Macroeconomic Variables and Loan Portfolio Quality: Moderating Role of Capital Adequacy for Sustainable Development of Listed Banks in Nigeria

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Abstract

The study examined the moderating role of capital adequacy on the relationship between macroeconomic variables on loan portfolio quality among listed deposit money banks in Nigeria. The study period covered the period of 10 years from 2014-2023 using secondary data (Annual audited reports) of listed banks in Nigeria. The study used census sample of 12 banks listed in Nigeria. The study used descriptive research design to determine the effect of the independent variables to the dependent variable as well as the moderating effect. The independent variable of exchange rate, inflation and gross domestic product were regressed on loan portfolio quality. The data analysis includes descriptive and inferential statistical analysis by employing regression analysis. Panel regression analysis was adopted to estimate the regression equation. Findings from the study revealed that the exchange rate, Gross domestic product and capital adequacy has significant positive and significant effect on loan portfolio quality, conversely inflation rate has positive but no significant relationship with loan portfolio quality among listed Banks in Nigeria. Furthermore, capital adequacy has moderating effect on the relation between exchange rate and loan portfolio quality, capital adequacy has moderating effect on the relationship between inflation rate and loan portfolio quality. On the other hand, capital adequacy has positive but no moderating effect on the relationship between gross domestic product and loan portfolio quality among listed Banks in Nigeria. The study recommends amongst other things to Central Bank of Nigeria on fiscal and monetary policies which could aim at controlling hyper-inflation and growing a robust economy that will support the intermediation functions of deposit money banks without jeopardizing the loan portfolio quality of banks.

Keywords: Capital Adequacy, Exchange rate, Inflation rate, Gross Domestic Product and Loan Portfolio Quality

INTRODUCTION

It is evidenced that banks play a key role in preserving and mobilizing funds for both private and public sector of the economy as well as providing funds for small and medium scale businesses. The banks greatly contribute to the socioeconomic development of a nation by supporting the financial system of the economy. The banks globally provide about 20-25% of the global economy (Ross, 2021). the global market size for commercial banks is USD 3 trillion and industry employment of 7.7 million employees (IbisWorld, 2022). Loans portfolio quality is one of the measures used in determining the financial performance of banks and is an indication of credit risks exposure that financial institutions make provisions for in their financial statements. The loan portfolio quality of Nigeria Banks is benchmarked against a threshold of 5% by the regulatory authority, the Central Bank of Nigeria. Moreover, the quality of loan portfolio across most countries in the world has continued to decline since the global economic crises in more recent times.

Loan portfolio relates to the sum total of monies loaned out through various lending products to different borrowers. Proper management of loan portfolio is a key factor for financial soundness and bank profitability and hence the need to regulate banks and indentify macro factors that affect growth of bad and doubt loans (Abel 2018). There is growing concern among stakeholders over management of bank loan portfolio quality and it is argued that poor loan portfolio quality of banks is the root cause of bank failure in Nigeria (Ugoani, 2016). In addition, the growing interest of researchers (Clementina & Isu 2014; Diawan & Rodrik 1992; Sethi & Bhatia 2007; Vatansever & Hepsen 2013) in examining the factors that affect loan portfolio quality is not unconnected with the fact that banks plays an important intermediary and stability roles in the economy of any nation and crisis in the banking sector would have overall financial implications on the economy. Likewise, the literature investigating loan portfolio quality have used several alternative indicators: non-performing loans (Castro, 2012; Fainstein & Novikov, 2011; Jimenez & Saurina, 2005 and Pestova & Mamonov, 2012), loan loss reserves (Arpa,Giulini, Ittner & Pauer,2001; Bikker & Hu, 2002; Glogowski, 2008; Laidroo & Mannasoo, 2014 and Pain, 2003) or default rates (Trenca & Benyovszki, 2008 & Virolainen, 2004). But the lack of consensus by researchers as the appropriate measurement for loan portfolio quality motivates the need for the present study.

Similarly, studies (Klein, 2013, Fajar & Umanto, 2017) on effect of macroeconomic variables such as exchange rate, inflation and gross domestic product show that economic variables have implication on loan portfolio quality of banks. Nanteza (2015) found a strong relationship between exchange rate and nonperforming loans. Inflation rate have a significant effect on the build-up of non-performing loans as shown by studies (Endut, Syuhaha, Ismail & Mahmood, 2013 and Kjosevski, Petkovski & Naumovska, 2019).

The level of economic activities in a country represented by gross domestic product can determine the level of loan portfolio quality as indicated in previous studies (Richardas,2012 & Roland, Petr & Anamaria,2013) on determinants of non-performing loans indicate that GDP affects the level of non-performing loans in different countries banking industry. However, studies by Klein (2013) used VAR analysis to estimate the dependent and independent variables while Fajar and Umanto

(2017) employed the dynamic panel data GMM as tool of analysis to investigate the effect of macroeconomic variables on non-performing loans but Tyona, Tyohemba and Eya (2017) used the panel multiple regression analysis to examined the effect of macroeconomic variables on non-performing loan. Findings from empirics indicate that scanty previous studies (Nanteza, 2015 and Messai & Jouini 2013) have been conducted to the best of literature review using multiple regression model as statistical tool of analysis to estimate the variables. This present study will adopt panel regression technique to provide the Nigeria evidence of the moderating role of capital adequacy on the relationship between macroeconomic variables on loan portfolio quality and this methodology gap is what the present research responds to.

