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# Macroeconomic Variables and Non-Performing Loans of Banks in Nigeria

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**ABSTRACT**

The banking sector holds immense importance in any economy. However, the non-performing loans of Nigerian banks are a concern for the economy and financial stability. This can be attributed to the effects of macro-economic factors on banking activities in the country. The **study aimed** to examine macroeconomic variables and the non-performing loans of banks in Nigeria. A descriptive research **design method** was used for the study. Secondary data were collected for the period from 1990 to 2021. The auto regressive distributed lag (ARDL) error correction **model** was used for data analysis. The study's **results** show that tax revenue, recurrent expenditures and the real interest rate will in the long run resolve the problems of non-performing loans of banks in Nigeria. Contrarily, money supply and exchange rate, if not properly managed, may amplify non-performing loans of banks in Nigeria. The **study concluded** that macroeconomic variables, when properly devised, will help subdue the problem of increasing non-performing loans in Nigeria.

***Keywords:*** non-performing loans; macroeconomic factors; banks; financial stability; inflation; Nigeria; ARDL; GDP

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ОРИГИНАЛЬНАЯ СТАТЬЯ

# Макроэкономические показатели и просроченные кредиты банков в Нигерии

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**АННОТАЦИЯ**

Банковский сектор имеет огромное значение для любой экономики. Однако неработающие (просроченные) кредиты нигерийских банков вызывают беспокойство за экономику и финансовую стабильность, что может быть связано с влиянием макроэкономических факторов на банковскую деятельность в стране. **Целью** данного исследования стало изучение взаимосвязи макроэкономических переменных и проблемных кредитов банков Нигерии. Для исследования использовался описательный **метод**. Вторичные **данные** были получены за период с 1990 по 2021 г. Данные были проанализированы с использованием модели авторегрессии и распределенного лага (ARDL). **Результаты исследования** показывают, что налоговые поступления, текущие расходы и реальная процентная ставка в долгосрочной перспективе решают проблему неработающих кредитов банков Нигерии. В то же время денежная масса и обменный курс, если ими не управлять должным образом, могут усилить негативное влияние неработающих кредитов. В результате исследования был сделан **вывод** о том, что макроэкономические факторы при правильном подходе помогут сгладить проблему роста неработающих кредитов в Нигерии.

***Ключевые слова:*** неработающие (просроченные) кредиты; макроэкономические показатели; банки; финансовая стабильность; инфляция; Нигерия; ARDL; ВВП

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## 1. Introduction

The banking sector holds immense importance in any economy, serving as a crucial lifeline. Banks play a pivotal role by channeling funds from surplus units to deficit units, infusing vital financial support into the economy [1]. Through this fundamental function, banks actively contribute to the development of the economy. A study [2] shows that over the past two decades, the banking landscape has witnessed notable transformations, resulting in a well-established banking system worldwide in recent years.

The increase in non-performing loans (NPLs) poses a serious threat to the financial performance of banks, as it negatively impacts both their profitability and their ability to facilitate financial transactions (intermediation capacity). As highlighted in [3], a large volume of non-performing loans in the banking system can lead to bank failures. Considering that the banking industry is a crucial pillar of the economy, any shock to this sector would undoubtedly have ripple effects on the overall financial system and the economy as a whole. Moreover, a high level of non-performing loans jeopardizes the stability of the banking industry itself, as it can significantly affect the banks' profitability [4]. Therefore, it becomes imperative to closely monitor and address the lending portfolio of banks to mitigate potential risks and maintain the stability of the banking sector. Safeguarding the health of the banking industry is of utmost importance, given its pivotal role in supporting economic growth and development.

In Nigeria, NPLs experienced a significant decline from Q4'18 until Q1'20 [5]. However, starting in 2020, they began to rise consistently. This can be attributed to a considerable portion of the Nigerian banking sector being controlled by the private sector. As a result, banks may be more reluctant to extend loans to investors, leading to an increase in NPL. A loan is classified as non-performing when the principal and interest remain unpaid for six months or more from the first day of default [6]. The factors influencing NPL can be both institutional or structural, and macroeconomic in nature. These factors have an impact on the overall health of the banking sector and the economy as a whole.

The effect of macroeconomic variables on the NPLs has been an important point of interest to scholars in the current trend of research in finance. It is commonly concluded that the NPLs of commercial banks can be affected by internal and external factors. According to [6], the internal factors are regarded as bank-specific factors that affect the bank's performance. These factors are basically influenced by the internal decisions of management and the board. While the external factors are sector-wide or country-wide factors that are beyond the control of the banks and affect NPLs. These external factors include macroeconomic variables such as interest rates, gross domestic product (GDP), inflation, and exchange rates. Businesses must be aware of macroeconomic factors that affect firm value in order to lessen the shock they cause to future cash flows and NPLs [7]. The necessity for businesses to estimate the diverse effects of various macroeconomic elements on future business performances arises from the reality that macroeconomic parameters like the GDP growth rate, inflation rate, and currency rates are outside the control of an organization [8]. In addition to suppliers, rivals, and government fiscal policy measures, regulations and policies, macroeconomic elements also exist outside of the organization and are not under management's control that affects NPLs [9].

