Credit Risk Management and Deposit Money Banks' Performance in Nigeria

Ejem, Chukwu Agwu[1], Okore, Chinedu Samuel[2], Effe-Nnamdi, Ann Chinenye [3]
Abia State University, Uturu, Nigeria
ecjah71@yahoo.com

ABSTRACT

This study examined the relationship between credit risk management and performance of deposit money banks in Nigeria. It was mainly conceived to unravel the causes of the incessant loan delinquencies and its resultant effect on the performance of deposit money banks in Nigeria, despite the various credit policies used by the monetary authorities to curtail them. To achieve this study, data for empirical analysis were sourced from the Nigerian deposit insurance cooperation spanning from 1990 to 2020. Error Correction Mechanism was employed to estimate the various models specified. It was found among others that non-performing loans (credit risks) exert significant impact on bank performance within the period of the study, while average liquidity ratio insignificantly relates to bank performance within same period. In the light of the above findings, the researchers recommend among others that the monetary authorities should intensify their regulatory as well as their supervisory role as it concerns the reduction of the volume of bad loans granted by banking system in Nigeria. Also, that deposit money banks should adopt a workable credit policy to forestall delinquent loans.

Keywords: *Non-performing Loans, Liquidity Risk, Bank Performance, ECM, Nigeria*

1.1 Introduction

The important role of banking sector in economic growth and development in developed and developing economies has been acknowledged by scholars, economists, accountants, researchers, and professionals. The banking sector contributes to the real productivity of the economy and the overall standard of living since banks can simultaneously satisfy the needs and preferences of both surplus and deficit units. The banking industries in any economy across the globe are the most important financial sector because of their ability to mobilize funds from the surplus sector and facilitate the same to the deficit sector of the economy. Deposit Money Banks play a crucial role in the financial sector through lending. Bank lending is dispensable because it makes possible the financing of agricultural, industrial, and commercial activities of a country (Uwuigbe, et al, 2015; Collins et al, 2017). The failure or success of these banks will to a large extent affect the financial sector and the economy at large. This implies that banks are the major determinant of financial inclusion because they allocate funds from savers to borrowers in an efficient manner (Ogunlade & Oseni, 2018). Risk inherent in banking business are part of its maturity transformation (borrowing short and lending long). The foundation of doing this according to Nwankwo (1991) is the probability that it will not

be called upon at any one time to redeem all its obligations, provided it manages their affairs prudently. Banks use customers deposit to generate credit for their borrowers which in fact is a revenue generating activity for banks. This credit creation process exposes the banks to high default risk which might lead to financial distress including bankruptcy.

Meanwhile, the sensitive aspect of bank's market interaction is their ultimate role in payment system. Operating within the central role of the payment system exposes the participants to variants of risks. The most pervasive of the risks are credit risk and liquidity risk. Credit risk is the risk that one party in a transaction may not be able to meet up with its obligation because of insolvency; liquidity risk is probability that the counterparty will not be able to settle on time (Lindgren et al, 1996). No wonder Njoku et al, (2017) believed that credit management for banks cannot be overemphasis and it also forms an integral part of the loan process. Njoku et al, (2017) went further to argue that Credit risk management maximizes bank risk adjusted risk rate return by maintaining credit risk exposure with a view to shielding the bank from the adverse effect of credit risk. Credit risk management is all about identification of and mitigation against dangerous situations or obstacles (risks) likely to stand against the ability of someone that has been trusted to borrow money today and pay back tomorrow. Credit analysis is simply an undertaking to put all prescribed facts and figures together with a view to determining whether the credit applicant or loan applicant is suitable for the facility. Each of these constituents of credit management is heavily loaded with operational activities. Looking closely at these clarifications, credit management truly has three major components: credit analysis, credit administration and credit risk management or measurement. Credit policy and procedure manual of an organization must clearly reflect these pillars to be effective. Each pillar is loaded with an enormous number of activities so that it can stand alone as a department with sufficient staff. By creating wealth and transferring it from deficit to surplus units through the extension of loans and advances, financial institutions, specifically banking institutions, perform the function of financial intermediation. However, the stability of the financial system plays a crucial role in boosting economic growth just as its collapse can have a disastrous effect on the economy (Lindgren et al, 1996).

Researchers and theorists have made frantic efforts to unravel the linkage between credit risks and banks' performance. As a result, a good number of researchers recently have been able to come up with findings that could be reliable, though are still undecided and unending. Okeke et al (2018) examined the extent to which banks risk management affect banks' performance, with emphasis on credit and liquidity risks and impact on the performance of deposit money banks in Nigeria. Okeke et'al (2018) came out boldly to state that a positive relationship exists between risk management and banks' performance of Nigerian deposit money banks. Almekhlafia et al, (2016) investigated the relationship between credit risk and Deposit Money Banks' performance in Yemen and were able to find a negative relationship existing non-performing loan (credit risk) and performance of banks in Yemen. In this same way, Zhongming et al, (2019) conducted the same research on credit risk and Deposit Money Banks' performance in China and found that non-performing loan has a mitigating impact on bank performance. Most banks in Nigeria in the past and till now do not have clearly defined and adherently implemented credit lending policies. What exist is more or less "discretion or good judgment 'lending' a practice which has fueled unacceptable incidence of bad debt stock,

leading to crisis and depletion on liquidity position of the banks. Credit risk as a major factor responsible for distress and collapse of majority of the banks that have folded. To this end, various policies and credit guidelines were formulated which include such risk management, corporate governance, knowing your customer (KYC), anti-money laundering, counter financing of terrorism, loan loss provisioning, peculiarities of different loan types and financing different sectors of the economy, among others. Despite these series of guidelines, banks continue to witness a high level of credit default and non-performing loans. The Nigerian banking sector continues to be faced with high volume of non-performing loans leading to high number of distressed banks over the past three decade. (Ogbulu & Eze, 2016) have shown that credit risk tends to have negative effect on banks profitability. Its resultant effects have led to the acquisition and takeover of perceived reputable banks and other contagion effects on the economy as whole. This is notwithstanding the immeasurable mitigating policies and regulations from the Central Bank of Nigeria (CBN) and the Nigerian Deposit Insurance Commission (NDIC). However, this study is conceived to further investigate the incessant cases of delinquent loans and under performance of deposit money banks in Nigeria, hence will examine the relationship between Nigerian deposit banks' performance and credit risk.