Problem Statement

The banking sector performance in Nigeria has been questioning due to the recent window dressing about their financial performance. The earnings as well as returns of commercial banks in Nigeria from 2014 to 2023 has been ups and down an indication of unstable profitability trend (Statista, 2024) that has been linked to banks liquidity problems and rising credit risks. The years 2015, 2019 and 2022 recorded falling profitability among Nigeria 's commercial banks as indicated by earnings (CBN, 2024). This could be attributed to the then economy recession in the country, the Covid -19 pandemic, and the issue of changes in currency in Nigeria.

Empirical studies have investigated the effect of macroeconomic variables in the banking industry on commercial banks' financial performance (Wairimu, 2017; Okeno, 2018; David et al., 2018; Musabi & Mbithi; 2018). The studies undertaken did not combine the conceptual variables as this study. Some study employed primary data in determining how macroeconomic variables impact commercial performance of commercial banks, yet secondary information from financial records were available leading to methodological gap.

Capital adequacy ratio is an important issue that has drawn the attention of researchers and academics. According to Al-Sabbagh (2004), capital adequacy is an indicator of risk exposure of banks (that is how banks are exposed to risks). Risk in the banking industry is classified into various types including credit risk, market risk, interest rate risk and exchange rate risk that are considered in the CAR calculation. According to Abdul-Karim (1996), regulatory authorities use capital adequacy ratio to evaluate the soundness of banks and other depository institutions because, to them, capital serves as a cushion to absorb losses.

There are evidences in literature stating the effects of macroeconomic factors on loan portfolio particular in developed countries, but there are few of such studies due to scanty data in such area. Furthermore, Mondal (2016) examined effects of macroeconomic variables on the increase of NPLs revealed a negative correlation with the inflation rate and spread in the rate of interest and positively affected by GDP. In a similar development to the studies conducted in Arab countries and Greek, Fajar and Umanto, (2017), in a study of 20 banks listed on the Indonesia Stock Exchange (IDX) between Q1 2005 and Q4 2014, using dynamic panel data GMM, reveal that NPLs in the previous period, GDP growth, and inflation, have a significant negative impact on

NPLs and that operations expenses to operations income ratio (BOPO) and return on equity (ROE) have a significant positive relationship with NPLs.

Although an empirical examination by Tanasković and Jandrić (2015) assessed the macroeconomic determinants of growth of NPL ratios and found an inverse relationship between GDP and NPL ratio. The study also found that GDP, the ratio of foreign currency loans and exchange rate level changes positively with NPL ratio surge. In addition, Fajar and Umanto (2017) study analyzed the determinants of NPLs using banks listed in Indonesia stock exchange for the period 2005Q1 to 2014Q4 adopting dynamic panel data techniques (systems GMM) in the analysis. The results of the analysis indicate that, past value of non-performing loans positively contributes to the current value, thus confirming the bad loans are not immediately written off.

However, during recession banks will find it more difficult to lend resulting in a contraction in the loan portfolio. Also loan growth over an economic expansionary period may have adverse effect on banks financial performance in a recession period as the borrowers find it difficult to service their loans. Study by Makri and Papadatos (2016) indicate that the macroeconomic environment (i.e. public debt, local unemployment, economic activity and inflation) and the accounting ratios (i.e. past loan quality and profitability) have significant effect on loan quality. Capital adequacy ratio is the ratio which measures the ability of a bank in terms of meeting liabilities and risks such as credit risk, market risk, operational risk, and exchange rate risks. It is a measure of how much capital is used to support the banks' risk assets. It represents a total amount of funds that a bank should keep and plan to maintain in order to conduct its business in a prudent and orderly manner (Kishore, 2007). It is the minimum amount that is necessary to boost confidence in banks and effectively fulfill the principal task of preventing bank failure by absorbing losses without being strained into costly liquidation and enable banks to take advantage of profitable growth opportunities (Akintoye & Somoye, 2018).

A number of researchers have provided insights into the capital adequacy. A study conducted by Al- Sabbagh (2021) investigated the impact of 9 bank specific variables affecting CAR of Jodanian Banks by studying the financial statement of 17 sampled banks in two periods. Almazari (2013) investigated relationship between capital adequacy ratio and the profitability of the Saudi Arabia commercial Banks. Olarenwaju and Akande (2016) carried out an empirical analysis of capital adequacy determinants in Nigerian banking sector during the period of 2005-2014. Secondary data of 15 quoted banks were analysed using multiple regression to explain the effect of explanatory variables on the dependent variable which is capital adequacy ratio. The result highlighted that capital adequacy is positively correlated with return on asset and bank size and negatively liquidity.

It is evidence in literature that studies has been conducted on capital adequacy and firm performance as well as macroeconomic variables and loan portfolio quality, but few is known on the moderating effect of capital adequacy on the relationship between macroeconomic variables and loan portfolio quality of listed banks in Nigeria. Due to the mixed findings as well as gap in literatures, the researchers are interested in examining the moderating role of capital adequacy on

the relationship between macroeconomic variables on loan portfolio quality among listed deposit money banks in Nigeria.

