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Relationships Among Non-Performing Loans, Macroeconomic And Banks' Specific Variables In Nigeria's Economy: ARDL Model Approach

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Abstract
Increasing levels in non-performing loans (NPLs) which remained an area of great concern contributed to the issues of declining economic activities in Nigeria in the 1990s and thereafter.
The study investigated the relationship among non-performing loans, macroeconomic and banking system-specific variables in the Nigerian economy. Time series data spanning from 1981 to 2019 were obtained from the Central Bank of Nigeria and The World bank. Data were analyzed using distributed lag multiple regression model. Descriptive and inferential results showed evidence of a negative relationship between non-performing loans and gross economic activities thereby suggesting that improving the macroeconomic environment might lead to a reduction in the non-performing loans in the banking system of Nigeria.

Keywords: *Non-performing loans, macroeconomic variables, unemployment rates, Credit to the economy, interest rate*

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I. Introduction

Globally, there had been increased banking crises in the last two decades than ever before the 1980s. The major cause seemed to be associated with increased instability in macroeconomic, banking variables and the accelerated growth rate in non-performing loans (NPLs) whose consequences have been far-reaching. Many economies had witnessed unprecedented banks failures. Several banks were shut down by the regulatory authorities because of distress sequel to increased rates of NPLs. The volatility in the macroeconomic variables coupled with the high proportion of the NPLs to total loans in the banking system seemed to have precipitated and propelled banking system failure and crises. The banking system's failure led to crises and reduction in credit flow in the economy which constrained efficiency and productivity in the allocation of resources in all business units over time. (Farhen, Satar, Choudhury and Khalil, 2012). In Nigeria, these crises had not only amplified the roles of the Central Bank of Nigeria (CBN), a major supervisor/regulator of the financial system but compounded the challenges of maintaining monetary and price stability in the economy. High and uncontrollable level of growth in NPLs posed deleterious challenges not only to the Nigerian banking system but the global financial system. Empirical studies showed that loan quality was a vital predictor of the solvency of the banking system (Kashif,Iftikhar and Iftikhar, 2016; Badar, and Javid,2013). The results of various studies showed that banks that were on the verge of bankruptcy were often saddled with a high level of NPLs of which the major cause was associated with increased instability in the macroeconomic and banking system-specific variables. (CBN/NDIC,1995). Despite the immense adverse impacts of NPLs on the performance of the banking system, yet there seemed to be insufficient empirical studies relating macroeconomic and banks' specific variables with the emergence of growth in NPLs. Some scholars argue that it is a long-lasting recession that triggers off growth in NPLs while others appeal to the debt-deflation theory of Fisher (1933). They maintain that deflation (which is a decline in general prices) is the major cause. The inadequate empirical study seems to hinder financial economists from arriving at a common stance on this issue. However, it should be noted that the continuous instability in macroeconomic as well as banking system-specific variables may exact dominant influences that can trigger off rapid growth in NPLs.

Financial economists are interested in the relationship between macroeconomic variables of the economy and NPLs of the banking system. Adeyemi, (2011) opined that an unstable macroeconomic system could cause distress in the financial system. Empirical evidence showed that as economic recession and output slowed down or declined over a period of time, loan beneficiaries found it difficult to repay their loans as a result of abysmal sales. Studies by Quagliarello, (2007) and Espinoza and Prasad, (2010) maintained that