The remaining sections of this study are organized as follows; section two takes care of review of related literature; section three addresses the materials and methods of analysis adopted; section four analyses the data, results, and interpretation while section five handles conclusion and recommendations for policy making.

2. Review of Related Literature

This section examined related works of literature that have relevance to this study. It looked at previous work that has been done by others in this area and is dissected under Conceptual, Theoretical Framework and Empirical Review

2.1 Conceptual Framework

As documented in CBN (1992), credit is the money that banks give out as loans and advances with future date of repayment. The Central Bank of Nigeria (CBN) Prudential Guidelines of 2010 however provides a wider definition of credit, and this includes aggregate of all loans, advances, overdrafts, bills discounted banks guarantees, banks acceptances, commercial papers, leases, and indemnities. Credit is the money from the lender to the borrower. Spencer (1977) noted that credit implies a promise by one party to pay another for money borrowed or goods and services received. Credit cannot be divorced from the banking sector as banks serve as a conduit for funds to be received in the form of deposits from the surplus spending unit of the economy and passed on to the deficit spending units who need funds for productive purposes. Banks are therefore debtors to the depositors of funds and creditors to the borrowers of funds.

Yakubu and Affoi (2013) thus defined bank credit as the borrowing capacity provided to an individual, government, firm, or organization by the banking system in the form of loans. Bank credit is often accompanied by some collateral that helps to ensure the repayment of the loan in the event of default. Credit channels savings into productive investment thereby encouraging economic growth.

Thus, the availability of credit allows the role of intermediation to be carried out which is important for the growth of economy. The total domestic bank credit can be divided into two: credit to the private sector and credit to the public sector (Okwo et al 2012). Credit risk emanates from a bank's dealing with individuals, corporations, financial institutions, or a sovereign. Deposit money banks are exposed to credit risk through their trading, financing, and investing activities and in cases where they act as an intermediary on behalf of customers or other third parties or it issues guarantees. The amount of credit risk exposure in this regard is represented by the carrying amounts of the loans and advances on the balance sheet (Drigă, 2012).

Pânzaru (2011) noted that credit risk includes three risks: default risk, exposure risk and recovery risk, in a bank's loan portfolio, credit risk includes the transaction Risk, intrinsic Risk and concentration Risk. For each of these aggregations, the bank should define appropriate and reasonable portfolio concentrations necessary to mitigate against the exposure. Credit risk refers to delinquency and default by borrowers, i.e., failure to make payment as at when due or non-payment by those owing the firm. The need to include delinquency derived from the importance usually attached to the time value of money in financial analysis: one naira received today is worth more than one naira received in the future. While delinquencies indicate delay in payment, default denotes non-payment, and the former, if unchecked, leads to the latter (Padmanabhan, 1988). Non-payment of loans has several undesirable consequences. It reduces the business value of the bank that granted the loan and destabilizes the credit system. When defaulters are big farmers, the system becomes unjust as they are subsidized by small farmers who repay promptly.

Deposits are defined as funds placed in a financial institution by economic surplus units such as householders, corporations, investors, and government. These funds can either be from cash, claims to money, like cheques placed in depositor's accounts, bank loans or money from investments. Deposits, Aliyu (2010), are funds that customers place with a bank and the bank is obligated to repay them on demand, after a specific period or after expiration of some required notice period. Bank Deposit is money placed into a banking institution for safe keeping. The authors stressed further that bank deposits are made to deposit accounts at a banking institution, such as savings accounts, current accounts, and time deposit accounts. The account holder has the right to withdraw any funds deposited, as set forth in the terms and conditions of the account. The deposit itself is a liability owed by the bank to the depositor and refers to this liability rather than to the actual funds that are deposited. In the banking sector, deposit mobilization is a scheme intended to encourage customers to deposit more cash with the bank and this money in turn will be used by the bank to disburse more loans and generate additional revenue for them. The main business for banks is accepting deposits and granting loans. The more loans the banks disburse the more profit they likely make. Also, banks do not have a lot of their own money to give as loans. They depend on customer deposits to generate funds for granting loans to other customers. Deposit mobilization is the most important function of commercial banks since their successful functioning depends on the extent of funds mobilized. In Nigeria, the government has directed banks from time to time to make all possible efforts to mobilize new deposits, which can expedite the pace of lending activities. Historically, monetary incentives have been used to reward bank employees for good job performance. Monetary rewards have been tied to the achievement of sales or target deposits. Thus, the staff financial incentive scheme in the banking

industry is mostly designed to have positive and powerful effects on productivity in terms of deposit mobilization. For Omolayo and Owolabi (2010), most financial incentive schemes or bonuses in banks are designed in a manner that only better performing staff (especially marketers) are rewarded with higher salaries or bonuses. In the banking sector in Nigeria marketers are given higher compensation for working better and harder in meeting or exceeding targets given to them. As a marketer, your ability to mobilize more deposits earns you financial reward.

2.1.1 Bank Credit risk and deposit money bank Performance

The role of finance in terms of bank credit has well been acknowledged by researchers. The function of banks as financial intermediaries involves channeling funds from the surplus unit to the deficit unit of the economy, thus transforming deposits into loans or credits. The role of bank credit in economic development has been recognized as credits are obtained by the various economic agents to enable them to meet investment operating expenses (Okwo et al, 2012). For instance, business firms obtain credit to buy machinery and equipment, farmers obtain credit to purchase machines such as tractors, seeds, fertilizers, and erect various kinds of farm buildings. Government bodies obtain credits to meet various kinds of recurrent and capital expenditures. Individuals and families also take credit to buy and pay for goods and services (Adeniyi, 2006). Ademu (2006), the provision of credit with sufficient consideration for the sector's volume and price system is a way to generate self-employment opportunities. This is because credit helps to create and maintain a reasonable business size as it is used to establish and/or expand the business to take advantage of economies of scale. It can also be used to improve informal activity and increase its efficiency. While highlighting the role of credit, Ademu (2006), further explained that credit can be used to prevent economic activity from total collapse in the event of natural disasters such as flood, draught, disease, or fire. The banking sector helps to make these credits available by mobilizing surplus funds from savers who have no immediate need for such funds and thus channels such funds in the form of credit to investors who have brilliant ideas on how to create additional wealth in the economy but lack the necessary capital to carry out the ideas.