Objectives of the Study

The main objective of the study is to examine the moderating role of capital adequacy on the relationship between macroeconomic variables on loan portfolio quality among listed deposit money banks in Nigeria. The specific objectives are

 (i). To determine the effect of exchange rate on loan portfolio quality of listed Banks in Nigeria
(ii). To Investigate the effect inflation rate on loan portfolio quality of listed Banks in Nigeria?
(iii). Examine the effect of gross domestic product growth rate on loan portfolio quality of listed Banks in Nigeria?
(iv). To Examines the extent to which Capital Adequacy moderates the relationship between macroeconomic variables (exchange rate, inflation rate and gross domestic product) on loan portfolio quality among listed Banks in Nigeria

2. Literature Review

1. Loan Portfolio Quality
Loan portfolio refers to the total loan exposure of a lender or lending institution at any point in time, while loan portfolio quality is an indication of the performing status of the loan portfolio and it is measured by the non-performing loan (NPL) ratio, that is, the ratio of nonperforming loans to total loan exposure, expressed in percentage (CBN, 2016). When the NPL ratio is low, the loan portfolio quality is said to be high, while a high NPL ratio implies a low loan portfolio quality. In view of the foregoing, it is not out of place to describe loan portfolio quality as the ratio of performing loans to total loan exposure, expressed in percentage. The Basel Committee defined NPLs as any loan that is overdue for more than 90 days (Alton & Hazen 2001; Guy 2011). Non-performing loans are bad debts whose recovery is doubtful because the borrowers are not servicing them. Fofack (2005) defined NPLs as those loans which have ceased earning income for the bank for a long time, that is, the principal and the interest have not been paid for more than 90 days. Vatansever and Hepsen (2013) argued that NPLs are a good measure to ascertain the performance of financial institutions, the economy and the stability of the financial sector.

2. Exchange Rate
According to Demburg and McDougall (1980) as cited in Jhingan, (2002) defined exchange rate as the domestic price of foreign currency which can be determined either administratively or by the market forces of demand and supply of currencies through imports and exports respectively in the foreign exchange market. The importance of this definition is that it focuses on the concept of price as a nature of exchange rate. The basis for exchange rate determination has been on the premise of purchasing power parity (PPP) concept as enunciated by Cassel (1918). Purchasing power parity (PPP) concept defines exchange rate as the amount of the currency of one country, which endows the holder with the same amount of purchasing power. Expressed differently, purchasing power parity theory states that the same collection of goods purchased with different currencies should have same cost as measured in any of the currencies (Cooper & Fraser, 1990).

Exchange rates are defined as the price of one country's currency in relation to another. They may be expressed as the average rate for a period of time or as the rate at the end of the period. This indicator is measured in terms of national currency per US dollar.

3. Inflation Rate

In line with Demberg and McDougall (nd), refer to inflation as a continuous price increase as calculated by an index such as the Consumer Price Index (CPI) as cited in (Jhingan, 2002). In an inflationary economy, it is difficult for the national currency to function as a means of exchange and a store of value without having an adverse effect on the distribution of income, production and employment (CBN, 2016). Inflation is characterized by a fall in the currency value of the country and an increase in the exchange rate of the country with the currencies of another state. Inflation as an indicator of price stability affects the solvency of loan. For long periods of high inflation, the real value of the payments of borrowers begins to decrease, which helps them to pay duties. This is associated with improved quality of the loan portfolio. The Consumer Price Index (CPI) methodology is used to calculate inflation rates in Nigeria as it is readily available and currently available on a monthly, quarterly and annual basis (CBN, 2016). The study adopted the consumer price index as a measure of inflation rate for this study.

4. Gross Domestic Growth Rate

The real GDP is the sum of the value added in the economy during a given period or the sum of incomes in the economy during a given period adjusted for the effect of increasing prices (Daferighe & Aje, 2009). Nominal GDP is the determination of GDP without taking into account other factors or variables such as inflation. Nominal GDP increases overtime for two reasons (Daferighe & Aje, 2009). The first is that the production of most goods increases overtime. The second is that the naira price of most goods increases overtime. For instance, in a study by Ugbede, Otache and Umar (2012) on the impact of commercial banks credit on Nigeria's GDP they discovered that Commercial banks credit has a high positive impact on the nation's GDP meaning the higher the volume of Commercial banks credit made available, the higher the corresponding GDP. Gross domestic production (GDP) can be defined as the measurement of the total market value of the goods or services produced by the economy of a particular country as well as total income earned by the people living at that country. High rise of GDP implies that economy is performing well coupled with the increase of income of the people. Borrowers with the rising trend of income indicate that they would be able to pay off the loan. Annual growth of GDP indicates that banks can implicitly be assured that lending function of banks would work effectively.

Exchange Rates and Loan Portfolio Quality

According to Klein (2013), evaluate the determinants of NPLs in Central, Eastern and South Eastern Europe (CESEE) economies for the period of 1998-2011. The study used panel VAR analysis in to estimate the equation. The study results confirmed that the level of NPLs tends to increase when unemployment rises, exchange rate depreciates, and inflation is high. The study by Klein (2013) is a cross-country study which is normally affected by the operational environment of the different countries used as samples but the present study will present a Nigeria experience based on economic and regulatory environment which differs from the CESEE economies and this reason justifies the rationale for the current study. Considering Uganda, Nanteza (2015), examined

the effect of economic factors on NPLs in Uganda's commercial banks, using a multiple linear regression model. Precisely, the study found that exchange rate, inflation rate, interest rate and GDP growth do not have any significant impact on NPLs in Uganda's commercial banks. The present study considered macroeconomic factors that affect non-performing loans in Uganda but this is a Nigeria study where the macro-prudential guidelines is different from that of Uganda and this regulatory differences is the gap the present study will fill and address.

In the work of Tyona, Tyohemba and Eya (2017) who investigated the impact of macroeconomic determinant of nonperforming loans in Nigeria. Data from 1982-2015 was sourced from secondary sources. Using the error correction methodology, the study reveals a strong positive relationship between non-performing loans and selected macroeconomic variables in the short run including exchange rate Money supply and GDP. The study by Tyona, Tyohemba and Eya (2017) did not consider the time frame of 2016-2020 which time void in previous study done in Nigeria that is filled by the present study as the period of recession and covid-19 witnessed during these periods affected the level of NPLs in Nigeria. The Romanian study by Hada, Barbuta-Misu, Luga and Wainberg (2020) studied the effect of some macroeconomic determinant factors affecting the rate of NPLs in Romania. The study use archival data for the period 2009–2019. The study adopted linear regression analysis to estimate the explained and the explanatory variables. The results from statistical results showed that all selected independent variables (exchange rates, unemployment rate, and inflation rate) have a significant impact on the dependent variable NPL. The study by Hada et al (2020) adopted linear regression analysis as statistical tool but the present study used panel multiple regression analysis after conducting diagnostics tests and this is the void established in the previous study that the present study responds to.