From the foregoing, the rising trend of low NPLs in Nigeria has had a detrimental impact on the availability of financial resources for economic agents, thus constraining financial intermediation and economic activities, ultimately affecting economic growth [10]. When NPLs remain low, it means that fewer loans are turning bad, indicating that banks are cautious when lending to borrowers who may have higher credit risks. While this cautious approach by banks may reduce the risk of bad loans, it can also lead to a reduced availability of credit for businesses and individuals in the economy. Therefore, this study aims to examine the relationship between macroeconomic variables and the non-performing loan ratio of banks in Nigeria.

## 2. Theoretical review and empirical literature

This study offers an analysis of the Bad Luck Hypothesis, a theory explaining the causes of NPLs. Introduced by Berger and DeYoung in 1997, the Bad Luck Hypothesis posits that external factors impacting the economy similarly influence NPLs, leading to increased costs for banks in managing these loans and ultimately weakening their cost efficiency.

According to this hypothesis, external events contribute to a rise in problematic loans for banks.

Missed loan repayments or breaches in the original agreement terms result in additional managerial costs and efforts to deal with these problem loans. Consequently, the theory predicts that an upsurge in NPLs would lead to a decline in cost performance for banks. However, it is important to note that the "extra expenses associated with problem loans create the appearance, but not necessarily the reality, of lower cost efficiency" [11, p. 20].

Dimitrios, Louri, and Tsionas [12] state that the bad luck hypothesis assumes external factors play a role in elevating bank NPLs, leading to higher operating costs when dealing with such problem loans and consequently reducing banks' overall efficiency. These additional operating costs can arise from various factors, including monitoring moral hazard, borrower and collateral valuation, and the cost of recovering and selling collateral in case of non-payment [13].

The bad luck hypothesis proposes that NPLs are primarily caused by factors beyond the banks' control, such as adverse weather conditions or sudden price fluctuations in specific commodities, among other things. This study relies on the bad luck hypothesis as it presents a credible explanation for the NPLs in the banking industry and the factors influencing them. Specifically, the theory highlights how external factors impact the economy and, consequently, NPLs in the banking sector. Hence, this theory provides a comprehensive framework for understanding NPLs and their determinants in research.

Aside from the foregoing, the empirical past academic literature from outside and within Nigeria that has resulted in different findings and conclusions was reviewed. Kanum and Olweny [14] used a panel data set of 29 East African listed banks to examine the effect of macroeconomic indicators on NPLs. The study found that interest rate, money supply, and bank size have a significant positive relationship with bank NPLs. Kigamwa and Mutwiri [15] examined macroeconomic factors and Kenyan banks' non-performing ratios using inferential and descriptive statistics and found that the real interest rate has a positive relationship while the exchange rate has both a negative and positive relationship with NPLs. Similarly, [15, 16] used the generalized method of moments (GMM) model and found that GDP growth, unemployment rate, gross domestic savings, and real interest rate have a positive impact on NPLs.

Anita et al. [8] examine the impact of selected macroeconomic factors on NPLs in a panel of eight South Asian Association for Regional Cooperation countries (Afghanistan, Bangladesh, Bhutan, India, Nepal, the Maldives, Pakistan, and Sri Lanka) during the period 2008–2019. The research employs various statistical methods, including ordinary least squares (OLS), fixed effect estimates, and random effect estimates, with robust fixed effect estimates used to address heteroscedasticity. The empirical findings confirm a significant positive association with government budget balance and a significant inverse relationship with GDP, sovereign debt, inflation rate, and money supply, as previously observed in other studies. Likewise, Msomi [17] uses data from 47 listed commercial banks across six countries (19 banks from Nigeria, 14 banks from Benin, 3 banks from Burkina Faso, 3 banks from Gambia, 3 banks from Guinea, and 5 banks from Liberia) for the period from 2008 to 2019. The analysis employs fixed and random effect models, with the Hausman test favoring the fixed effect model. Results indicate that liquidity ratio, capital adequacy ratio, and inflation rate significantly affect NPLs.

Ahmed et al. [18] conducted a study to investigate the impact of bank-specific and macro-economic factors on NPLs in Bangladesh. The study collected annual panel data from the best 26 conservative banks and four Islamic banks in Bangladesh for the period between 2014 and 2018. The loan-to-deposit ratio showed a negative influence on NPLs, indicating that a higher loan-to-deposit ratio was linked to a decrease in NPLs. Furthermore, the study found a positive relationship between capitalization, economic growth, bank size, and NPLs, but the relationships were statistically insignificant.

Prasanth, Nivetha, Ramapriya, and Sudhamathi [19] conducted a study to explore the factors influencing NPLs in India between 2015 and 2019. They collected secondary time series statistics from the bank's audited yearly reports and performance reports. The researchers used a multiple linear regression equation to create their model. The results of the regression analysis showed that three variables, namely the loan-to-deposit ratio, financial efficiency as measured by return on equity, and capital adequacy, were statistically significant determinants of NPLs. These variables had a notable impact on NPLs in Indian banks during the study period. On the other hand, the study found that other variables such as loan growth, cost-effectiveness, and bank size were analytically insignificant in influencing NPLs.

Koju, Koju, and Wang [20] conducted a study to evaluate the macro-economic and bank-specific factors influencing NPLs in the Nepalese banking system. They collected data from 30 commercial banks in Nepal between 2003 and 2015. The analysis assessed the impact of seven bank-specific and five macro-economic variables on NPLs. The results indicated that the export-to-import ratio had a positive and significant relationship with NPLs, while cost efficiency and asset size showed a negative relationship with NPLs concerning GDP growth rate, capital adequacy, and inflation rate.