It is instructive to note that the banking sector has stood out in the financial sector as of prime importance because in many developing countries of the world the sector is virtually the only financial means of attracting private savings on a large scale, Mckinnon (1980) as cited by Adeniyi (2006). According to Adekanye (1986) in making credit available, banks are rendering a great social service because through their activities, production is increased, capital investment is expanded, and a higher standard of living is realized. However, in Nigeria as in many other developing countries, the ratio of bank credit to the private sector to GDP has not increased significantly. Transformation in the economy implies a movement from a particular level of development to a more acceptable level of development (Todaro,1997). Rapid transformation of economy depends on the available resources, manpower and capital. Capital is defined as a factor of production, not required for immediate consumption but to help expedite the production process, and therefore capital is often regarded as the nucleus of economic development of any nation, capital accumulation in any economy depends on the roles of the banks (Oyetayo & Oladipe 2010).

2.2 Theoretical Review

The following theories are reviewed to properly elucidate the relationship between credit risk and performance of deposit money bank.

2.2.1 Anticipated Income Theory: This theory states that banks should involve themselves in a broad range of lending which may include long-term loans to business, consumer installment loans and amortized real estate mortgage loans because the likelihood of loan repayment which generates a cash flow that supplement bank liquidity depends on the anticipated income of the borrower and not the use made of the funds per se. This implies that a high excess reserve increases profitability of banks by increasing the availability of loanable investment funds (Nwankwo,1991; Ekpung et al, 2015).

2.2.2 Liability Management Theory: The theory holds that banks could satisfy any liquidity need and short-run profit opportunity by issuing money market liabilities such as certificate of deposit (CD). Another version of the theory states that money market bank liabilities should be used along with bank assets to meet liquidity needs, which will lead to Deposit Money Banks' profitability (Nwankwo,1991; Ekpung et al, 2015).

2.2.3 Shiftability Theory: The central thesis of this theory holds that the liquidity of a bank depends on its ability to shift its assets to someone else at a predictable price. Better still, the theory of shiftability exposes the banks' vulnerability to government security for liquidity. Whether or not a bank can quickly realize liquidity through this means depends on the marketability of the securities and their relative prices. The theory tries to broaden the list of assets demanding legitimate for ownership and hence redirected the attention of bankers and the banking authorities from loan to investment as source of bank liquidity. It is hypothesized that an increase in capital investment will lead to Deposit Money Banks' profitability. However, an increase in profits may also motivate further increase in capital investment, which in turn expands the scope of banking operations for increased profitability. Adequate capital investment provides for a bank to perform the intermediation function and provide related financial services. It also provides protection in conditions of near economic collapse against unanticipated adversity leading to loss more than normal expectations and permits banks to continue operations in periods of difficulty until a normal level of earning is restored (Nwankwo,1991; Ekpung et al, 2015).

2.2.4 Commercial Loans Theory (Real Bill Doctrine): This theory states that the liquidity of the commercial bank achieved automatically through self-liquidation of the loan, which being granted for short periods and to finance the working capital, where borrowers refund the borrowed funds after completion of their trade cycles successfully. According to this theory, the banks do not lend money for the purposes of purchasing real estate or consumer goods or for investing in stocks and bonds, due to the length of the expected payback period of these investments, whereas this theory is proposed for traders who need to finance their specific trading transactions and for short periods (Akinwumi et al, 1997).

2.3 Empirical Review

Outside Africa, Zhongming et al, (2019) established the nexus of credit risk management and bank performance, employing variants of panel data analysis techniques. The results among others disclosed that non-performing loans has a mitigating impact on bank performance in China.

In the same vein, Almekhlafia et al, (2016) examined credit risk and commercial banks' performance in Yemen using panel model analysis techniques. After a thorough analysis, it was found that non-performing loans negatively affects the bank performance of banks in Yemen. It was also established that credit risk management and its effect on banks performance are similar across banks in Yemen.

In Iran, Ahmadyan (2018) looked at measuring credit risk management and its impact on bank performance using panel data analysis method on financial statements of banks for the period of 2005 to 2016 inclusive. The result of the study showed that there was a significant relationship between risk management and profitability and bank survivability implying risk management impact significantly on banks' performance.

Wood and McConney (2018) examined the impact of risk factors on the performance of the commercial banking sector in Barbados using a quarterly data for period of 2000 to 2015. The study employed multiple regression models which include several risk variables and other factors which might influence the bank's financial performance. The study revealed among others that credit risk exerted a negative impact on performance, thus added that banks must ensure they adopt appropriate measures to minimize the impact of credit risk.

In Nigeria, Okere et al, (2018) examined the degree to which banks' risk management (credit and liquidity risks) have impacted performance of Nigeria Deposit Money Banks. They used panel data analysis techniques and descriptive statistics to reveal that there is a positive relationship between risk management and financial performances of Nigerian deposit money banks.

Njoku et al, (2017) x-rayed whether credit risk management impact the performance of commercial banks in Nigeria with panel regression model. The study found that credit risk management has a significant impact on the performance of Deposit Money Banks in Nigeria.

Still in Nigeria, Kolapo et al, (2012) made an enquiry into the effect of credit risk on the performance of commercial banks over the period of eleven years (2000-2010) employing panel data estimation technique for analysis. The result showed that the effect of credit risk and bank performance measured by the return on assets of banks is cross sectional invariants.

Ogbulu and Eze (2016) investigated the impact of credit risk management on the performance of deposit money banks in Nigeria using the ECM and Granger causality techniques in addition to the IRF and VDC methodology. Data for the study were sourced from the CBN Statistical Bulletin and the Annual Reports and Accounts of the NDIC for the period 1989 to 2013. The findings of the study demonstrate that the selected credit risk management indicators under study significantly impact on the performance of deposit money banks measured as return on equity, return on total assets, and

return on shareholders' fund respectively. However, the findings report no evidence of significant granger causality relationship between the various credit risk management indicators and the various measures of performance except for a uni-directional granger causality relationship from Return on Equity (ROE) to RNPD and from Return on Total Assets (ROTA) to RNPS respectively. Based on the foregoing, it recommended that given the observed significant relation between credit risk management and performance, deposit money banks in Nigeria should always pay particular attention to their credit risk management policies to significantly improve on the performance of these banks.