Inflation Rate and Loan Portfolio Quality
Mahmoud and Mohamed (2015) investigated the macroeconomic determinants of non-performing loans in some Arab countries through the period 2000-2012 using the dynamic panel data approach. The outcomes of findings indicate that inflation rate has a negative impact on NPLs, whereas improvement in macroeconomic and financial conditions seems to have a negative impact on the level of NPLs. The study conducted by Mahmoud and Mohamed (2015) is cross country study and the implications of the findings will be different for Nigeria because of the banking operational environment and policy regulation. This void in the operational and policy dynamics of the banking system in Arab countries when compared with Nigeria is the gap filled by present study. Likewise, Makri and Papadatos (2016) examined the determinants of loan quality of Greek cooperative banks during the period 2003-2014. Loan quality is measured by Loan Loss Reserves Ratio and dynamic regression techniques are implemented for the econometric estimations.

The outlined results indicate that the macroeconomic environment (i.e. public debt, local unemployment, economic activity and inflation) and the accounting ratios (i.e. past loan quality and profitability) have significant effect on loan quality. The void of how the dependent variable (loan portfolio quality) was measured was filled by the present study. The present study measured loan portfolio quality by nonperforming loans while the previous study by Makri and Papadatos (2016) used loan loss Reserve Ratio to proxy loan portfolio quality.

Furthermore, Mondal (2016) examined effects of macroeconomic variables on the increase of NPLs revealed a negative correlation with the inflation rate and spread in the rate of interest and positively affected by GDP. In a similar development to the studies conducted in Arab countries and Greek, Fajar and Umanto, (2017), in a study of 20 banks listed on the Indonesia Stock Exchange (IDX) between Q1 2005 and Q4 2014, using dynamic panel data GMM, reveal that NPLs in the previous period, GDP growth, and inflation, have a significant negative impact on NPLs and that operations expenses to operations income ratio (BOPO) and return on equity (ROE) have a significant positive relationship with NPLs. The present study differs in methodology by using panel multiple regression models to estimate the regression equation which the previous adopted GMM.

In a related study in India, Memdani (2017) conducted a study on the determinants of non-performing Assets in the Indian Banking sector and the study assessed if these determinants vary across the three different ownership structures viz., public sector banks, private banks and foreign banks, of banks in India. The panel data for all the banks from 2005 to 2014 is collected from the official website of Reserve Bank of India. The econometric technique of panel data analysis was used.

The results reveal that macro economic factors, like log of per capita income and Inflation are significantly determinants of NPLs in Public Sector Banks. The study was conducted in India and the findings of the study have no implication in Nigeria because of data and variables difference regarding macroeconomic factors used in estimating the regression model and this justifies the reason for the present study. In the same vein, Polat (2018) used data set of 2000-2016 to examine the macroeconomic determinants of NPLs Turkey and Saudi Arabia. By using NPL ratio as the dependent variable and estimating through beta regression analysis, it is found that market capitalization and inflation variables are positively related with NPL for Turkey while GDP, inflation, debt, market capitalization and money supply are positively related with NPL for Saudi Arabia and unemployment and transparency variables are negatively related with NPL for Saudi Arabia. The study by Polat (2018) is a cross-country study conducted overseas whose banking operational and regulatory environment is different from the Nigerian environment.

Gross Domestic Product Growth Rate and Loan Portfolio Quality
Gremi (2013) analyzed the link between the macroeconomic developments especially GDP growth and interest loan rate and the banking credit risk measure by non-performing loan rate (NPLR). The study analyzes the data of commercial banks in Albania over the time period from 2005Q1 to 2013Q1. Employing dynamic panel data approaches, the study found that the banking credit risk is significantly affected by the macroeconomic environment; the credit risk increases when GDP growth and is also negatively affected by a rise of the interest loan rate. The study found out that amount of doubtful and non-performing loans in banks is highly dependent on macroeconomic changes such as GDP. The previous study was an Albania study using quarterly data but the present study is a Nigeria study that would used annual data for estimation of the panel estimation. This

void in location of study the annual data used for analysis instead of quarterly data was addressed by the present study.

An empirical examination by Tanasković and Jandrić (2015) assessed the macroeconomic determinants of growth of NPL ratios and found an inverse relationship between GDP and NPL ratio. The study also found that GDP, the ratio of foreign currency loans and exchange rate level changes positively with NPL ratio surge. In addition, Fajar and Umanto (2017) study analyzed the determinants of NPLs using banks listed in Indonesia stock exchange for the period 2005Q1 to 2014Q4 adopting dynamic panel data techniques (systems GMM) in the analysis. The results of the analysis indicate that, past value of non-performing loans positively contributes to the current value, thus confirming the bad loans are not immediately written off.

The results further show that GDP growth rate increases individual incomes while inflation reduces the real debt burden. The previous study by Fajar and Umanto (2017) used GMM techniques for analysis while the present study adopted panel multiple regression analysis and this void in method of analysis is the void in previous study addressed and filled by present study. Also, Tyona, Tyohemba and Eya (2017) investigated the impact of macroeconomic determinant of non-performing loans in Nigeria. Data from 1982-2015 was sourced from secondary sources. Using the error correction methodology, the study reveals a strong positive
relationship between non-performing loans and selected macroeconomic variables in the short run including Money supply and GDP. The previous study used error correction model while the present study adopted panel regression analysis. The gap in method used in analyzing the independent variables is the void in previous study addressed by present study.

