	13	78
Im, Pesaran and Shin W-stat	-4.22593	0.0000	13	78
ADF - Fisher Chi-square	72.2587	0.0000	13	78
PP - Fisher Chi-square	132.403	0.0000	13	91
Series: D(TR,2)				
Levin, Lin & Chu t*	-8.88220	0.0000	13	78
Im, Pesaran and Shin W-stat	-2.71095	0.0034	13	78
ADF - Fisher Chi-square	53.4071	0.0012	13	78
PP - Fisher Chi-square	137.465	0.0000	13	91
Series: D(BRD)				
Levin, Lin & Chu t*	-16.3128	0.0000	13	91
Im, Pesaran and Shin W-stat	-4.49758	0.0000	13	91
ADF - Fisher Chi-square	71.0321	0.0000	13	91
PP - Fisher Chi-square	111.354	0.0000	13	104
Series: D(BC)				
Levin, Lin & Chu t*	-10.5227	0.0000	13	91
Im, Pesaran and Shin W-stat	-3.83207	0.0001	13	91
ADF - Fisher Chi-square	63.7304	0.0001	13	91
PP - Fisher Chi-square	98.8215	0.0000	13	104

Source: Extract from E-view, 2020

The table 1 test panel unit root on the relationship between bank is diversification, Basle compliance and risk transfer and performing loans of quoted commercial banks in Nigeria, from the table we can conclude that the results of panel unit root test (IPS test) reported support the hypothesis of a unit root in all variables across among the variables, as well as the hypothesis of zero order integration in first differences. Even at one per cent significance level, we found that all tests statistics in both with and without trends significantly confirm that all series strongly reject the unit root null at fist difference. Given the result of IPS test, it is possible to apply panel cointegration method in order to test for the existence of the stable long–run relation among the variables.

Table 2: Presentation of Multiple Regression Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Fixed regression model				
TR	-0.338806	0.157153	-2.155899	0.0332
BRD	0.310404	0.112929	2.748666	0.0070
BC	0.070094	0.038187	1.835546	0.0690
C	5.526666	0.698378	7.913569	0.0000
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.574688	Mean dependent var		6.014077
Adjusted R-squared	0.518726	S.D. dependent var		0.873964
S.E. of regression	0.606304	Akaike info criterion		1.951946
Sum squared resid	41.90685	Schwarz criterion		2.304873
Log likelihood	-110.8765	Hannan-Quinn criter.		2.095352
F-statistic	10.26922	Durbin-Watson stat		1.202889
Prob(F-statistic)	0.000000			
Random regression model				
TR	-0.268080	0.132208	-2.027711	0.0447
BRD	0.337411	0.110673	3.048706	0.0028
BC	0.055819	0.037188	1.501018	0.1359
C	5.099063	0.553082	9.219368	0.0000
Effects Specification				
			S.D.	Rho

Cross-section random		0.622254	0.5130
Idiosyncratic random		0.606304	0.4870
Weighted Statistics			
R-squared	0.887795	Mean dependent var	1.770910
Adjusted R-squared	0.666076	S.D. dependent var	0.628523
S.E. of regression	0.607403	Sum squared resid	46.48624
F-statistic	6.042285	Durbin-Watson stat	1.092475
Prob(F-statistic)	0.000090		
Unweighted Statistics			
R-squared	0.664021	Mean dependent var	6.014077
Sum squared resid	92.22378	Durbin-Watson stat	0.673693
Correlated Random Effects - Hausman Test			
		Chi-Sq	
Test Summary		Statistic	Chi-Sq. d.f. Prob.
Cross-section random		3.457394	3 0.3263

Source: Extract from E-view, 2021

The Hausman (1978) specification was used to determine the appropriate method fixed or random effects models. According to above table shows Hausman specification test the model has the value of $p = 0.3263$ for the regression model of dependent and independent variables. This shows random effect model is more appropriate, because the null hypothesis is accepted. Therefore, this includes insignificant P-value, $\text{Prob} > \chi^2$ larger than 0.05, then it is more suitable to use random effects. The adjusted R^2 from the table 0.666076, this implies that 66.6 per cent variations in the performing loans portfolio can be accounted for by the independent variables. This means 33.4 per cent of variations in the performing loans of the quoted commercial banks are explained by exogenous variable. This showed that the independent variable values have at 67 per cent significant influence on performing loans portfolio of the commercial banks. This also indicates that there are other variables that influence the variations in the level of performing loans. The **F-statistics** (Fisher statistics which is a measure of the overall goodness of fit of regression) of 6.04228 and probability of 0.000090 which implies that the regression model fitted the data, therefore there is goodness of fit. **D-W** statistics also showed significant values. The value of the DW statistics which ranges from 1.092475 further indicates that the regression equation is free from the problem of autocorrelation. Hence, the results can be relied upon to make meaningful inferences Furthermore, from the random effect results it evidence that bank risk diversification and Basle compliance have positive relationship with performing loans portfolio while risk transfer have negative relationship with performing loans of the commercial banks. The estimates model paved that the regression intercept is positive and significant which implies that holding other variables constant, performing loans of the commercial banks increases b 5.09 units

Table 3: Presentation of panel cointegration test

	<u>Statistic</u>	<u>Prob.</u>	<u>Weighted Statistic</u>	<u>Prob.</u>
Panel v-Statistic	-1.767485	0.9614	-2.915092	0.0028
Panel rho-Statistic	1.687878	0.9543	2.901986	0.0118
Panel PP-Statistic	-2.845995	0.0022	-2.245511	0.0124
Panel ADF-Statistic	-0.398802	0.3450	-2.061723	0.0196
Alternative hypothesis: individual AR coefs. (between-dimension)	<u>Statistic</u>	<u>Prob.</u>		