Ogundayo et al, (2020) investigated the impact of credit risk management on profitability of listed Deposit Money Banks in Nigeria during the period 2013-2017. The study employed the use of multiple regression techniques. The results indicated that credit risk management has a significant positive effect on banks profitability. Specifically, Non-Performing Loan (NPL) was significantly negative, LLP was insignificantly positive while loan and advances had a significant positive impact on performance.

Munangi and Sibindi (2020) investigated the impact of credit risk on the financial performance of South African Banks for the period 2008 -2018. Panel data techniques were employed for the study via the RE and FE models. Non-performing loans were found to have a negative relationship with performance, capital adequacy was found to have a positive relationship with performance.

Alphonsus (2019) also examined the importance of credit risk management by the deposit money banks and scrutinized its positive and negative impacts on the financial position of the banks and the economy. He recommended major steps to be deployed by the banks to ensure good credit management that will usher in confidence in the lending policy of the banks, by enunciating steps to be taken in the administration of credits to eliminate the possibilities of the loans crystalizing into bad debts. The government should establish a special bank tribunal, for quick dispensation of court cases related to fraud in the banking sector. He also advised The Central Bank of Nigeria should ensure effective and consistent regulation and supervision of the banks to maintain stability in the banking industry in line with one of its core mandates "to promote a sound financial system in Nigeria. He also emphasized that the CBN should equip the newly established credit bureau to track down defaulters of bank credits. The credit bureau database should be electronically available to all who need the information. This would enable the banks to avoid lending them to those habitual defaulters.

Alobari et al, (2018) examined the impact of credit management and bank performance in Nigeria. The study adopted cross sectional survey design. The population of the study consisted of all management staff of Deposit Money Banks operating in Nigeria. The sample size of eleven (11) select commercial banks were considered by systematic technique. The Purposive sampling technique was adopted; hence six respondents were administered questionnaire (Bank Manager and five senior staff) from each bank to make up 66 respondents for the study. Multiple regression analysis was adopted for the study to determine the influence of credit management variables on financial performance. The study revealed that credit management has a significant impact on bank performance in Nigeria. The study also revealed that among the credit management variables considered, credit risk control has the highest driving force for bringing about an effective financial

performance of bank in Nigeria. It was recommended that financial institutions should not only take credit management seriously but should recognize the role of the credit risk section if they aim at increasing profitability.

Taiwo and Agwu (2017) carried out research on the impact of credit risk management on the performance of Nigeria's Deposit Money Banks (DMBs) and Bank lending growth over the period of 17 years (1998- 2014) using secondary data obtained from CBN Statistical bulletin 2014 and World Bank Information (WDI) 2015. The study used multiple linear regression models to analyze the time series data. The result revealed that sound credit management strategies can improve investors and savers' confidence in banks and enhance growth in funds for loans and advances which lead to increased bank profitability. The study further showed that credit risk management has an insignificant effect on the growth of total loans and advances by Nigerian Deposit Money Banks and suggested that DMBs in Nigeria should strictly abide by credit appraisal policies which ensure that only credit worthy borrowers are granted credit facilities.

3. Materials and Methods

3.1 Sources of Data

The study employed aggregated data collected from Nigeria Deposit Insurance Commission (NDIC) 2021 for credit risk proxied by non-performing loan to total loan (NPLTL) (non–performing loans) and average liquidity ratio (ALR) and return on assets (a proxy of bank performance) from 1990 to 2020.

3.2. Model Specification

The function of the model is specified as follows.

Bank Performance $= f$ (Risk Factor) (1)

Bank Performance $= f$ (Non-performing Loan to Total Loan, Average Liquidity Ratio) (2)

ROA $= f$ (NPLTL, ALR) (3)

While the explicit form in the first difference is.

ROA $= b_0 + +b_1 NPLTL_{t-1} + b_2 ALR_{t-1} + e_{t-1}$ (4)

LogROA $= b_0 + +b_1 logNPLTL_{t-1} + b_2 logALR_{t-1} + e_{t-1}$ (5)

Where, ROA = Return on Asset (Bank Performance, NPLTL = Non-performing Loan to Total Loan, ALR = Average Liquidity Ratio, e_t = Stochastic Elements

3.3 Technique of Data Analysis

In this study, the following tools are employed in the analysis and estimation; the Augmented Dickey Fuller (ADF) unit root test is used, to determine if long run relationship exists between the dependent and independent variables in this study, Johansen Cointegration is used. In testing for

multicollinearity and global utility of specified models, the correlation matrix and ordinary least square (OLS) are engaged. To examine the interplay of the long run and short-term fluctuations in the model, error correction model (ECM) is used.

3.4. Description of tools

3.4.1. Unit Root Test

To stem the problem of spurious regression, it is important that the time series properties of the data set employed in the estimation are ascertained. It might be reasonable to test for the presence of unit root in the series using the Augmented Dickey Fuller (ADF) unit root test to test for the stationarity of the variables (Brooks, 2008). Unit root tests are tests for stationary in a time series. A time series has stationarity if a shift in time doesn't cause a change in the shape of the distribution; unit roots are one cause for non-stationarity. The ADF handles bigger, more complex models. It does have the downside of a fairly high Type I error rate.

Deriving from AR (p) representation, the ADF test involves the following regression:

No constant, no trend: $\Delta y_t = \gamma y_{t-1} + v_t$ (1)
Constant, no trend: $\Delta y_t = \alpha + \gamma y_{t-1} + v_t$ (2)
Constant and trend: $\Delta y_t = \alpha + \gamma y_{t-1} + \lambda_t + v_t$ (3)

The Augmented Dickey Fuller adds lagged differences to these models:

No constant, no trend: $\Delta y_t = \gamma y_{t-1} + \sum_{s=1}^{m} a_s \Delta y_{t-s} + v_t$ (4)

Constant, no trend: $\Delta y_t = \alpha + \gamma y_{t-1} + \sum_{s=1}^{m} a_s \Delta y_{t-s} + v_t$ (5)

Constant and trend: $\Delta y_t = \alpha + \gamma y_{t-1} + \lambda_t + \sum_{s=1}^{m} a_s \Delta y_{t-s} + v_t$ (6)
Let Υ_t be a time series.