Supporting earlier studies, Fajar and Umanto, (2017), in a study of 20 banks listed on the Indonesia Stock Exchange (IDX) between Q1 2005 and Q4 2014, using dynamic panel data GMM, reveal that NPLs in the previous period, GDP growth, and inflation, have a significant negative impact on NPLs. The previous study was conducted outside the shores of Nigeria and the rationale for the present study is to provide the Nigerian evidence of determinants of non-performing loans. In furtherance of studies on determinants of NPLs in different jurisdictions, Polat (2018) used data set of 2000-2016 to examine the macroeconomic determinants of NPLs Turkey and Saudi Arabia. The study used NPL ratio as the dependent variable and estimating through beta regression analysis, the study found that market capitalization and inflation variables are positively related with NPL for Turkey while GDP, inflation, debt, market capitalization and money supply are positively related with NPL for Saudi Arabia and unemployment and transparency variables are negatively related with NPL for Saudi Arabia. It has been found that the NPL ratios are well explained by some macroeconomic variables. The study by Polat (2018) is a cross-country study while the present study is a country study that used industry-specific variable of capital adequacy ratio to estimate the panel regression equation for the present study.

Theoretical Framework
1. Financial Accelerator Theory
Financial accelerator theory was propounded by Bernanke and Gertler (1989). Financial accelerator theory explains how relatively small economic shocks such as inflation and exchange

rate instability can have large and persistent effects on aggregate economic activity due to financial market imperfections. Financial accelerator theory shows the mechanism of economic shocks amplification and propagation in an economy.

The theory considers the interplay between economic agents' net worth and the external finance premium that arises due to asymmetric information between lenders and borrowers. This theory opines that banks' loan portfolio is likely to grow substantially resulting in improved financial performance during periods of economic expansion and this assertion holds true with the studies of (Fajar & Umanto,2017; Gremi ,2013; Polat ,2018) However, during recession banks will find it more difficult to lend resulting in a contraction in the loan portfolio. Also loan growth over an economic expansionary period may have adverse effect on banks financial performance in a recession period as the borrowers find it difficult to service their loans.

2 Capital Buffer Theory

The theoretical framework adopted for this study is capital buffer theory. It predicts that banks hold safety cushions above the regulatory capital requirement. Stolz (2007) define capital buffer as the capital that banks hold in excess of the regulatory minimum capital requirement. It is due to the fact that the banks may not be able to adjust capital and risk instantaneously due to adjustment costs or illiquid markets. Furthermore, under asymmetric information, raising equity capital could be interpreted as a negative signal with regard to a bank's value (Myers & Majluf 1984), rendering it unable or reluctant to react to negative capital shocks instantaneously. However, to breach regulations trigger costly supervisory actions that can possibly lead to a bank's closure. Consequently, banks have an incentive to hold more capital than required (a capital buffer) as an insurance against violation of the regulatory minimum capital requirement (Milne & Whalley 2001). This theory will specifically guide us to understand the capital ratio requirement advised by the BIS through the regulatory agent. Study by Makri and Papadatos (2016) indicate that the macroeconomic environment (i.e. public debt, local unemployment, economic activity and inflation) and the accounting ratios (i.e. past loan quality and profitability) have significant effect on loan quality.

The Research Framework
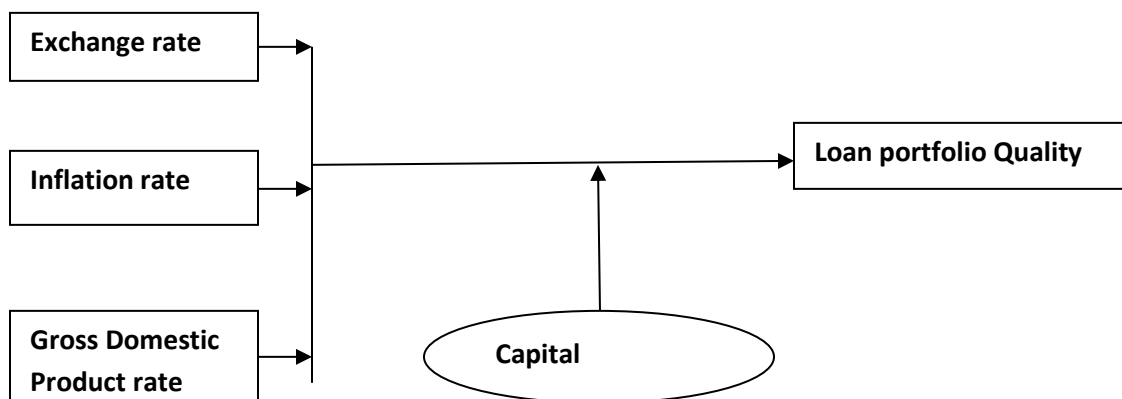
Source: Researchers, (2024)

Methodology

This study examined the moderating role of capital adequacy on the relationship between macroeconomic variables on loan portfolio quality among listed deposit money banks in Nigeria. To achieve this aim, the study employed descriptive statistics in which data were sourced through annually published financial report of listed Banks in Nigeria within a particular period of 2014 to 2023. Therefore, this method is suitable when a phenomenon or behavior of entities needed to be observed over a period of times. The model for the study on macroeconomic variables and loan portfolio quality among listed deposit money banks in Nigeria was expanded to incorporate moderating variable of capital adequacy to reflect the need for inclusion of the changing loan portfolio quality among listed Banks in Nigeria, particularly the Deposited Money Banks. The total of 12 listed banks in Nigeria was used as the population of the study. This study used census sampling techniques.