Rajha [11] conducted a study to explore the bank-specific and macro-economic factors that could influence NPLs in commercial banks in Jordan. The study utilized an exclusive annual dataset covering all periods from 2008 to 2012 and employed a regression model to analyze the collected data. The findings of the study showed that NPLs in the Jordanian banking sector were notably and significantly affected by two factors: the ratio of loans to total assets and the lagged NPLs. These variables had a significant impact on the occurrence of NPLs in commercial banks during the studied period.

Ghosh [21] conducted an analysis using a dynamic GMM and fixed effect model to examine bank-specific and economic variables affecting aggregate NPLs in 50 banks in both Columbia and the USA from 1984 to 2013. The study's findings indicated that increasing GDP, housing price index, and personal income growth rate led to a decline in NPLs, while sovereign debt and the rate of unemployment significantly increased NPLs. Subsequently, [22] confirmed these impacts in their study on the Greek economy from 2001 to 2015.

Umar and Sun [10] noted that there is an insignificant relationship between banks' liquidity and NPLs. According to their observations, the liquidity creation by Chinese banks appears to be independent and unrelated to changes in NPLs. They argued that liquidity creation serves as a better measure of risk compared to loan growth, which was used in previous studies. Liquidity creation offers a more precise assessment of the absolute amount of risk transformation in the banking system.

Egiyi [4] investigated the link between NPLs and key macroeconomic indicators. Economic data for interest rates, inflation, GDP, and NPLs were analyzed quarterly from 2016 to 2020. The Gaussian regression analysis revealed a positive relationship between interest rates, inflation, and NPLs. Conversely, there was a negative relationship between GDP and NPLs, indicating that NPLs have a detrimental impact on economic growth.

Tomi, Iliyasu, and Mojisola [23] focused on NPLs in Nigerian Deposit Money Banks (DMBs), spanning the period from 1999 to 2019. Panel data from the annual reports of listed DMBs were collected and analyzed. The researchers utilized the random effect model, determined through the Hausman test, as their panel data technique. The findings indicated that the loan-to-total assets ratio (LTAR) exhibited a significantly positive relationship with the NPLs of banks, suggesting that as the LTAR increased, NPLs also increased. On the other hand, the capital adequacy ratio (CAR) showed an insignificant relationship with the NPLs of banks, implying that CAR had no significant impact on NPLs during the studied period.

Ibitomi and Micah [2] conducted an empirical analysis of NPLs and liquidity of DMBs in the Nigerian context. The study used a panel regression analysis on data from 15 quoted DMBs spanning from 2009 to 2019. Based on their empirical findings, the study identified four variables that were significantly related to banks' liquidity at a 5% significance level. These variables are NPLs, capital adequacy ratio, bank size, and inflation. On the other hand, three variables, namely GDP, loan growth, and monetary policy rate, were found to be insignificant in their relationship with banks' liquidity.

The study [9] investigated the relationship between interest rates and the loan performance of DMBs in Nigeria from 2010 to 2015. They analyzed various factors, including loan repayment, credit quality, and loan loss provision as dependent variables, and interest rates, monetary policy rate, liquidity ratio, non-interest fee income, capital adequacy, and NPLs as independent variables. The findings revealed a significant connection between interest rates and loan repayment, measured by credit quality using the NPL ratio. A rise in interest rates could impact credit quality positively or negatively. The study also noted that even small improvements in lending rates could lead to an increase in NPLs.

Ayunku and Uzochukwu [5] conducted a study that examined the credit management and bad debt issues among listed Nigerian DMBs. The study focused on four independent variables: loan loss allowance, loan-to-deposit ratio, equity-to-asset ratio, and loan write-off. The research period spanned five years, from 2014 to 2019. To analyze the data, the researchers utilized descriptive statistics, cor-

relation analysis, and the ordinary least squares regression method. The findings indicated that in both the return on asset and Tobin-Q models, the study developed random effect models that showed NPLs, loan loss provision, and equity-to-asset ratio significantly influencing bank performance.

In a study by Mustafa and Jeffery [1] on Nigerian commercial banks, data were collected and analyzed using econometric techniques, including co-integration analysis. The results indicated a positive relationship between NPLs, capital adequacy, and GDP with loans and advances. On the other hand, the interest rate showed a negative relationship, and total deposits had an insignificant effect on bank loans and advances.

In a study conducted by Atoi [24], the focus was on NPLs and their impact on the stability of Nigerian banks with national and international operational licenses. The research covered the period from 2014(Q2) to 2017(Q2). To analyze the factors influencing NPLs in each licensed group, a "restricted" dynamic GMM was utilized. The Z-score served as a proxy for banking stability, and its response to NPL shocks was examined using a panel vector autoregressive approach. The study's findings revealed that the drivers of NPLs varied between the two types of banks, national and international. However, it was observed that the weighted-average lending rate played a crucial role as a macroeconomic trigger for NPLs for both categories of banks.

Ademola [25] conducted a study to examine the determinants of NPLs in listed DMBs in Nigeria. The study focused on data from 2006 to 2016, using secondary data sources. NPLs were the dependent variable, while the study considered several explanatory variables, including capital adequacy ratio, loan-to-total asset ratio, loan loss provision by banks, crude oil price, and exchange rate. The research employed panel regression estimation. The study's findings revealed that the loan loss provision ratio, loan-to-asset ratio, and crude oil price had a positive and significant impact on the NPLs of banks. On the other hand, the capital adequacy ratio and exchange rate exhibited a positive but statistically insignificant impact on the NPLs, indicating that their influence on NPLs was not significant.