3.4.2. Co-integration Test

It is often said that co-integration is a means for correctly testing the relationship between two variables having unit roots (integrated order 1). Johansen's co-integration test was applied to check the co-integration between and among the variables. There are different methods of testing for co-integration but Jung and Seldon (1995) stated that Johansen co-integration test is more valid as there is no need of prior knowledge of the co-integration vectors in cases when they are unknown. According to Koirala (2009), the Johansen (1998) method of testing for the existence of co-integration relationships has become standard in the econometrics literature because of its superiority over other alternatives. According to Engle and Granger (1987), as a set of variables Yt is said to be

co-integrated of order (d,b) denoted Yt = CI(d,b) if all components of Yt are integrated of order d or b (band d > 0) and there exists a vector β= (β₁,β₂...βₙ) such that a linear combination βY$_t$ =β₁Y$_{1t}$+β₂ Y$_{2t}$+……βₙY$_{nt}$ is not integrated of order (d,b).

3.4.3. Error Correction Mechanism (ECM)

The next step is to estimate the equation using ordinary least square (OLS) technique. Having ascertained whether co-integration exists, then the next step requires the construction of error correction mechanism to model dynamics relationship. The purpose of the error correction model is to indicate the speed of adjustment from the short-run equilibrium to the long-run equilibrium state. If co-integration is accepted, it suggests that the model is best specified in the first difference of its variables with one period lag of the residual {ECM (-1)} as an additional regressor. The advantage of using error correction models (ECM) is that it incorporates the variables at both side levels and first differences and thus ECM captures the short run disequilibrium situations as well as the long-run equilibrium adjustments between variables (Mukhtar and Ahmed, 2007). Co-integration is a test for equilibrium between non-stationary variables integrated into the same order.

3.4.5. Granger Causality Test

The Granger causality test is a statistical hypothesis test for determining whether one time series is useful in forecasting another while ordinary regression reflects mere correlations. Granger causality in economics could be tested for by measuring the ability to predict the future values of a time series using prior values of another time series. To determine the direction of causality between the variables, we employ the standard Granger causality test (Granger, 1969). The test is based on error correction (ECM), which suggests that while the past can cause or predict the future, the future cannot predict or cause the past. Thus, according to Granger (1969), X Granger causes Y if past values of X can be used to predict Y more accurately than simply using the past values of Y. If a time series is a stationary process, the test is performed using the level values of two (or more) variables. In practice it may be found that neither variable Granger-causes the other, or that each of the two variables Granger-causes the other. For instance, if a signal X_1 "Granger-causes" (or "G-causes") a signal X_2, then past values of X_1 should contain information that helps predict X_2 above and beyond the information contained in past values of X_2 alone. The test is based on the following regressions:

$$Y_t = \alpha_0 + \sum\_(i = 1)\hat{}n \; \alpha_i{}^y \; Y\text{t-1} \sum_{i=1}^{n} Xt - 1 \; \alpha_i \; x + U_t \qquad\qquad (7)$$
$$X_t = \beta_0 + \sum\_(i = 1)\hat{}n \; \beta_i{}^y \; Y\text{t-1} \sum_{i=1}^{n} Xt - k \; \beta_i \; x + Y_t \qquad\qquad (8)$$

Where X_t and Y_t are the variables to be tested while U_t and V_t are white noise disturbance terms. The null hypothesis $\alpha_i{}^x = \beta_i{}^y = 0$ for all i's is tested against the alternative hypothesis $\alpha_i{}^x \neq 0$ and $\beta_i{}^y$=0. If the co-efficient of $\alpha_i{}^x$ are statistically significant but that of $\beta_i{}^y$ are not, then X causes Y. If the reverse is true, then Y causes X. However, where both co-efficient of $\alpha_i{}^x$ and $\beta_i{}^y$ are significant then causality is bi-directional.

And other Diagnostic and residual tests such as Serial Correlation, Heteroskedasticity and the Recursive Estimates of the CUSUM (Cumulative Sum Control) tests were also used to affirm the validity of the finding for policy making.

3.5: Decision Rules

3.5.1 Coefficient and Probability

The coefficient of each independent variable or explanatory variable indicates the strength and the type of relationship the independent variables have with the dependent variable. If the associated sign is positive, the relationship is positive and if negative, it is a negative relationship. That means the coefficient shows the expected change in the dependent variable for every one-unit change in the associated variable, while other variables remain constant. The T-test is engaged to examine whether an independent variable is statistically significant. The null hypothesis is that the coefficient for all purposes, equal to zero, means is not helping the model.

Whenever the probability is less than 5% at 5% significant level or less than 10% at 10% significance level, it is statistically significant, hence the null hypothesis is rejected, otherwise do not reject. Independent variables associated with a statistically significant coefficient is important to the regression model if theory supports a valid relationship with the dependent variable, if the relationship being modeled is primary linear, and if the variable is not redundant to any other independent variables in the model.

3.5.2 Durbin-Watson statistic (DW)

This is named after James Durbin and Geoffrey Watson. It is a statistic test used to check the presence of autocorrelation in the residuals from a statistical regression analysis. DW has values between 0 and 4. A value of 2 0r approximately 2 suggests no autocorrelation. Autocorrelation (lagged correlation or serial correlation) is the relationship between a variable's current values and its past values. If no autocorrelation is found, it means previous error does lead to current error and conversely. If it is less than 2 and cannot be approximated to 2, it is a positive autocorrelation. If found greater than 2 and cannot be approximated to 2, a negative autocorrelation.

4. Data Presentation and Analysis
Data on Return on assets (ROA), a proxy of Bank performance, non-performing loan to total loan (NPLTL) and Average liquidity ratio (ALR) are analyzed and interpreted in this section.

4. 1. Trend analysis of Data.