during the depression, investors were over conscious and pessimistic regarding investments in new projects and other consumption decisions and consequently the banking system held back lending decisions. Quagliarello, (2007) observed that during booms, NPLs were reasonably low, because the high incomes of borrowers provided them with stable cash flows stream to meet credit obligations. To earn more during the boom, banks may grant loans to low quality borrowers. However, in recession, the inability of low-quality loan beneficiaries to repay loans resulted in the growth of NPLs. The growth in NPLs may be due to the decline in the prices of the assets used as collateral during the depression, as the resultant value of the pledged collateral may not have been enough to cover the loan amount in case of default. This may increase the banks' NPLs and riskiness. Marcucci and Quagliariello, (2008); Espinoza and Prasad, (2010) confirmed the link between NPLs and the business cycle. According to economic theory, an inverse relationship exists between NPLs and real GDP.Several studies documented the existence of a relationship between loan defaults and macroeconomic variables (Morakinyo and Sibanda 2016; Hou and Dickinson,,(2007; Koopman and Lucas, 2005). This indicated that the two variables were correlated. In a related studies, Samoye (2010) as well as Fofack (2005), they maintained that the dynamics of NPLs was best explained by the macroeconomic variables such as real GDP. In a another study, Badar and Javid, (2013) as well as Messai and Jowini (2013) maintained that real GDP was negatively associated with NPLs. Many studies suggested that the macroeconomic environment had a major effect on NPLs. (Mabvure, Gwanga, Faitira, Mutibya, and Kamoyo, 2012; Vogiazas and Nikolaidu, 2011; Dash and Kabra 2010;). Furthermore, Morakinyo and Sibanda (2016), in a study on determinants of non-performing loans in Nigeria used time-series data collected from the Central Bank of Nigeria from 1981 to 2011, the results of the study showed that unemployment, credit to the private sector and exchange rate exacted a positive influence on non-performing loans in the long run. Salas and Saurina (2006), also studied the determinants of NPLs in Spain from 1984 to 2003. The study's results showed that high-interest rate, growth in credits and soft loan conditions were the major causes of growth in NPLs in Spanish banking system. In another study, Hoggarth, Forensen and Zuchina (2008) conducted a study in the United Kingdom from 1988 to 2004, the results of the study showed that inflation and interest rate were the main causes of NPLs. In another study, Bofondi and Repele (2011); Nkusu,(2011) found that adverse macroeconomic conditions such as contraction of real GDP, unemployment, lending rates caused NPLs growth in the economy. Furthermore, Khemraj and Pasha (2009) studied NPLs in Guyana from 1994 to 2004. The results showed that GDP growth was inversely related to NPLs while exchange and interest rates were directly associated with NPLs.

Shingjergii, (2013) in his study of the impact of macroeconomic variables on NPLs in the Albanama banking system from 2005 to 2012 also found that the existence of a negative relationship between NPLs ratio and GDP growth. This might indicate that an increase in GDP growth would translate to a reduction in NPLs growth. The inability of the banking system to grant new credits or issue new securities during the recession might be associated with the cost and uncertainty of viable returns. The banking system would rather cut its lending portfolios than issue new loans to retain its solvency. Therefore, the linkage between the banking system and the macroeconomic environment, emerging adverse issues in macroeconomic environment could propel banks in creating a banking crisis. Adverse macroeconomic shocks could threaten banking system liquidity by exacerbating the inability of loan beneficiaries to meet loan repayment obligations.

Deductions from the reviewed literatures **posit that** unstable macroeconomic and banking system-specific variables seem to be responsible for the increasing level of NPLs in Nigeria. This might have militated against accelerated lending to the economy thereby negatively impacting financial intermediation. This might be due to the decrease in the availability of loanable funds. Given the above, the key questions which the study seek to address are stated thus: Did the high level of NPLs rate in the banking system relate with the instability in macroeconomic and banking system-specific variables from 1981 to 2019? Did the instability in macroeconomic variables cause fluctuation in NPLs? These form the cardinal focus of the study. Therefore, the objective of the study is to determine the relationships among NPLs in the banking system, macroeconomic and banks' specific variables in the Nigerian economy during the study period

II. Methodology

The study was conducted in Nigeria. The study area is located on the Gulf of Guinea in the sub-Saharan region of Africa. It lies between $4^0$and 14^0 north of the equator and between longitude 3^0 and 15^0 east of Greenwich meridian. Nigeria has a total land area of 923,768.622km^2 equivalents to 98.3 million hectares (Akpan, *et al.*, 2012). Nigeria has a population of around 200 million (NPC, 2021).In the country, agriculture which is the largest sector of the economy dominates the economic landscape, providing 70% employment and 40% Gross Domestic Product (GDP)

Sources of data

Time series data from 1981 to 2019 were collected from the annual statistical bulletin of the Central Bank of Nigeria; the National Bureau of Statistics and the World Bank. The study used specific information on

aggregate NPLs in the Nigerian banking system, key macroeconomic variables and banks specific variables. These included annual gross domestic product, lending interest rates, annual unemployment rate, and liquidity ratios among others.