From 1994 to 2014, Etale, Ayunku, and Etale [26] conducted a study examining the relationship between NPLs and bank performance in Nigeria. Data for the analysis were gathered from the Central Bank of Nigeria (CBN), the Nigeria Deposit Insurance Corporation (NDIC), and the annual reports of listed banks. The researchers employed the ADF unit root test, descriptive statistics, and multiple regression techniques for their analysis. The study's findings indicated that bad loans and doubtful loans had a statistically significant negative impact on return on capital employed (ROCE), indicating that these types of NPLs had adverse effects on the banks' performance. However, sub-standard loans had a statistically insignificant negative influence on ROCE, implying that their impact on bank performance was not significant.

From the empirical review, studies such as [8, 20, 27], and others carried out their respective research outside Nigeria using various macroeconomic variables to predict the non-performing loan. Despite all the variables used, none of these studies have examined fiscal macroeconomic variables such as tax revenue and the recurrent expenditure of the government on non-performing loans of banks.

In Nigeria, various studies such as [2, 4, 5] and others have examined various macroeconomic variables on the non-performing loans of banks in Nigeria without using government tax revenue and recurrent expenditure as variables that also determine the non-performing loans of banks in Nigeria. Therefore, this study will fill this gap by including fiscal macroeconomic variables such as tax revenue and recurrent expenditure to predict the non-performing loans of banks in Nigeria using time series data.

## 3. Methodology

This section outlines the model specification, research design, data sources, data collection method, and technique for data analysis.

### 3.1. Model Specification:

The study adopts a model similar to the one used in the previous study of Anita et al. [8] as follows:

$$NPLit = \beta 0 + \beta 1 M2GDPit + \beta 2 EXCit + \beta 3 GDPit + \\ + \beta 4 FISCALit + \beta 5 INFLit + \beta 6 DEBTit + \varepsilon it. \quad (1)$$

However, the model was re-modified as this:

$$NPL_t = \alpha + \beta_1 \ln TRV_t + \beta_2 \ln M2_t + \\ + \beta_3 RIR_t + \beta_4 \ln REX_t + \beta_5 EXG_t + \varepsilon_t, \quad (2)$$

where *NPL* — Non-performing loan ratio

*TRV* — tax revenue

*M*2 — broad money supply

*RIR* — real interest rate

*REX* — recurrent expenditure

*EXG* — exchange rate

$\beta_1$..... $\beta_5$ — slopes; $\alpha$ — intercept; $\varepsilon$ — error term; *t* — the *t*-th period of variables; ln — natural logarithm.

Variables are explained in *Table 1*.

### 3.2. Research design

The research design for this study is descriptive in nature. This choice is based on the study's objective, which is to establish the empirical relationship between fiscal policy measures and bank performance in Nigeria. A descriptive research design is suitable for investigating two or more variables empirically. Additionally, this design enables the collection of quantitative data, which can be analyzed using descriptive and inferential statistics.

### 3.3. Data sources and collection method

The data gathering approach will be secondary and will cover the 32-year observation period from 1990 to 2021 because the data for this study are quantitative. This time frame was selected because it includes the years following the 2008–2009 financial crises, all of which may have had an impact on the topics being studied.

The Nigeria Deposit Insurance Cooperation (NDIC), the Central Bank of Nigeria, the Nigeria Bureau of Statistics (NBS), and the World Bank Development data bank provided the secondary data for this study.

### 3.4. Techniques for data analysis

This study uses a time series data process and time series analysis, and the relationship between the dependent variable (non-performing loans) and the independent variable (macro-economic variables) is investigated using the OLS econometric technique. This econometric method contains BLUE properties, making it appropriate for analysis. The Augmented Dickey-Fuller (ADF) test for unit root is used to ascertain the stationarity of the variables in the study, which is a pre-test on the model. The type of OLS regression technique based on the results of the unit root test is the ARDL error correction model. The models will also be put through a stability test to determine their stability. Additionally, tests for serial correlation, normality, the Ramsey RESET test, and heteroskedasticity will be carried out to diagnose the model.

The ARDL model for study:

$$\begin{aligned} NPLR_t = \alpha + \sum_{i=1}^{n1}\gamma NPLR_{t-i} + \sum_{i=1}^{n2}\beta_1 \ln TRV_{t-i} + \sum_{i=0}^{n3}\beta_2 \ln M2_{t-i} + \\ + \sum_{i=0}^{n4}\beta_3 RIR_{t-i} + \sum_{i=0}^{n5}\beta_4 \ln REX_{t-i} + \sum_{i=0}^{n6}\beta_5 EXG_{t-i} + \\ + \sum_{i=1}^{n1}\gamma\Delta NPLR_{t-i} + \sum_{i=1}^{n2}\beta_1\Delta \ln TRV_{t-i} + \sum_{i=0}^{n3}\beta_2\Delta \ln M2_{t-i} + \\ + \sum_{i=0}^{n4}\beta_3\Delta RIR_{t-i} + \sum_{i=0}^{n5}\beta_4\Delta \ln REX_{t-i} + \sum_{i=0}^{n6}\beta_5\Delta EXG_{t-i} + \\ + \delta ECM_{t-i} + \varepsilon_t. \end{aligned} \quad (3)$$

## 4. Data analysis and interpretation of results

### 4.1. Descriptive statistics for the study

*Table 2* shows that all variables, the dependent variable (non-performing loan ratio — *NPLR*) with standard deviation value of 13.45 and a mean of 19.75, has improved over the years. Likewise, all the independent variables (tax revenue, recurrent expenditure, real interest rate, exchange rate, and money supply (M2)) in Nigeria have improved over the years.