MODEL SPECIFICATION

Model 1
$$LPQ_{it} = \beta_0 + \beta_1 EXCR_{it} + \beta_2 INFR_{it} + \beta_3 GDP_{it} + \beta_4 EXCR*CAR_{it} + \beta_5 INFR*CAR_{it} + \beta_6 GDP*CAR_{it} + \beta_7 CAR_{it}\ \varepsilon_{it}\dots\dots\dots\dots\dots\dots\dots1$$
Where i represent the Banks (1-12), t = time (2014-2023), β_0 represent the intercept, $\beta_{1-\beta_5}$ are coefficient, ε is the error term, Exchange rate (EXCR), inflation rate (INFR), Gross domestic product (GDP), and Capital Adequacy (CAR)

RESULTS AND DISCUSSION

4.3 Descriptive Statistics

This reflects the basic features of the data used for this research and it provides insight into the nature of data and gives a room for further analyses. Table 3 shows the characteristic and contents of data used in the research and findings shows that loan portfolio quality has an average of 7.145 and standard deviation of 0.813 while 4.562 and 5.543 are the minimum and maximum respectively. The standard deviation shows that the data of loan portfolio quality are far spread across the mean of the data; by implication the loan portfolio quality of Banks in Nigerian are not similar. This is further confirmed by the differences between the maximum and minimum. Thus, the loan portfolio quality of listed banks in Nigeria varies a great deal from one Bank to another Bank.

Exchange rate has a mean of 2.583 and standard deviation of 0.162. From the value of the standard deviation it can be deduced that the Exchange rate is far clustered around the mean of data under study, invariably the Exchange rate effects differs from banks to Banks. Moreover, the minimum value is 2.299 and 2.954 as maximum value thus; it has a wide range of Exchange rate reading from the minimum and maximum value.

Inflation has a mean of 1.143, standard deviation as 0.142 with a minimum value of 0.906 and maximum of 1.393. This result shows that the average is higher than the maximum value and higher than the minimum value implying a little variation on inflation rate of banks, like wise inflation rate does affect Loan portfolio quality of some banks in Nigeria. Also, the standard deviation reflects that Inflation values are slightly spread out around the mean because it is relatively low. But, the minimum and maximum value reflects that some banks have very low effect of inflation rate while others have very high effect of inflation rate.

Gross domestic product has a mean of 0.375, standard deviation as 0.229 with a minimum value of -0.097 and maximum of 0.799. This result shows that the average is far lower than the maximum value and minimum value implying a wide range of variation on Gross domestic product effects of banks in Nigeria. Also, the standard deviation reflects that GDP values are widely spread out around the mean because it is relatively large. But, the minimum and maximum value reflects that some banks have very low GDP effect while others have very high Gross domestic product.

Capital adequacy has a mean of 1.227, standard deviation as 0.661 with a minimum value of -0.127 and maximum of 3.240. This result shows that the average is far lower than the maximum value, implying a wide range of variation in the liquidity of banks in Nigeria. Also, the standard deviation reflects that Capital adequacy values are widely spread out around the mean because it is relatively large. But, the minimum and maximum value reflects that some Banks have very low liquidity while the others have very high liquidity.

Table 3: Descriptive Statistics (N= 120)

Variable	Mean	Std Dev.	Min	Max
Loan Portfolio	36.495	100.834	0.5	1011.75
Exchange rate	3.437	8.485	-40.031	63.999
Inflation rate	31.917	70.803	-15.533	638.927
GDP	272.729	1963.265	-614.820	35838.22
Capital Adequacy	0.087	0.419	-5.722	3.313
Inflation	10.750	2.789	5.4	15.7

Source: Extracted from Stata (version 13.0) Output, 2024

Regression Result

ESTIMATOR VARIABLE	Without Moderator		With Moderator	
	Coef	Prob	Coef	Prob
Exchange rate	0.9081 (2.71)	0.008	0.8757 (0.07)	0.943
Inflation rate	0.3020 (2.81)	0.600	0.2803 (0.01)	0.991
Gross Domestic Product (GDP)	0.6657 (-0.25)	0.153	-0.7554 (-0.06)	0.951
Capital Adequacy (CAR)	-0.5154 (-6.31)	0.000	-	
Exchange rate*CAR			0.1989 (-4.92)	0.000
Inflation rate * CAR			0.0036 (0.18)	0.000
GDP *CAR			0.5661 (0.12)	0.178
Cons	4.8207 (3.81)	0.000	4.9277 (0.16)	0.907
R-square	0.2062		0.2035	
Prob. F	0.000		0.000	

Source: Output, 2024

Table 1 shows the results on the moderating effect of capital adequacy on the relationship between macroeconomic factors and loan portfolio quality among Nigeria Banks. The table presents the results of Ordinary Least Square (OLS) for macroeconomic factors (exchange rate, inflation rate & GDP) on loan portfolio quality as capital adequacy. In Model 1, Exchange rate is positive and highly significant at 1% level in explaining loan portfolio quality. The output of OLS indicates that EXrate has positive but no significant effect on loan portfolio quality. The coefficient value measures the degree to which each of the explanatory (EXrate, INFrate & GDP) variables affects the dependent variables (loan portfolio quality). Under model 1, the OLS results, the coefficient of EXrate is 0.9081with p-value 0.000. It means that a unit times change in EXrate will lead to approximately 90.81 change in loan portfolio quality. While with the moderating variable (CAR),

a unit changes in EXrate lead to no significant change in loan portfolio quality of listed Banks in Nigeria.