Analytical Technique

The macroeconomic variables and bank-specific variable were factored as explanatory variables in the non-performing loan equation in Nigeria. The explanatory variables were selected based on the related works in the literature and the availability of reliable data sources. The non-performing loan equation adopted assumes the following implicit Cobb-Douglas form:

$$NPLS_t = f(GDP_t, ITR_t, INR_t, LAD_t, UMR_t, EXR_t, LQR_t) \dots\dots\dots\dots\dots (1)$$

Where,

NPL_t = Nonperforming loans of the Nigerian banking system from 1981-2019
GDP_t = Gross domestic product at current market price (₦b)
ITR_t = Lending interest rate (%)
INR_t = Annual inflation rate (%)
LAD_t = Domestic credit to the private sector as a % of GDP
UMR_t = Unemployment rate (%)
EXR_t = Average nominal exchange rate (%)
LQR_t = Annual liquidity ratio (%)
Note, variables are expressed in logarithm form.

Testing for the short and long runs relationships among series in the NPLs equation

The autoregressive distributed lag (ARDL) bounds testing approach which was developed by Pesaran and Shin (1999) and Pesaran *et al.* (2001) was used to investigate the long and the short-run relationships among variables specified in the NPLs equation in Nigeria. The ARDL bound model has three advantages when compared with the Engle and Granger (1987) two steps method and Johansen and Juselius (1990) co-integration method. The ARDL method is applied to deal with time series having mixed stationary issues (i.e. the mixture of 1(0) and 1(1)). Hence, it relaxed the assumption that all times series must be integrated of the same order. The second merit associated with ARDL model is that of being relatively more efficient in the cases involving small and finite sample data sizes. The method produces unbiased estimates of the long-run model (Harris and Sollis, 2003). The ARDL model for equation (1) is expressed as follows:

$$\begin{aligned}\Delta NPL_t = {} & \beta_0 + \beta_1 \sum_{i=1}^{n_1} \Delta NPL_{t-1} + \beta_2 \sum_{i=1}^{n_2} \Delta GDP_{t-i} + \beta_3 \sum_{i=1}^{n_3} \Delta ITR_{t-i} + \beta_4 \sum_{i=1}^{n_4} \Delta INR_{t-i} + \beta_5 \sum_{i=1}^{n_5} \Delta LAD_{t-i} \\ & + \beta_6 \sum_{i=1}^{n_6} \Delta UMR_{t-i} + \beta_7 \sum_{i=1}^{n_7} \Delta EXR_{t-i} + \beta_8 \sum_{i=1}^{n_7} \Delta LQR_{t-i} + \delta_1 NPL_{t-i} + \delta_2 GDP_{t-i} + \delta_3 ITR_{t-i} \\ & + \delta_4 INR_{t-i} + \delta_5 LAD_{t-i} + \delta_6 UMR_{t-i} + \delta_7 EXR_{t-i} + \delta_8 LQR_{t-i} + U_t \dots\dots\dots\dots\dots (2)\end{aligned}$$

The specification of the ARDL model assumes endogeneity of series, and this implies that equation 2 is specified for all variables in equation 1. The coefficients from β_1 to β_8 represent the short-run coefficients whereas the coefficients from δ_1 to δ_8 represent the long-run coefficients of the ARDL model. Also, β_0 is the drift component, "n" is the maximum lag length while U_t is the stochastic error term. The bounded F-statistic test was used to check the existence of stable long-run relationships among the variables in the models. For instance, if the calculated F-statistic in equation (2) is greater than the upper bound critical values, the null hypothesis is rejected implying the existence of the co-integration relationship. But if the value of the F-statistic is below the lower bound, the null cannot be rejected, thereby indicating the absence of co-integration. Besides, if the F-statistic value lies within the lower and upper bounds, the results are considered inconclusive (Pesaran *et al.*, 2001). If the bound test shows evidence of co-integration among the specified variables, the long and short-run (an error correction model (ECM)) equations of the ARDL model are specified as follows;