### 4.2. ADF unit root test

*Table 3* depicts the unit root test using the ADF test. The result shows that the non-performing ratio and real interest rate were stationary at level I(0), while other variables such as tax revenue, recurrent expenditure, broad money supply (*M*2), and exchange rate were stationary at first difference I(1).

### 4.3. ARDL Bound Test Cointegration Test

The ARDL bound test result in *Table 4* revealed F-Stat (8.0363), which is greater the upper bound at the 1% significance level. This indicates that macro-economic variables a have long run relationship with banks non-performing ratios in Nigeria.

### 4.4. Regression results and discussion: error correction model (short-run and long-run results)

From *Table 5*, it revealed the ECM regression result for both the short-run and long-run relationship between macro-economic variables and the non-performing ratio of banks in Nigeria. The short-run result revealed that one lag of the non-performing loan ratio (*NPL*) has a negative and significant relationship with NPL in Nigeria. In addition, tax revenue and recurrent expenditure have a negative relationship with *NPL* in Nigeria, although only re-

Table 1
*Variable(s) explanation*

| S/N | Variable(s) | Description | Source(s) |
|---|---|---|---|
| 1 | Non-performing Loan Ratio (NPL) | Aggregate Ratio of non-performing loans to Total banks loans | Nigeria Deposit Insurance Cooperation (NDIC), Central Bank of Nigeria |
| 2 | Tax Revenue (TRV) | Total tax revenue accrued by government annually | Central Bank of Nigeria, Nigeria Bureau of Statistics (NBS) |
| 3 | Recurrent Expenditure (REX) | Total recurrent expenditure paid yearly by government | Central Bank of Nigeria, Nigeria Bureau of Statistics (NBS) |
| 4 | Broad Money Supply (M2) | Aggregate stock of money in a financial system annually | Central Bank of Nigeria, Nigeria |
| 5 | Real Interest Rate (RIR) | Annual Rate at which borrowers pay for using borrowed funds (%) | Central Bank of Nigeria, World Bank Development database |
| 6 | Exchange Rate (EXG) | Local currency units relative to U.S. dollars | Central Bank of Nigeria, Nigeria |

*Source:* Developed by the author.

Table 2
*Descriptive statistics result*

| Variables | *NPLR* | *LNTRV* | *LNREX* | *LNM2* | *EXG* | *RIR* |
|---|---|---|---|---|---|---|
| Mean | 19.75313 | 6.400381 | 6.807880 | 14.91015 | 136.6216 | 3.896875 |
| Median | 19.55000 | 6.592110 | 7.211725 | 14.93100 | 128.9350 | 5.900000 |
| Maximum | 44.80000 | 8.760787 | 9.120979 | 17.59561 | 363.2100 | 18.20000 |
| Minimum | 2.960000 | 2.906901 | 3.589611 | 11.13696 | 8.040000 | -31.50000 |
| Std. Dev. | 13.45212 | 1.763323 | 1.677808 | 2.038238 | 104.0835 | 10.41307 |
| Observations | 32 | 32 | 32 | 32 | 32 | 32 |

*Source:* Developed by the author.

current expenditure was significant at 5%. Similarly, broad money supply (*M*2), real interest rate, and exchange rate have a positive relationship with *NPL* in Nigeria, but only the exchange rate was significant.

Moreover, the short-run shocks that cause disequilibrium in the long run can be adjusted each year with a speed of (–1.65), which is significant at the 1% level. This suggests that the adjustment speed is non-monotonic rather than oscillatory. Hence, this indicates that the error correction process fluctuates around the long-run value, and when this process is completed, there is rapid convergence to the path of equilibrium [29].

## 5. Discussion of findings

The long-run result shows that tax revenue has a negative and significant relationship with banks' *NPL* in Nigeria with a coefficient of –11.73 significant at 1%. This suggests that a percent increase in tax revenue will reduce banks *NPL* in Nigeria by 11.73%. Tax revenue improvement reduces the non-performing loan ratio of banks, which simply implies that individuals and corporate entities are making judicious use of borrowed funds, which results in higher tax revenue accrued and, as such, possesses enough funds to pay back interest and the principal loans advanced by banks. This was in line with prior expectations that tax revenue has a significant negative relationship with banks' *NPLs* in Nigeria. Similarly, recurrent expenditure with a coefficient value of –7.73 has a negative relationship with the non-performing loans of banks in Nigeria. However, the result further revealed that the relationship is non-significant between recur-

Table 3
*ADF Stationary Unit Root Test Results*

| Variables | Statistics Values | Sig. Values | Order of Integration | Remarks |
|---|---|---|---|---|
| Non-performing ratio | –7.023 | 0.0000*** | I(0) | Stationary |
| Tax revenue | –8.545 | 0.0000*** | I(1) | Stationary |
| Recurrent expenditure | –9.434 | 0.0000*** | I(1) | Stationary |
| Money supply | –4.0569 | –0.0018** | I(1) | Stationary |
| Real interest rate | –4.2836 | –0.0000*** | I(0) | Stationary |
| Exchange rate | –4.5654 | –0.0000*** | I(1) | Stationary |

*Source:* Developed by the author.