The time series plot of the data is shown in figure I below. The figure below shows that all variables (ROA, NPLTL and ALR) trended upward and downward, sometimes undulation over the period of the study, except ROA that trended smoothly with sharp upshoot in 2010, indicating non-stationarity of the variables as expected. In all the variables, there are periods of troughs and peaks. It can be recognized as outliers in the years.
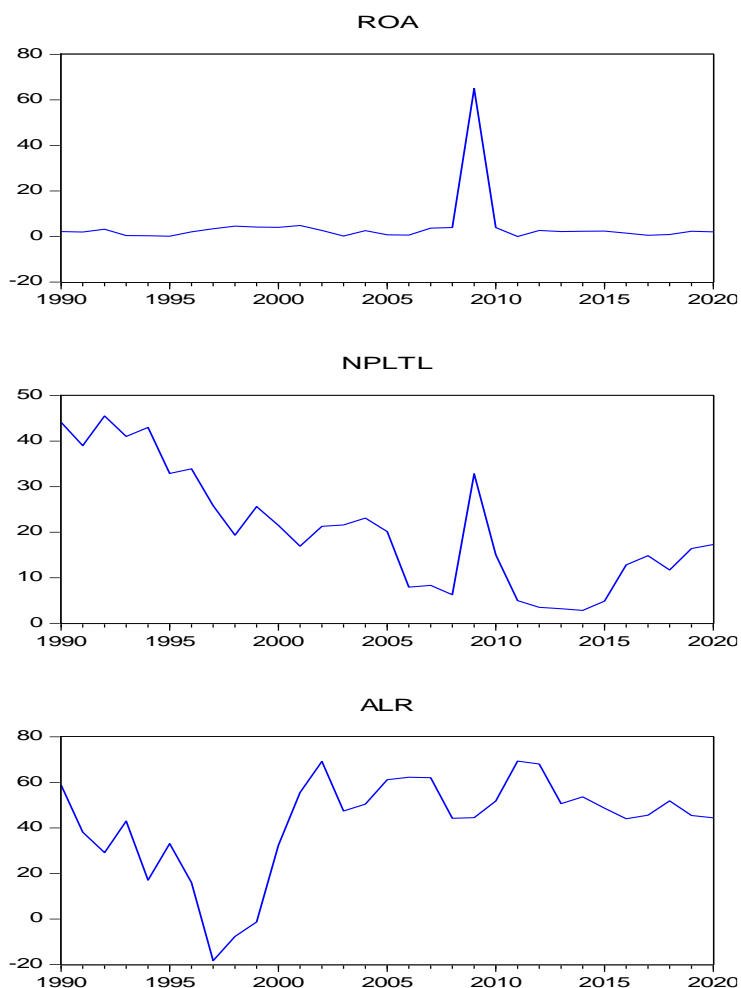
Figure 1: Trend Analysis of ROA, NPLTL and ALR

4.2. Descriptive Statistics

Table 4.2 below shows the summary of statistics that describe the distributional features of all the data. The variables recorded average of the following: 4.20%, 20.55% and 42.25%.for ROA, NPLTL, and ALR respectively. This shows ALR is higher than other variables, while ROA is the least. The risk (standard deviation) inherent in each of the variables are 11.3%, 13.o8% and 21.62% for ROA, NPLTL, and ALR respectively. These also suggest that ALR is the most volatile with ROA recording the least. ROA, and ALR showed Kurtosis greater than 3, suggesting a leptokurtic distribution, which is in excess from the normal distribution. NPLTL has Kurtosis lower than 3 indicating platykurtic distributions, suggesting that small shocks of either sign are likely to present itself with economic volatility within the scope of the study. Jarque-Bera normality distribution test statistical probability values show that ROA, and ALR have abnormal distribution while NPLTL is normally distributed. ALR has skewness with negative coefficients, confirming asymmetry in the series. It is important to point out that the skewness is negatively skewed, suggesting the distribution has a long-left tail. This shows large negative movements in interest rate are not normally followed by the same magnitude of

positive movement, whereas ROA and NPLTL have positive skewness, indicating otherwise. The wide differences in Maximum and minimum values for all the variables show conspicuous fluctuations within the scope of the study.

Table 4.2: Descriptive Statistics of ROA, NPLTL, and ALR

	ROA	NPLTL	ALR
Mean	4.209677	20.55935	42.25065
Median	2.290000	19.35000	45.56000
Maximum	64.92000	45.50000	69.29000
Minimum	-0.040000	2.810000	-18.30000
Std. Dev.	11.35591	13.08413	21.62501
Skewness	5.163432	0.440925	-1.264530
Kurtosis	28.14169	2.131213	4.141389
Jarque-Bera	954.2170	1.979416	9.944425
Probability	0.000000	0.371685	0.006928
Sum	130.5000	637.3400	1309.770
Sum Sq. Dev.	3868.704	5135.835	14029.23
Observations	31	31	31

4.3 Global Utility Test:

In macroeconomic analysis, it is pertinent to check the global utility or usefulness of the specified models. To achieve this, the researchers engaged correlation matrix and ordinary least square.

4.3.1 Multicollinearity Test

Table 4.3 below reveals the correlation of the variables. The correlations between NPLTL, ALR and ROA are 0.157854 and -0.017736 respectively, between NPLTL and ALR is -0.415019. The highest value here is 0.157854 which shows that the variables are not linearly correlated. Therefore, the researchers have sufficient evidence to say there is no presence of multicollinearity in the model.

Table 4.3: Correlation Matrix

Variables	ROA	NPLTL	ALR
ROA	1.000000	0.157854	-0.017736
NPLTL	0.157854	1.000000	-0.415019
ALR	-0.0177362	-0.415019	1.000000

The researchers now proceeded to check the global usefulness of our model by using the Ordinary Least Square (OLS) method as shown in Table 4.4 below.

Table 4.4 below depicts the Ordinary Least Square (OLS) estimated model for the relationship between credit risk variables and performance of deposit money banks. From the table Durbin-Watson statistics is 1.789433, showing absence of autocorrelation. But F-statistic value is 0.398486 with probability value of 0.675083 showing that null hypothesis cannot be rejected; there is overall insignificance and invalid for comparison. Therefore, it cannot be used for further analysis and policy formulation.

Table 4.4: Ordinary Least Square (OLS) Methods

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NPLTL	0.157794	0.177767	0.887644	0.3823
ALR	0.030309	0.107557	0.281796	0.7802
C	-0.315053	7.219989	-0.043636	0.9655
F-statistic	0.398486	Durbin-Watson stat		1.789433
Prob(F-statistic)	0.675083			

4.4. Stationarity/Unit Root Test:

This is a statistical valid procedure in macroeconomics time series analysis that assists to determining the best estimation method for the data. It is due to the peculiarities of time series data. To do this the popular Augmented Dickey Fuller (ADF) unit root/stationary test is used as shown below. Table 4.5 below reveals the summary of stationarity test for all at first difference data.