The ARDL long-run model for equation 1:

$$\begin{aligned}NPL_t = {} & \delta_0 + \delta_1 NPL_{t-i} + \delta_2 GDP_{t-i} + \delta_3 ITR_{t-i} + \delta_4 INR_{t-i} + \delta_5 LAD_{t-i} \\ & + \delta_6 UMR_{t-i} + \delta_7 EXR_{t-i} + \delta_8 LQR_{t-i} + U_t \dots\dots\dots\dots\dots\dots (5)\end{aligned}$$

Then the ARDL short run model (ECM model) for equation 1is stated as thus:

$$\Delta NPL_t = \beta_0 + \beta_0 + \beta_1 \sum_{i=1}^{n_1} \Delta NPL_{t-1} + \beta_2 \sum_{i=1}^{n_2} \Delta GDP_{t-i} + \beta_3 \sum_{i=1}^{n_3} \Delta ITR_{t-i} + \beta_4 \sum_{i=1}^{n_4} \Delta INR_{t-i} + \beta_5 \sum_{i=1}^{n_5} \Delta LAD_{t-i} + \beta_6 \sum_{i=1}^{n_6} \Delta UMR_{t-i} + \beta_7 \sum_{i=1}^{n_7} \Delta EXR_{t-i} + +\beta_8 \sum_{i=1}^{n_7} \Delta LQR_{t-i}\ \beta_1 + \emptyset ECM_{t-1} + U_t \dots\dots\dots\dots\dots\dots\dots\dots\dots (6)$$

Where Ø is the error correction term and measures the speed of adjustment towards the long-run equilibrium, and the remaining coefficients provide the short-run dynamics. To analyze the performance of the estimated model, RESET test, Serial correlation and normality of the residuals tests were conducted, whereas the cumulative sum squared (CUSUM) test was conducted to verify the stability of the model.

III. Results and Discussions

Table 1: Summary Statistics

Variable	Mean	Std. Dev.	C.V	Minimum	Maximum
GDP	3.0963e+013	4.2043e+013	1.3578	1.3931e+011	1.4564e+014
INR	19.146	17.063	0.89117	5.3880	72.836
UMR	10.431	6.8131	0.65317	1.9000	25.400
ITR	17.511	4.7938	0.27089	8.9167	31.650
LAD	9.1924	3.5479	0.38596	4.9575	19.626
LQR	47.618	10.625	0.22313	29.100	75.825
EXR	89.247	93.137	1.0436	0.55000	306.90
NPLs	23.348	13.264	0.56808	3.5000	45.400

Source: computed by authors

The descriptive statistics in Table 1 summarized the behaviour of non-performing loans and macroeconomic as well as banking system-specific variables used in the study. NPLs, macroeconomic and banking system-specific variables showed some degrees of variability during the specified period. The mean variation exceeded 100% in nominal exchange rate and the GDP, but less than 100% for the rest of the variables. However, the variability was far less in the lending interest rate (27.09%) and liquidity ratio (22.31%). The nature of variability in the lending rate might be associated with arrays of credit policies coupled with the management styles in the banking system during the period of the study. The aggregate average NPLs rate was 3.5 per cent which appeared lower than the threshold of 5.0 per cent.

Unit root test

The study employed ADF unit root test to confirm the unit root for the specified variables. The results are presented in Table 2. The results revealed that inflation rate (INR), lending rate (ITR) and liquidity ratio (LQR) were stationary at levels; while the rest of the variables were stationary at the first difference for the ADF equation that contained constant only. For the ADF equation that contained constant and trend, inflation rate (INR), lending rate (ITR) and liquidity ratio (LQR), as well as the non-performing loans (NPLs), were stationary at levels; while the rest of the variables were stationary at first difference. Since we have a mixture of variables that are 1(0) and 1(1), it indicates that the ARDL model is the most appropriate to test for the co-integration in the specified models. Before estimating the ARDL model, the optimal lag lengths for the series were determined using the Akaike Information Criterion (AIC), Schwarz and Bayesian Criterion (SBC). The F-statistics computed for the selected equation is presented at the upper portion of Table 3.