*Note:* *** and ** shows significance level at 1% and 5% respectively.

Table 4
*Null hypothesis: No long-run relationships exist.*

| Bound test result | | |
|---|---|---|
| Test Statistic | Value | K |
| F-statistic | 8.036372 | 5 |
| **Critical Value Bounds** | | |
| 10% | 2.75 | 3.79 |
| 5% | 3.12 | 4.25 |
| 2.5% | 3.49 | 4.67 |
| 1% | 3.93 | 5.23 |

*Source:* Developed by the author.

rent expenditure and banks' *NPLs* in Nigeria. This was contrary to the prior expectation that the relationship would be negative and significant between recurrent expenditure and banks' *NPLs* in Nigeria.

The study further revealed that broad money supply has a positive and significant at 1% relationship with banks' *NPL* in Nigeria, with a coefficient value of 32.82. This implies that a percentage increase in the broad money supply (*M*2) will increase the banks' NPL in Nigeria by 32.82%. Although, when there is an expansion of the money supply, banks have more funds available to lend to borrowers. However, if these loans are extended without proper evaluation of the borrowers' creditworthiness, it can lead to a higher likelihood of borrowers defaulting on their repayments. This, in turn, results in an increase in non-performing loans for the banks. This was in contravention of the findings of [8], where the study discovered a significant negative relationship between money supply and non-performing loans. This may be the result of the data used and the country in which the study was conducted.

Furthermore, the real interest rate has an insignificant negative relationship with the non-performing loans of banks in Nigeria, with a coefficient value of –0.07. This suggests that with an increase in the real interest rate, the non-performing loans of banks in Nigeria will decrease by 0.07%, but this is insignificant. This agreed with the findings of [1, 2, 9] that the real interest rate has a negative but insignificant relationship with the non-performing loans of banks in Nigeria. However, contrary to the finding of [4, 15, 16] that the real interest rate has a positive relationship with the non-performing loans of banks in Nigeria. This is because higher interest

Table 5
*Regression result*

| Non-performing Ratio (*NPLR*) Long-Run Results | | | Short-Run Results | |
|---|---|---|---|---|
| Variables | Coefficient | Sig Value | Coefficient | Sig Value |
| *NPL*(−1) | – | – | −10.82 | 0.000*** |
| Tax revenue | −11.73 | 0.000*** | −5.331 | 0.123 |
| Recurrent expenditure | −7.73 | 0.108 | −10.37 | 0.015** |
| *M*2 | 32.82 | 0.0036*** | 8.807 | 0.202 |
| Real interest rate | −0.07 | 0.486 | 0.064 | 0.304 |
| Exchange rate | 0.21 | 0.000*** | 0.253 | 0.000*** |
| $\delta ECM_{t-1}$ | – | – | −1.53*** | 0.000*** |

*Source:* Author's EViews Result.

Table 6
*Diagnostic tests for the study*

| Non-performing ratio (*NPL*) | | |
|---|---|---|
| **Diagnostic test** | **Coefficient** | **Significance value** |
| $R^2$ Adjusted | 0.82 | - |
| BG-LM test | 0.20 | 0.823 |
| Ramsey Reset Test | 1.36 | 0.297 |
| JB Test | 2.79 | 0.248 |
| ARCH Test | 0.57 | 0.570 |
| Durbin-Watson Test | 1.89 | - |
| F-statistics | 12.96 | 0.0000*** |

*Note:* ***,** and * shows significance level at 1%, 5% and 10% respectively.

*Source:* Author's EViews results, 2023.

will lead to an increase in the non-performing loans of banks, as defaulters will not be able to pay.

Lastly, the exchange rate has a positive and significant relationship with the non-performing loans of banks in Nigeria, with a coefficient value of 0.21. This suggests that an increase in the exchange rate will increase the non-performing loans of banks in Nigeria by 0.21%. This is because changes in the exchange rate can also affect the overall economic environment. A depreciating domestic currency can contribute to inflationary pressures, which might lead to higher production costs for businesses and reduced consumer purchasing power. These economic challenges can result in decreased business performance and individual financial stress, both of which can contribute to a higher likelihood of loan defaults and, consequently, an increase in *NPLs*. This is contrary to prior expectations and to the findings of [25] that the exchange rate has a negative and insignificant relationship with the non-performing loans of banks in Nigeria.

### 5.1. Diagnostic and stability tests

Test results are shown in *Table 6*. The BG-LM test of auto (serial) correlation indicates that the model does not suffer from auto correlation, meaning