Group rho-Statistic	4.231621	0.0000
Group PP-Statistic	-1.946414	0.0258
Group ADF-Statistic	-1.481116	0.0493

Source: Extract from E-view, 2021

The next step is to test whether the variables are cointegrated using Pedroni’s (1999, 2001, 2004). This is to investigate whether long–run steady state or cointegration exist among the variables and to confirm what Coiteux and Olivier (2000) state that the panel cointegration tests have much higher testing power than conventional cointegration test. Since the variables are found to be integrated in the same order I (1), we continue with the panel cointegration tests proposed by Pedroni (1999, 2004). Cointegrations are carried out for constant and constant plus time trend and the summary of the results of cointegrations analyses are presented in table 4.4. In constant level, we found that the seven statistics reject null hypothesis of no cointegration at the five per cent level of significance for the ADF statistic and group ρ –statistic, while the group –ADF is significant at one percent level.

Table 4: Pairwise Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.
TR does not Granger Cause PLP	104	0.66171	0.5182
PLP does not Granger Cause TR		0.25656	0.7742
BRD does not Granger Cause PLP	104	1.26483	0.2868
PLP does not Granger Cause BRD		0.06466	0.9374
BC does not Granger Cause PLP	104	2.55014	0.0832
PLP does not Granger Cause BC		0.33382	0.7170

Source: Extract from E-view, 2021

As summarized in table 4, a unidirectional causal relationship has been found between Basle compliance and bank risk diversification indicator of the commercial banks which is significant at 5 per cent probability, because the p-value is < 0.05. The study found no the causality among the variables.

Discussion of Findings

After cross examination of the fixed effect and the random effect regression results, the study adopted the random effect model. The estimated model found that the explanatory variables can explain 66.6 per cent variations on the performing loan portfolio of the commercial banks over the periods covered in this study. Further examination of the results from the f-statistics and probability justifies that the model is significant. The estimated beta coefficient of the variables indicates that bank risk diversification have positive and significant effect on performing loan portfolio of the commercial banks, the coefficient justifies that a unit increase on the variables adds 0.33 units to performing loan portfolio while the results further proved that Basle compliance have positive but no significant effect on the dependent variable such as that unit increase can lead to 0.05 unit increase on performing loan portfolio.

The positive relationship between bank risk diversification and Basle compliance confirm our a-priori of the study and justifies the objective of risk diversification and the formulation of Basle risk compliance strategies. The positive effect of bank risk diversification on performing portfolio of the commercial banks confirm the modern portfolio theory which tries to explain how investors could maximize their returns and minimize their risks by diversifying in different assets. Markowitz (1952) and Tobin (1958) showed that it was possible to identify the composition of an optimal portfolio of risky securities, given forecasts of future returns and an appropriate covariance matrix of share returns. The positive findings further confirm risk management theory that market and credit risks would have either direct or indirect effect on banks survival (Eichhorn, 2004) which revealed a strong association between the credit scoring and the performance in financial perspective of the SACCOs and found that credit administration in deposit-taking SACCOs had a strong relationship with performance in financial perspective. The findings of Wangi et al., (2014) that financial performance of Kenyan microfinance industry has been impacted by Non-Performing Loans and the effects on the survival of small and medium enterprises. However, the result as presented in table 2 indicates that risk transfer have negative and significant relationship with performing loan portfolio of the commercial banks. The coefficient of the variable indicates that if the variable is increase by a unit, performing loans of the commercial banks will reduce by 0.26 units. The finding is contrary to our a-priori expectation. The negative relationship between the variable can be traced non-compliance of the commercial banks to relevant rule and regulations guiding then operation Nigeria Deposit Insurance Corporation as established in 1988. It could also be traced to poor credit risk management strategies of the commercial banks. The negative effect of the variable contradicts the findings of Roman and Tomuleasa (2013) that the increase in non-performing loans had a negative impact on banks profitability. Saba, Kouser & Azeem (2017) that real total loans have positive significant effect on non-performing loan portfolio, Shingjergji (2013) that total loans level is positively influencing the NPLs means increased loans level will result in increased level of NPLs and the findings of Sufi and Qaisar (2015) that credit terms and appraisal of clients has a positive and a significant impact on performance of loan, whereas credit policy and control of credit risk has insignificant but positive effect on loan performance.

Conclusion

The regression result proved that 66.6 per cent variations in the performing loans portfolio can be accounted for by the independent variables. The random effect results found that bank risk diversification and Basel compliance have positive relationship with performing loans portfolio while risk transfer have negative relationship with performing loans of the commercial banks. From the findings, the study concludes that there is significant relationship between bank risk diversification, Basel compliance and risk transfer and commercial banks performing loan portfolio in Nigeria.

Recommendations

1. The study recommends that for commercial banks to have performing portfolio all times, they should have loan portfolio management which will help them in making prudent decisions about loan investment mix and internal policy, matching loan portfolio to credit risk.
2. Level of loan asset allocation for banking institutions should be balanced against risk of the operating environment.
3. Loan product diversification across different sectors and products has beneficial effects on the credit risk management. Commercial banks in Nigeria should put more emphasis on risk management and credit worthiness analysis, credit score analysis and internal ratings in their credit risk management practices.
4. Risk diversification is one major way of effective credit risk management; therefore, management should enhance risk diversification policies.

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