Table 2: Result of the Unit Root test for Variables Used in the Analysis

Logged Variables	ADF Unit Root Test					
	With Constant			**With Constant and Trend**		
	Level	1st diff.	OT	Level	1st diff.	OT
GDP	-1.09797	-3.37516*	1(1)	-0.07595	-3.51555*	1(1)
INR	-3.39115**	-	1(0)	-3.49344*	-	1(0)
UMR	-1.26388	-5.79281***	1(1)	-2.20167	-5.72759***	1(1)
ITR	-3.57159**	-	1(0)	-3.26903*	-	1(0)
LAD	-0.7697	-5.2610 ***	1(1)	-0.9081	-5.2482 ***	1(1)
LQR	-3.22671**	-	1(0)	-3.23919*	-	1(0)
EXR	-1.49614	-5.70606***	1(1)	-1.03053	-5.97105***	1(1)
NPLs	-1.71232	-6.1358***	1(1)	-3.42244*	-	1(0)

Note: OT means the order of integration. Critical value (CV) is defined at 1%, 5% and 10% significant levels and asterisks *, ** and *** represent 1%, 5% and 10% significance levels respectively. Variables are as defined previously in equation 1.

The results of the F-statistic for equation 2 revealed that co-integration existed among the specified variables. The calculated F-statistic was greater than the tabulated upper bound critical value at 10%, 5% and 1% levels of significance. The finding implies that the long-run equilibrium equation exists for equation 2 and it indicated that the short-run model could be generated from this equation.

Table 3: ARDL Bound Test

Equations	F-Statistic		Decision
F_{NPL}(NPL | GDP, INR, UMR, ITR, LAD, LQR, EXR)	15.64956		Co-integration
Critical Values Bound (at K = 7 and n = 39)			
	Lower	Upper	
10%	2.169	3.306	
5%	2.558	3.846	
1%	3.468	5.057	

Source: computed by authors using Eviews 10 and data as described in equation 1 and 2. Critical values are derived from Narayan, (2005). Note, variables are stated in natural logarithm form.

Following the establishment of co-integration for the specified NPLs equation, Table 4 presents the long-run coefficients for the ARDL model for equation 2 (NPLs equation).

The Long-run Coefficients of ARDL for NPLs equation

In tandem with theory, the results revealed that the NPLs has a significant negative (at 1%) impact on the GDP (Fofack 2005;Khremaj and Pasha 2009; Dash and Prasad 2010;Espinoza and Prasad 2010; Shingjergii, 2013). This means that a one per cent increase in the NPLs led to a 0.6112 per cent decrease in the GDP in Nigeria during the period under study. Improvement in the real economy resulted to declines in the non-performing loans rates in the banking system. An increase in the GDP implies improvement in the economic performances with the corresponding increase in the overall performance of the economy.

Table 4: The Long-run Coefficients for NPLs equation

	Coefficient	*Std. Error*	*t-ratio*	*p-value*
Constant	20.7584	5.2126	3.982***	0.0004
$LnGDP_t$	−0.6112	0.1943	−3.145***	0.0036
$LnINR_t$	0.1614	0.0872	1.850*	0.0739
$LnUMR_t$	0.2946	0.1546	1.905*	0.0661
$LnITR_t$	0.3157	0.1127	2.801***	0.0095
$LnLAD_t$	−0.1869	0.4052	−0.4615	0.6477
$LnLQR_t$	−0.6962	0.2722	−2.557**	0.0157
$LnEXR_t$	0.3769	0.1951	1.932*	0.0626
R-squared	0.7867	Adjusted R-squared		0.7385
F(7, 31)	15.5731	Durbin-Watson		1.4924

Source: computed by authors. Note: ***, and ** indicate 1% and 5% significance level respectively. Note, variables are specified in natural logarithm form.

The result also reveals that an increase in the inflationary rate has a significant positive influence on the NPLs in the country. Thus a unit increase in the inflation rate would lead to about 0.1614 units increase in the NPLs. An increase in the inflation rate would result in increase in prices of factors of production thereby escalating the cost of production and lowering the profit margin. Hence, if inflationary rate hike persists, the tendency of loan default by producers would amplify as well as the NPLs over time.