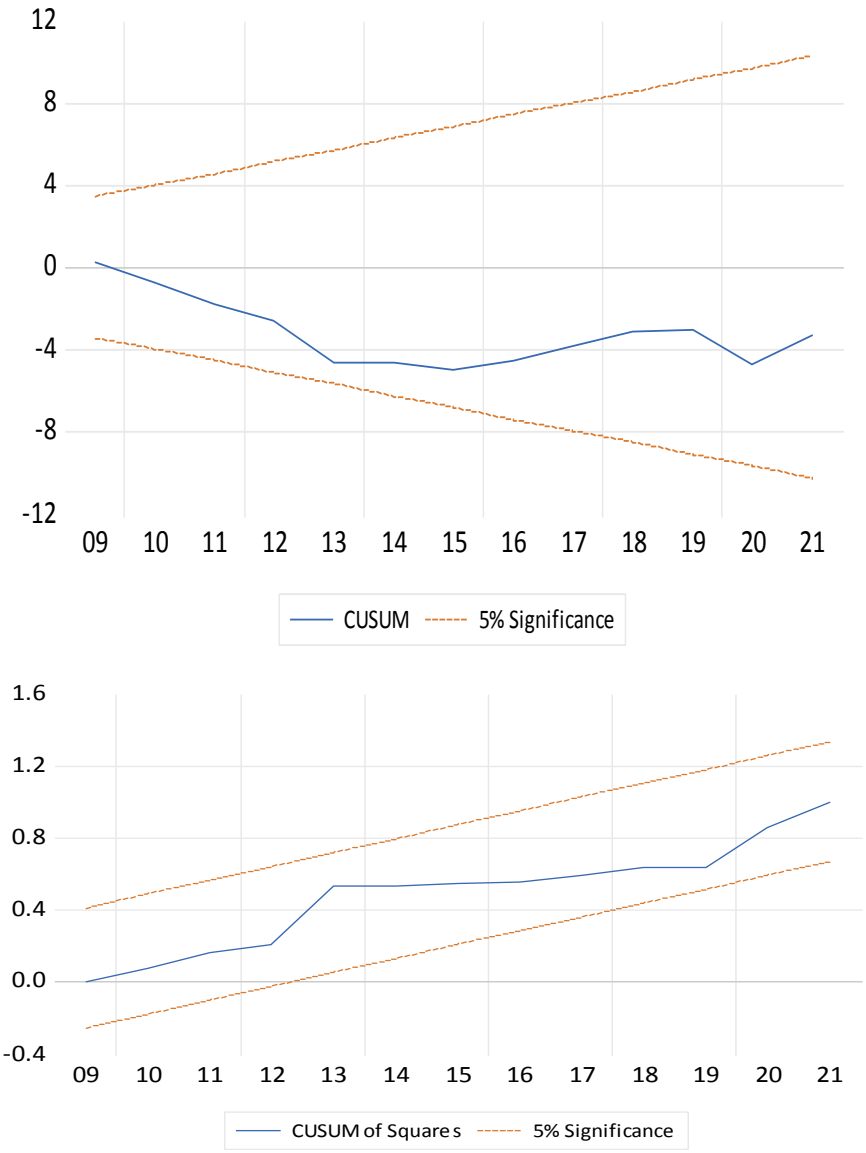


*Fig.* **CUSUM and CUSUM square test for the models**

*Source:* Developed by the author.

there is no correlation between the values of the same variables (lag) over successive time intervals. The Ramsey RESET test confirms that there is no misrepresentation or misspecification of the model. Additionally, the JB test of normality demonstrates that all residuals (error terms) are normally distributed. The presence of ARCH heteroskedasticity suggests that the errors are constant and independent of the regressors, thereby ruling out any problem of heteroskedasticity. The Durbin-Watson Test value of 1.89 is close to 2.0 and shows that there is no first-order autocorrelation.

To ensure that the model used is stable and the long run relationship is valid, the study conducted a stability test using the cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residuals (CUSUMSQ). *Fig.* revealed that the plots for both monetary and fiscal policy variables and are within the 5% critical boundary. This suggests there is stability in the long-run relationship among the variables. In addition, the coefficients of the variables in the model are stable. Admittedly, it can be concluded that the models are stable.

## 6. Conclusion and recommendations

This study investigates the relationship between macro-economic variables and the non-performing loans of Nigerian banks. From the findings, it can be concluded that macroeconomic variables (tax revenues, real interest rate, and recurrent expenditure) have a negative relationship with the non-performing loans of Nigerian banks. This suggests that as tax revenues increase, real interest rates rise, or recurrent expenditure goes up, the level of

*NPLs* tends to decrease. These variables likely influence borrower capacity, financial stability, and economic conditions, impacting the likelihood of loan defaults.

Based on the findings and conclusions, the study suggests the following recommendations. There should be improvements in tax collection processes and enforcement to boost tax revenue because it will have a positive impact on the financial health of banks and borrowers. This can be achieved through better tax monitoring, efficient collection systems, and addressing tax evasion. Similarly, given the insignificant negative relationship between the real interest rate and non-performing loans of banks, it is recommended to focus on bank-specific factors that may have a more significant impact on *NPLs*. Banks should prioritize effective credit risk management closely, and consider diversifying their loan portfolios to reduce concentration risk. Similarly, the observed positive relationship between money supply and *NPLs* in Nigeria suggests that a careful balance needs to be struck regarding broad money supply, considering its effects on economic growth, financial stability and citizens' wellbeing as well. Overall, this relationship highlights the importance of prudent lending practices and effective risk management by banks and regulatory authorities to mitigate the negative impact of excessive money supply growth on the quality of loan portfolios and the stability of the banking sector. Likewise, it is recommended that governments prioritize fiscal discipline and prudent spending practices. By controlling recurrent expenditure, governments can create a stable economic environment, which may reduce the occurrence of *NPLs* in banks. Lastly, it is essential for banks to closely monitor and manage their liquidity levels. Effective liquidity management strategies should be implemented to ensure sufficient funds to meet obligations and mitigate the impact of NPLs on the bank's overall financial health. This is for further studies' consideration on the determinants of reducing the *NPLs* of banks in Nigeria.