Table 4.5 Augmented Dickey-Fuller (ADF) Unit Root Test

Variables	Max. Lag	ADF Statistic	Probability	Remarks
LnROA	7	-3.737091	0.0162	@1(1)
LnNPLTL	7	5.237809	0.0002	@1(1)
LnALR	7	-3.073626	0.0451	@1(1)

Source: Authors' computation with E-view 10

Since all the variables are integrated at order one, the researcher however has sufficient evidence to adopt Error Correction Model (ECM).

4.5. Cointegration and Long run Relationship Test:

This is necessary to know if there exist equilibrium relationships between the variables; NPLTL, ALR and ROA as shown below; Table 4.6 below shows that unrestricted rank tests (Trace and Maximum Eigenvalue) have trace statistics of 754.75 with probability values of 0.0001 and Max-Eigen Statistic of 748.4 with p-values of 0.0001 respectively at 'None' hypothesis. That shows one cointegration equation at 5% level of significance among the variables. This is sufficient evidence to show that long run relationship exists between the dependent variable Deposit Money banks' performance proxied by ROA and independent variables, Credit Risk (NPLTL, and ALR).

Table 4.6: Johansen Cointegration Test

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	1.000000	754.7514	29.79707	0.0001
At most 1	0.259707	6.349477	15.49471	0.6542
At most 2	0.001646	0.034592	3.841466	0.8524
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	1.000000	748.4020	21.13162	0.0001

| At most 1 | 0.259707 | 6.314884 | 14.26460 | 0.5732 |
| At most 2 | 0.001646 | 0.034592 | 3.841466 | 0.8524 |

4.6. Relationship between NPLTL, ALR and ROA

It can be recalled that OLS in this study exhibited unsatisfactory global utility and was therefore abandoned. For that the researchers moved ahead to determine the relationship between performance of deposit money banks and Credit Risk variables with Error Correction Mechanism (ECM).

4.6.1 Error Correction Mechanism (ECM):

The cointegration test result provides for short run fluctuations. Therefore, the researcher applies error correction models to examine the interplay of the long run and short-term fluctuations in the model using the general specific approach.

The results in Table 4.7 below show that there is a negative and significant relationship between NPLTL and ROA, ALR and ROA are insignificantly related. It was also found that the independent variables (NPLTL and ALR) jointly explained 34.9% of total variation in the dependent variable (ROA). It is also good to know that no autocorrelation issue in this model with Durbin-Watson Statistic of 1.976928.

Table 4.7 Parsimonious ECM

Dependent Variable: D(LNROA)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNPLTL(-1))	-2.136594	0.580023	-3.683637	0.0020
D(LNPLTL(-2))	0.854960	0.694988	1.230178	0.2364
D(LNALR(-1))	-0.458144	1.046665	-0.437718	0.6674
D(LNALR(-2))	-0.814175	1.051730	-0.774129	0.4501
C	0.213140	0.304033	0.701042	0.4933
R-squared	0.479474	Mean dependent var		0.008869
Adjusted R-squared	0.349343	S.D. dependent var		1.607395
S.E. of regression	1.296578	Akaike info criterion		3.561591
Sum squared resid	26.89783	Schwarz criterion		3.810286
Log likelihood	-32.39670	Hannan-Quinn criter.		3.615564
F-statistic	3.684542	Durbin-Watson stat		1.976928
Prob(F-statistic)	0.026062			

4.7 Granger Causality Test

Causality test is a tool used to know if causality exists or otherwise, between any two or more variables. From table 4.8 below, NPLTL granger causes ROA, suggesting a unidirectional causality between NPLTL and ROA. That shows causality flows from NPLTL to ROA only, no feedback effect. No direction of causality was found between ALR and ROA

4.8 Pairwise Granger Causality Test

Null Hypothesis:	Obs	F-Statistic	Prob.
LNPLTL does not Granger Cause LNROA	26	4.12845	0.0308

LNROA does not Granger Cause LNPLTL		0.22290	0.8021
LNALR does not Granger Cause LNROA	21	0.77824	0.4758
LNROA does not Granger Cause LNALR		1.25770	0.3110

4.8. Residual, Diagnostic and Stability Tests

This study used Normality test, Serial correlation test, Heteroscedasticity test and Recursive Estimates of the CUSUM (Cumulative Sum Control) Test for diagnostic and stability test.

Table 4.9: Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.056797	Prob. F(2,14)	0.9450
Obs*R-squared	0.169019	Prob. Chi-Square(2)	0.9190

Table 4.10: Heteroskedasticity Test: Breusch-Pagan-Godfrey

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.952809	Prob. F(4,16)	0.4596
Obs*R-squared	4.039928	Prob. Chi-Square(4)	0.4006
Scaled explained SS	1.851078	Prob. Chi-Square(4)	0.7631

The results in tables 4.9 and 4.10 revealed both Serial correlation and Heteroskedasticity tests showed that F-statistic and Obs*R-squared p-values are greater than the 5% level of significance, suggesting absence of serial correlation and no Heteroskedasticity in the model.
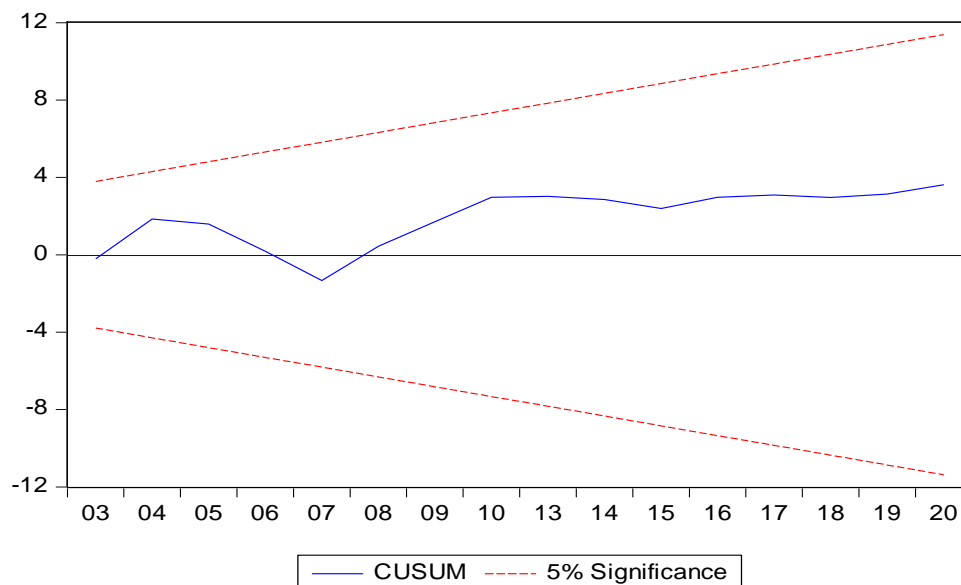

Figure 2: Recursive Estimates of the CUSUM (Cumulative Sum Control) Test

Recursive Estimates of the CUSUM in figure 2 above showed that the blue line falls between the two red lines showing the 5% significance level boundaries. This confirmed that the model is stable.