Furthermore, as regards labour market situation in Nigeria during the period of the study, the results depicted that NPLs had a significant positive relationship with the unemployment rate in the country in the long run (Bofondi and Repele 2011; Nkusu,2011) This means that, as the rate of labour/ unemployment increases in the long run, the magnitude of NPLs increases too. A unit increase in the unemployment rate would lead to about 0.2946 units increase in the NPLs in the long run. It might be deduced that unemployed loan beneficiaries could not meet their obligations nor repay their debts. This might have amplified the levels of NPLs over time.

An improvement in the activities of the economy could lead to increase inflow of incomes and eventual increase in profitability. However increase in unemployment rates might reduce the current and future purchasing power of the loan beneficiaries which might have culminated to low production of goods and services. Unemployment negatively influenced cash-flow of the investors which amplified outstanding loan balances. Unemployment could lead to decline in production which could have culminated to reduction in effective demand leading to decline in revenues generation.

Similarly, the long run coefficient of the banking system lending interest rate has a positive significant relationship with the NPLs (Messai and Jouini 2013). This means that, as the lending interest rates increase by a unit, the NPLs correspondingly would increase by 0.3157 units. The result satisfies the *a priori* expectation as accumulating lending interest rate would likely increase the probability of loan default. The implication of the results showed that increase in the level of banking system interest rate increased the level of NPLs indicating the decline in ability of loan beneficiaries to meet loan repayment obligations as when due.

The coefficient of the liquidity ratio is negative and is significantly related to the NPLs. A unit increase in the annual liquidity ratio would lead to about 0.6962 units decrease in the non-performing loans (NPLs). Increase in the liquidity ratio enhances entrepreneur's ability to meet adequately the short term debt obligations. A liquidity ratio which is greater than unity implies that, an entrepreneur is able to cover the short term liability and can also service part of the long run liabilities. The continuous increase in the liquidity ratio would therefore decrease the probability of both the short and the long term loan default. Furthermore huge NPLs negatively influenced the level of private sector investment and may affect deposit liabilities thus impeding the credit spread to the private sector. This negatively impacts on private consumption and may lead to contraction in demand.

The slope coefficient of the nominal exchange rate (₦/$) is positive and significantly correlated to the NPLs (Khemraj and Pasha,2009). This means that, a unit increase in the nominal exchange rate will accelerate the NPLs at about 0.3769 units. The result could be explained by the fact that, an increase in the exchange rate would likely restrict importation including capital goods. Predicated that the Nigerian domestic economy depend significantly on imported capital goods, thus an increase in the exchange rate would increase the cost of production thereby reducing the profit margins. The reduction of entrepreneurs' profit margin would increase the probability of loan default in the long run.

The Error Correction Model of the ARDL for the NPLs equation

The result in Table 5 contains the error correction representation of the ARDL model for equation 6. The coefficient of the error correction term (ECT) is negative and statistically significant at a 1% level, which indicates the existence of a stable long-run relationship among the variables included in the ARDL long run model for the NPLs equation. The result for the error correction model in respect of the short-run NPLs equation indicated that about 83.22% of the short-run disequilibrium was adjusted towards its long-run equilibrium annually during the period of the study. The diagnostic test for the ECT (model) revealed R^2 value of 0.8179 which means that the specified explanatory time series variables in the model explained about 81.79% of the adjusted total variations in the NPLs during the period of the study.