## REFERENCES


1. Mustafa I., Jeffrey E.O. Non-performing loans (NPL) and loans and advances of commercial banks in Nigeria. *Accounting and Taxation Review*. 2020;4(1):104–117.
2. Taiwo I., Mike M.E. Empirical Analysis of non-performing loans and liquidity of deposit money banks: Nigeria experience. *Journal of International Business and Management*. 2021;4(9):01–14.
3. Bhattarai B.P. Assessing banks internal and macroeconomic factors as determinants of non-performing loans: Evidence from Nepalese commercial banks. *International Journal of Accounting & Finance Review*. 2018;3(1):13–32.
4. Egiyi M.A. Non-performing loans and key macroeconomic variables' nexus in Nigeria. *European Journal of Finance and Management Sciences*. 2022;6(1):14–9.
5. Ayunku P.E., Uzochukwu A. Credit management and issues of bad debts: an empirical study of listed deposit banks in Nigeria. *Asian Journal of Economics, Business and Accounting*. 2020;14(3):32–49.
6. Atoi N.V. Non-performing loan and its effects on banking stability: evidence from national and international licensed banks in Niger. *CBN Journal of Applied Statistics (JAS)*. 2018;9(2):3.
7. Issah M., Antwi S. Role of macroeconomic variables on firms' performance: Evidence from the UK. *Cogent Economics & Finance*. 2017;5(1):1405581.
8. Anita S.S., Tasnova N., Nawar N. Are non-performing loans sensitive to macroeconomic determinants? An empirical evidence from banking sector of SAARC countries. *Future Business Journal*. 2022;8(1):7.
9. Ogundipe A.S., Akintola A.F., Olaoye S.A. Interest rates and loan performance of deposit money banks in Nigeria. *International Journal of Economics and Business Review*. 2020;8(1):13–20.
10. Umar M., Sun G. Non-performing loans (NPLs), liquidity creation, and moral hazard: Case of Chinese banks. *China Finance and Economic Review*. 2016;5(3):51–75.
11. Rajha K.S. Determinants of non-performing loans: Evidence from the Jordanian banking sector. *Journal of Finance and Bank Management*. 2016;(1):125–36.
12. Dimitrios A., Helen L., Mike T. Determinants of non-performing loans: Evidence from Euro-area countries. *Finance research letters*. 2016;18:116–119.
13. Podpiera J., Weill L. Bad luck or bad management? Emerging banking market experience. *Journal of financial stability*. 2008;4(2):135–148.
14. Kamun J.J., Olweny T. Macro-economic indicators and non-performing loans of public listed commercial banks across securities exchanges in East Africa. *Reviewed Journal International of Business Management*. 2023;4(1):142–164.

15. Kigamwa J.N., Mutwiri N.M. Macro economic factors and non-performing loans in the Kenyan banking industry. *International Academic Journal of Economics and Finance*. 2023;3(8):279–291.
16. Gashi A., Tafa S., Bajrami R. The impact of macroeconomic factors on non-performing loans in the Western Balkans. *Emerging Science Journal*. 2022;6(5):1032–45.
17. Msomi T.S. Factors affecting non-performing loans in commercial banks of selected West African countries. *Banks and Bank Systems*. 2022;17(1):1.
18. Ahmed S., Majeed M.E., Thalassinos E., Thalassinos Y. The impact of bank specific and macro-economic factors on non-performing loans in the banking sector: evidence from an emerging economy. *Journal of Risk and Financial Management*. 2021;14(5):217.
19. Prasanth S., Nivetha P., Ramapriya M., Sudhamathi S. Factors affecting non performing loan in India. *International Journal of Scientific and Technology Research*. 2020;9(1):1654–7.
20. Koju L., Koju R., Wang S. Macroeconomic and bank-specific determinants of non-performing loans: Evidence from Nepalese banking system. *Journal of Central Banking Theory and Practice*. 2018;7(3):111–38.
21. Ghosh A. Sector-specific analysis of non-performing loans in the US banking system and their macroeconomic impact. *Journal of Economics and Business*. 2017;93:29–45.
22. Konstantakis K.N., Michaelides P.G., Vouldis A.T. Non performing loans (NPLs) in a crisis economy: Long-run equilibrium analysis with a real time VEC model for Greece (2001–2015). *Physica A: Statistical Mechanics and its applications.* 2016;451:149–161.
23. Tomi S.H., Iliyasu A.D., Mojisola S.K. An analysis of non-performing loans in Nigerian deposit money banks. *Arts and Social Science Research*. 2022;12(2):23–34.
24. Atoi N.V. Non-performing loan and its effects on banking stability: evidence from national and international licensed banks in Niger. *CBN Journal of Applied Statistics*. 2018;9(2):3.
25. Ademola A.O. Credit risk management: Implication for deposit money banks' performance in Nigeria. *FUOYE Journal of Finance and Contemporary Issues*. 2022;3(2):183–200.
26. Etale L.M., Ayunku P.E., Etale E. The impact of non-performing loans and bank performance in Nigeria. *International Journal of Humanities and Social Science Invention*. 2016;5(4):1–5.
27. Hosen M., Broni M.Y., Uddin M.N. What bank specific and macroeconomic elements influence non-performing loans in Bangladesh? Evidence from conventional and Islamic banks. *Green Finance*. 2020;2(2):212–26.
28. Narayan P.K., Smyth R. What determines migration flows from low-income to highincome countries? An empirical investigation of Fiji-Us migration 1972–2001. *Contemporary economic policy*. 2006;24(2):332–342.

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