Histogram normality in Figure 3 revealed that the coefficient of Jarque-Bera 0.161030 with 0.922641; the p-value is more than 5% level of significance established in this study. This showed that the data set is normally distributed.
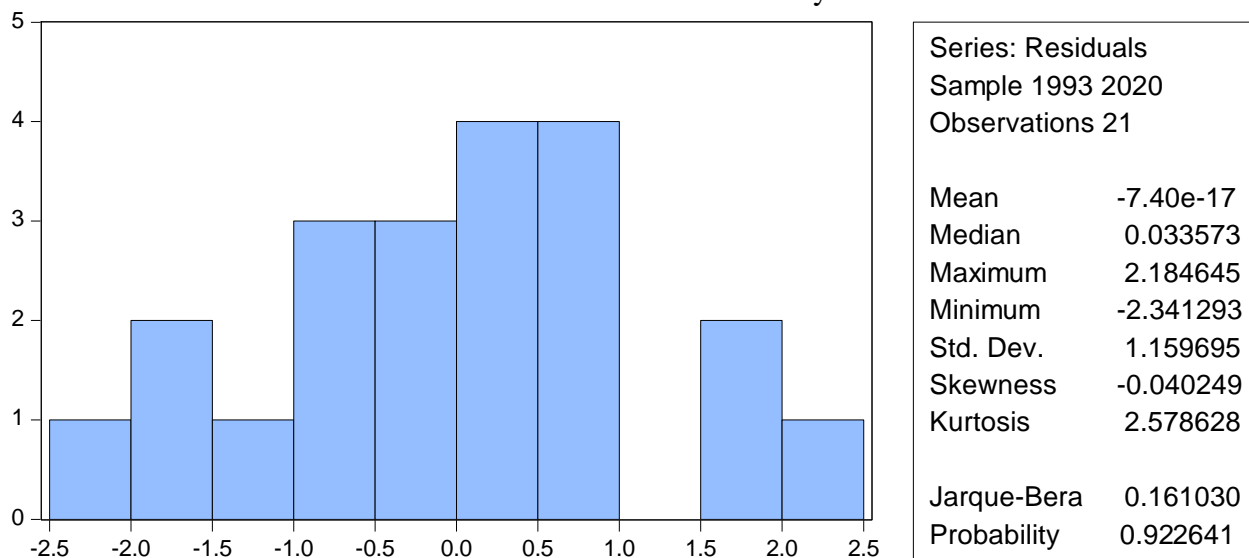

Series: Residuals	
Sample 1993 2020	
Observations 21	
Mean	-7.40e-17
Median	0.033573
Maximum	2.184645
Minimum	-2.341293
Std. Dev.	1.159695
Skewness	-0.040249
Kurtosis	2.578628
Jarque-Bera	0.161030
Probability	0.922641

Figure 3: Normal Distribution Test

4.7 Discussion of findings

In this study, credit risk and performance of Deposit Money Bank in Nigeria, after subjecting to empirical analysis, the following results were found; that Deposit Money Banks' nonperforming loans exert significant, though negative at lag 1 effect on Return on Assets, while average liquidity ratio (liquidity risk) insignificantly impacts bank performance within same period. These results agree with the findings of Wood and McConney (2018). It corroborates the results of Okere, Isiaka and Ogunlowore (2018); Njoku, Ezeudu and Ekemezie (2017); Ogunlade and Oseni (2018). It contradicts the findings of Solomon (2015) and Ogbulu and Eze (2016) that credit risk management exerts a positive impact on the performance of banks and other financial institutions. This result signposts that Deposit Money Banks in Nigeria are living up to expectation on extending loans to customers and other economic agents, but due to noncompliance of customers on loan repayment, it will impact adversely on the performance of Deposit Money Bank. This is because Deposit Money Banks credits are short term in nature, thus non repayment on maturity of the loan will automatically affect their performance.

5. Conclusion and Recommendations

5.1 Conclusion

Credit risk which seems to be inherent in the management of Deposit Money Banks (DMBs) in Nigeria is unavoidable hence should be traded with caution. Therefore, effective management of banking risk requires well-articulated risk management policies and strategies. This assists the bank

managers to think through the totality of its operations and the risk associated with the operations. It will reposition the perception of Bank Managers to see risk in totality as affecting the bank as a corporate entity rather than as individual risk affecting separate departments and units of the banks, assign responsibility and establishing the machinery for implementation, appraisal, and review.

Therefore, credit risk and liquidity risk are seen to be critical to the running of banks. Credit risk is the riskiest component of the risk items in the banking sector. This can easily be adduced from the analysis conducted. A practical case is that of Sky Bank and Polaris Bank that were recently taken over by CBN due to non-performing and delinquent loans paraded by the bank. However, credit risk, which is very cancerous, can seriously cripple the success and performance of the banking sector.

5.2 Recommendations

i. In the light of the above findings and conclusions, it is recommended that the monetary authorities should intensify their regulatory as well as supervisory role as it concerns the reduction of the volume of bad loans granted by the banking system in Nigeria.
ii. Also, adequate credit administration, measurement, monitoring processes and good control over credit, liquidity, and other risk components should be adopted.
iii. Again, the government, through their agency (CBN) should be careful of nonperforming loans since if neglected, it does not auger well for the banking sector and the economy in general.
iv. This study is of the opinion that deposit money banks should adopt a workable credit policy to forestall delinquent loans.

5.3. Suggestion for Further Study and Limitation of Study

The researchers suggested further studies should be extended to other countries. This will help to validate possible inferences, theories and policy making. The study is limited to Nigeria Deposit Money Banks. The researchers had wished it was extended to the study to banks outside Nigeria but was hindered by unavailability of data, times, and resources.

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