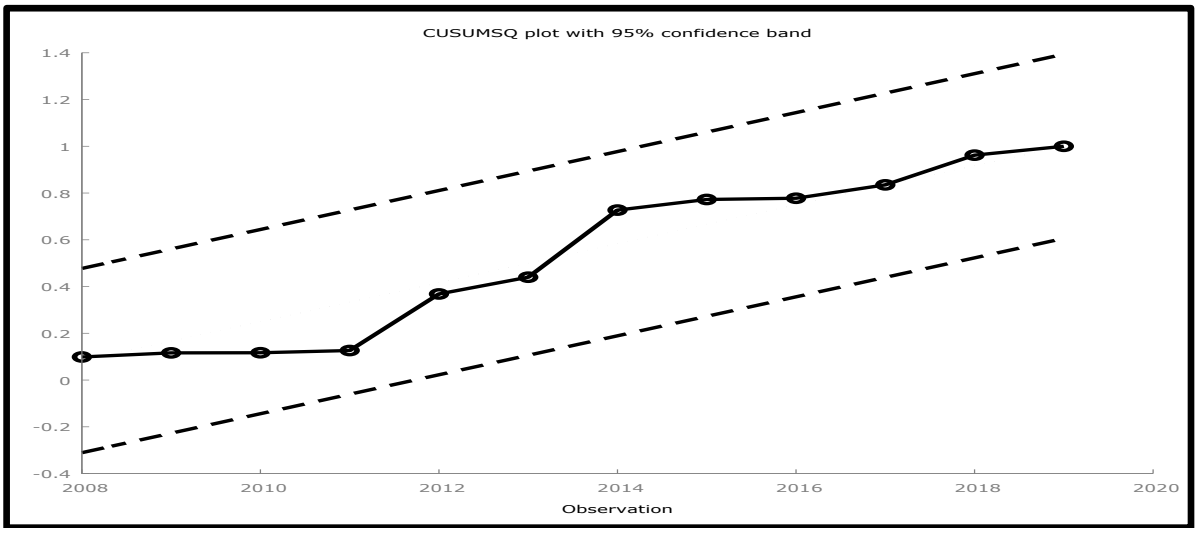
Table 5: The Short - run Coefficients for NPLs equation

Variable	Coefficient	Std. Error	t-ratio	p-value
Constant	−0.0304708	0.136078	−0.2239	0.8266
ΔLnNPLst-1	0.312815	0.160043	1.95467*	0.0709
ΔLnGDPt	−1.38253	0.722902	−1.912*	0.0800
ΔLnGDPt-1	−1.84478	0.657581	−2.805**	0.0159
ΔLnGDP_2	1.90477	0.839836	2.268**	0.0426
ΔLnINRt	0.0879555	0.158083	0.5564	0.5882
ΔLnINRt-1	0.0574583	0.0913514	0.6290	0.5412
ΔLnINRt-2	0.0728818	0.126259	0.5772	0.5744
ΔLnUMRt	0.556053	0.131031	4.244***	0.0011
ΔLnUMRt-1	−0.267885	0.175655	−1.525	0.1532
ΔLnUMRt-2	−0.130712	0.262827	−0.4973	0.6279
ΔLnITRt	0.814240	0.553769	1.470	0.1672
ΔLnITRt-1	−2.03231	0.376130	−5.403***	0.0002
ΔLnITRt-2	−0.922845	0.324250	−2.8461**	0.0110
ΔLnLADt	−0.110374	0.307062	−0.3594	0.7255

ΔLnLADt-1	−0.330032	0.277282	−1.190	0.2570
ΔLnLADt-2	1.16172	0.507707	2.288**	0.0411
ΔLnLQRt	−0.498048	0.251713	−1.979*	0.0713
ΔLnLQRt-1	0.262614	0.240640	1.091	0.2966
ΔLnLQRt-2	−0.169718	0.344541	−0.4926	0.6312
ΔLnEXRt	0.844224	0.185007	4.563***	0.0007
ΔLnEXRt-1	0.372067	0.251745	1.478	0.1652
ΔLnEXRt-2	0.339940	0.269446	1.262	0.2311
ECMt-1	−0.832189	0.271199	−3.069***	0.0097
R-squared	0.817965	Breusch-Pagan test	LM = 15.1207	
F(23, 12)	51.37163	RESET test	F(1, 11) = 0.678015	

Source: computed by authors. Note: ***, and ** indicate 1% and 5% significance level respectively. Note, variables are stated in natural logarithm form.