Also, the result under the OLS shows that inflation rate (INFrate) has a coefficient of 0.3020 with p-value 0.600 which is not significant. It means that a unit change in INFrate will lead to a no changes in loan portfolio quality of listed banks in Nigeria. In other words, 1percentage change in inflation rate will lead to no significant change in loan portfolio quality of listed Banks in Nigeria. However, this conclusion still remains the same even with the interaction of the capital adequacy which has a coefficient of 0.2803 with p-value of 0.991, and is statistically not significant at 1 % levels. It means that a unit change in Inflation rate will lead to no significant change in loan portfolio quality

Furthermore, the OLS shows that GDP has a coefficient of 0.6657 with p-value of 0.153 which are positive and not significant at 1 % level. However, this conclusion is slightly similar when the relation is moderated by capital adequacy with a coefficient of -0.7554 (p-value= 0.951) which is negative and not statistically significant.

Similarly, the OLS shows that capital adequacy (CAR) has a coefficient of -0.5154 with p-value of 0.000 which is negative and significant. The reason for the negative but significance effect of CAR could be that the loan portfolio reflects the actual situation for the firm. Another reason is perhaps most investors still depend on the CAR performance, there may be other factors affecting loan portfolio quality other than the variables used in the study.

On the moderating effect, the OLS shows a coefficient of 0.1989 with p-value of 0.000 of the interaction of CAR on the relationship between Exchange rate and loan portfolio quality, which is positive and significant. The reason for the positive and significant effect could be that loan portfolio quality reflect the actual situation for the Banks. Another reason is perhaps most manager and investors do depend on the exchange rate on Banks loan portfolio quality when making investment decision. Although, there may be other factors moderating affecting Banks loan portfolio quality other than the capital adequacy used in the study

Secondly, the OLS shows a coefficient of 0.0036 with p-value of 0.000 of the interaction of CAR on the relationship between Inflation rate and loan portfolio quality, which is positive and significant. The reason for the positive and significant effect could be that loan portfolio quality reflect the actual situation for the Banks. Another reason is perhaps most manager and investors do depend on the inflation rate on Banks loan portfolio quality when making investment decision. Although, there may be other factors moderating affecting Banks loan portfolio quality other than the capital adequacy used in the study

Equally, the OLS shows a coefficient of 0.5661 with p-value of 0.178 of the interaction of CAR on the relationship between GDP and loan portfolio quality, which is positive and not significant. The reason for the positive and not significant effect could be that the loan portfolio quality does not reflect the actual situation of the Banks. Another reason is perhaps most investors do not depend on the effect of gross domestic product on loan portfolio quality when making investment

decision. Besides, there may be other factors affecting banks performance other than the CAR and GDP used in the study.

The t tests for the direct relationship and are to check the individual significance of each explanatory variable. For t test, any value less than 2 is not significant. It can but concluded that using the t test values that EXrate and CAR has positive and significant effect on loan portfolio quality of listed Banks in Nigeria during the period under review. The t test further confirms that INFrate and GDP are negatives and not significant in explaining loan portfolio quality. Also the t test for the moderation shows that both EXrate*CAR and INFrate*CAR has positive and significant moderating effect on loan portfolio quality of listed Banks in Nigeria, GDP*CAR has positive but no significant moderating effect on loan portfolio quality

However, the R^2 results of OLS, show that the explanatory variables EXrate, INFrate, GDP and CAR are significant (0.2062 P>F =0.000). This revealed that there is a relationship at R^2= 0.2062 between EXrate, INFrate, GDP and CAR. Also on the moderation, the R^2 results of OLS, show that the explanatory variables EXrate*CAR and INFrate*CAR GDP*CAR are significant (0.2035 P>F =0.000). An examination of the table shows that the R^2 square = 0.2035 which implies that EXrate*CAR INFrate*CAR and GDP*CAR accounts for only 20.35% of variations having a significant effect on loan portfolio quality of listed Banks in Nigeria. This implies that a percentage change in CAR when moderated with EXrate, INFrate and GDP will lead to approximately 20.35 % change in Loan portfolio quality.

F statistics is 0.000 which is highly significant. F statistics is a measure of joint significance of all explanatory variables of the model used. This may provide support for the proposition that: first, there is a positive relationship between EXrate*CAR INFrate*CAR and GDP*CAR on Loan portfolio quality of listed Banks in Nigeria.

Conclusion

This study was undertaken to explore the moderating effect of capital adequacy on the relationship between macroeconomic variables and loan portfolio quality among listed banks in Nigeria. The study which used sample of 12 banks listed in the Nigerian Exchange Group covered the period from 2014 to 2023. Based on the analysis performed resulted from the data collected, the study made some remarkable findings.

First, the finding indicates Exchange rate has positive and significant impact on loan performance. This means increase in Exchange rate will cause loan portfolio to go up in the among banks. The implication of this finding is that for a banks to enhance its loan portfolio quality, it must look into the macroeconomic variables to boost Exchange rate. Secondly, the result also reveals that Inflation has a positive and no significant impact on loan portfolio quality. This means an increase in inflation will lead to no increase in loan portfolio quality.

Thirdly, the finding indicates GDP has positive and no significant impact on loan portfolio quality. This means increase in GDP will cause no change to loan portfolio quality. The implication of this

finding is that for banks to enhance its loan portfolio quality, it must consider the impact of GPD from loan portfolio quality

Fourthly, the result reveals that CAR has positive and significant impact on loan portfolio quality. This implies that increase in CAR will cause change or increase in loan portfolio quality. By implication CAR is a major tools use to determine loan portfolio quality.

Fifthly, the finding indicated that CAR has positive and significant moderating role on the relationship between exchange rate and inflation rate on loan portfolio quality of listed banks in Nigeria. This means that an increase in all the macroeconomic variables due to the influence of Capital adequacy will bring a change to loan portfolio quality. The implication of this finding is that for a bank to enhance its loan portfolio quality, it must improve its liquidity to reflect the changing loan portfolio quality on the financial statement so as enhance relevance and reliability attached by investors on accounting information.

Consequently, CAR has positive and insignificant moderating effect on the relationship between GDP and loan portfolio quality of listed banks in Nigeria. The implication of this finding is that a change in GDP as a result of change in CAR does not change bank loan portfolio quality within the period under review

Suggestions for Further Studies

The limitations encountered in this study have prompted the following suggestions: findings revealed that OLS Robust is ineffective for the study due to the present of serial correlation for a long term effect. FGLS can be used on the relationship between macroeconomic variables and loan portfolio quality. Further study can be explored on a short term relationship of macroeconomic variables and loan portfolio quality with moderating effect of CAR using random statistical techniques.

This study focused on some quantitative macroeconomic information variables such as exchange rate, inflation rate and Gross domestic product among other variables. Therefore, other quantitative macroeconomic variables to include interest rate, money supply and foreign direct investment can further be examined to account for the effect of macroeconomic variables on loan portfolio quality of listed banks in Nigeria.

It is clear that capital adequacy moderates on the relationship between macroeconomic variables on loan portfolio quality of listed banks in Nigeria. There are other exogenous variables that hampered the relationship between macroeconomic variables on loan portfolio quality of listed banks in Nigeria. Thus further researcher can explore on other factors to include macro economic variables such as interest rate, economic recession and foreign exchange rate, political and social factors

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Conflict of interest

There was no case of misunderstanding, misconception and conflict of interest among the various parties to the research work

References

Abel, S.(2018) Cost efficiency and non-performing loans: An application of the granger causality test. Journal of Economic and Financial Sciences 11(1), 1-8.

Central Bank of Nigeria (2016).Monetary policy.CBN Research Department, Education in Economics Series 2.

Ezra, J.K. (2017). Analysis of factors influencing bank asset quality in Tanzania. International Journal of Economics, Business and Management Research 1(3), 201-213.

Fajar, H & Umato, (2017). The impact of macroeconomic and bank-specific factors toward nonperforming loan: evidence from Indonesian public banks. Banks and Bank Systems, 12(1), 67-74.

Gremi, E. (2013). Macroeconomic factors that affect the quality of lending in Albania. Research Journal of Finance and Accounting, 4(9), 50-57.

Gujarati, D.N. (2017). Basic Econometrics, 5th ed. McGraw-Hill Education Hill Education, Washington, DC.

Hada,T., Barbuta-Misu, N., Luga, I.C; & Wainberg, D.(2020). Macroeconomic determinants of nonperforming loans of Romanian banks. Sustainability, 12(18), 1-19.

Jordan ,A. Tucker, C.(2013). Assessing the impact of non-performing loans on economic growth in the Bahamas. Moneteria, 372-400, July-December, 2013.

Khan,M.A., Siddique, A. & Sarwar, Z.(2020). Determinants of non-performing loans in the banking sector in developing state. Asian Journal of Accounting Research, 5(1),135-145.

Kjosevski, J; Petkovski, M; & Naumovska, E. (2019) Bank specific and macroeconomic determinants of non-performing loans in the Republic of Macedonia: Comparative analysis of enterprise and household NPLs, Economic Research 32(1), 1185-1203, DOI: 10.1080/1331677X.2019.1627894

Mahmoud,A.T.& Mohamed,A.S.(2015) Macroeconomic determinants of non-performing loans: An empirical study of some Arab countries. America Journal of Economics and Business Administration, 7(1),11-22.

Makri,V. & Papadatos,K.(2016).. Determinants of loan quality: Lessons from Greek cooperative banks. Review of Economic and Business Studies,9(1),115-140.

Memdani, L. (2017). Macroeconomic and bank -specific determinants of non-performing loans in the Indian banking sector. Studies in Business and Economics, 12 (2), 125-136.

Mondal, T. (2016). Sensitivity of non-performing loan to macroeconomic variables: Empirical evidence from banking industry of Bangladesh. Global Journal of Management and Business Research, 16(4), 21-28

Nanteza,H.(2015).Economic determinants of non-performing loans in Ugandan commercial banks. Taylors Business Review,5(2),137-153.

Polat, A. (2018). Macroeconomic determinants of non-performing loans: Case of Turkey and Saudi Arabia. Journal of Business Research, 10(3), 693-Hill Education709.

Tanasković, S., & Jandrić, M. (2015). Macroeconomic and institutional determinants of non-performing loans. Journal of Central Banking Theory and Practice, 4(1), 47- 62.

Tyona, T., Tyohemba, S., & Eya, C.I. (2017).Macroeconomic determinants of non-performing loans in Nigeria. Imperial Journal of Interdisciplinary Research, 3(7), 662-665.

Ugoani, J. N. (2016). Non-performing loans portfolio and its effect on bank profitability in Nigeria. Independent Journal of Management and Production, 7(2), 303 – 319.

Wanjiru, B. N., Jagongo, A. O., & Ndede, F. W. S. (2024). Effect of capital adequacy on financial performance of commercial banks in Kenya. *The Strategic Journal of Business & Change Management,* 11 (2), 327 – 349. http://dx.doi.org/10.61426/sjbcm.v11i2.2913