The F-statistic of 51.37 is significant at a 1% probability level, indicating that the R^2 is significant and the estimated equation has the goodness of fit. Also, the RESET test is not significant which confirms the structural rigidity of the estimated model. The residual is normally distributed and this justifies the use of the ordinary least squares (OLS) estimation method. The CUSUM test is significant, confirming that the estimated model is stable. As shown in Figure 1, the CUSUM of recursive residuals remains within the 5 per cent critical bounds, which also indicates that the model is stable. The Breusch-Pagan test shows a mild incidence of heteroscedasticity.



The short run model revealed the importance of the gross domestic product (GDP) on the growth of the NPLs in the country. This means that, the composition of the GDP significantly affected the accumulation of the NPLs in the country in a short run. However, the direction of the effect depends on the lag level of the GDP. For instance, at the current year, the relationship between the GDP and NPLs is negative, while it turns to positive at lag 2 of the GDP.

The short run coefficient of the unemployment has a significant positive relationship with the NPLs in Nigeria. This means that, as unemployment increases, the NPLs will likely increase too in the short run. A unit increase in the unemployment rate would likely increase the accumulation of NPLs by 0.556 units in the short run.

The result further showed a negative significant relationship between the banking system lending interest rate and the NPLs in the short run period in Nigeria. The result is against *a priori* expectation as increase in the lending interest rate would most likely increase the chance of default by the loan beneficiaries. Though at the level of the interest rate, the coefficient exhibited plausible sign, but was not significant. We suggest that, the short run significant relationship between the lending interest rate and the NPLs could be induced by the prudent management of loans by the banking system which might have evolved through efficient monitoring system among others. Furthermore, the result of the study also revealed that the domestic credit to the private sector had

a significant positive effect on the NPLs in the country. This connotes that increase in volume of credit injected into the economy would likely trigger increase in the NPLs in the short run. In a similar vein, the increase in ₦/$ exchange rate influences the NPLs in a positive manner. Therefore, increase in the exchange rate would cause acceleration in the NPLs in the country. Similar results were reported for the long run model.

On the contrary, the short run coefficient with respect to liquidity ratio displayed an adverse relationship with the NPLs. The result implies that as the liquidity ratio increases, the NPLs declines accordingly in the short run.

IV. Conclusion and Recommendation

The results generated from the study showed clear evidence of causal relationship between some selected macroeconomic variables and NPLs in Nigeria. Therefore, the study concluded that the prevalence of increased levels of NPLs rate in the Nigerian banking system was associated with instability in macroeconomic and banks' specific variables from 1981 to 2019 in the economy.

Policy Implications and Recommendations

The macroeconomic environment has effects on the assessment of loan beneficiary's capacity to liquidate borrowed funds from the banking system. An economy characterized by robust activities is good for increased income with a high capacity to create employment opportunity while an economy characterized by declining financial resources is bound to experience some levels of distress. Existence of inverse relationship among non-performing loans and macroeconomics variables namely GDP, credit to the private businesses and unemployment rates are the key results generated from the study. The existence of a direct relationship between banking system-specific variables and NPLs indicates that variations in the NPLs trends were caused by these bank-specific variables in the short run which later adjusted towards its long-run equilibrium annually.

Thus, a robust performance in the real economy indicates downward movement in the NPLs over time. Similarly, the inverse association between NPLs and unemployment rate implies that a strong performance in the real economy would lead to increase employment opportunities thereby creating marginal incomes among the economic agents. Inflation and liquidity ratio coupled with the injection of more liquidity into the real economy should be quantitatively managed by the banking system over time. As exchange rate exacted positive association with non-performing loans which indicate that depreciation in domestic currency will result in increased levels of non-performing loans.

It is recommended that serious attention be focussed on credit administration which is the main backbone of the banking system, and that the top management should pay more attention to the capacity of the competitiveness of the domestic economy as this may influence the repayment capacity of economic agents engaged in major export-oriented sectors of the economy. This could influence the growth of NPLs. Furthermore, it is recommended that the banking system should consider the performance of the real economy when appraising loans proposals as the NPLs may be higher during the depression. The liquidity and banking system interest rates, as well as credits granted to the real economic activities, should not only be constantly evaluated but efficiently monitored and adequately factored into the banking system stability indicators. This is not only to properly gear the aggregate financial system stability but fitness as well as soundness of the Nigerian banking system over time.

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