

Macroeconomic and Bank-Specific Determinants of Non-Performing Loans in Nigeria

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Abstract: - Proper management of banks' assets is the most sought panacea by bank managers in Nigeria. Lower quality of loans in the banking system can lead to higher loan loss provisions and affect banks' capital adequacy ratios. This study examines how Non-Performing Loans (NPLs) of Nigeria's Deposit Money Banks (DMBs) respond to selected macroeconomic and bank-specific determinants. Using the data within the sample period of 1981-2019 with Autoregressive Distributed Lag (ARDL) model, the study establishes that in the short-run, the level of NPLs in Nigeria is affected by these macroeconomic determinants namely, the unemployment rate (UNEMP), gross domestic products growth rate (GDPG) and exchange rate (EXRT) as well as bank-specific determinant (loan-to-deposit) ratio (LDR). However, in the long-run, GDPG and EXRT have a positive and significant influence on NPLs. The variables respond in line with our apriori expectation, however, unemployment, inflation and loans to deposits ratio are insignificant and appear not to affect NPLs in Nigeria in the long-run. The study recommends that government should ensure that the naira is properly managed as deterioration in its value portends a grave impact on the rate of non-performing loans. Also, improved infrastructures like good roads, water and power would enable the borrowers to fulfil repayment plans on time. A robust economy is important for borrowers to redeem their loan obligations in due time. This can be achieved by ensuring that loans assessed are channeled to more productive sectors of the economy.

Key-Words: - Bank-Specific Determinants, Deposit Money Banks, Economy, Inflation, Macroeconomic Determinants and Non-Performing Loans

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1 Introduction

The macroeconomic determinants of non-performing loans have been generating substantial interest from scholars from developing and developed economies. Following the outburst of the 2007-2009 global financial crisis (GFC), the prevalence of increasing non-performing loans (NPLs) ratio by deposit money banks (DMBs) despite banks' recapitalization and subsequent consolidation of banks in Nigeria are still a pointer to the fact that the Nigerian banking sector is still largely vulnerable to macroeconomic shocks. Meanwhile, proper management of banks' assets, which, largely are loans and other credit facilities, is the most sought panacea by bank owners and managers in Nigeria. However, lower quality of loans in the banking system or increasing tendency in NPLs can lead to higher loan loss provisions, which

can negatively affect the profitability and capital adequacy ratios of banks. In view of these, the focus of this study is, how does NPLs of Nigerian DMBs respond to macroeconomic determinants in Nigeria. This study attempts to answer this question by examining empirically, the effect of macroeconomic variables on NPLs of the DMBs in Nigeria.

In the same vein, the effect of NPLs is enormous for the banking and financial services industry and the economy at large. According to [1], banks' choice for investing a sizeable portion of their assets in loans and advances (risk assets), despite their higher risk profile, is because it generates higher returns. The going concern ability of banks can be threatened as their ability to create credit is hampered due to the toxicity of their risk assets. This deterioration in the risk assets extends to the entire banking industry resulting from the contagion effects

on healthy banks, as the resulting illiquidity of the affected banks tends to spread from one bank to the other. As a result, the economy at large bears the brunt since the instruments for transmitting monetary policy is effected by the Central Bank through deposit money banks. The need to deal with a fragile economy that is faced with macroeconomic challenges like low economic growth, high unemployment and volatile exchange rate, necessitates the need for stern banking reform.

Therefore, our findings in this study should have significant policy direction for designing stabilization and adjustment reforms for Nigeria and, as a template for other emerging economies in Africa. To achieve this task, this study is divided into five different

parts. After the first part, which is the introductory and Nigeria’s NPL profile, the second part is a brief literature review of the subject matter. Section three focuses on the theoretical framework and method of analysis, and section four deals with the result and discussion of findings. Finally, section five centered on recommendations and conclusions.

Graphical Illustration of Nigeria’s NPL Profile from 1981 to 2019

The World Development Index (WDI), [2], has the NPL ratio for the period 1981 to 2019, being 39 years. NPL ratio is measured as ratio of total non-performing loans to total loans and is shown in Table 1.

Table 1. Nigeria’s NPL Profile from 1981 to 2019

Year	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
NPLs to Total Gross Loans (%)	10.30	11.20	12.30	13.20	14.30	15.20	14.60	15.70	17.60	16.60
Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
NPLs to Total Gross Loans (%)	15.60	16.70	15.40	16.70	17.34	19.30	18.50	19.40	25.60	22.60
Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
NPLs to Total Gross Loans (%)	19.70	21.40	20.50	21.60	18.10	8.80	9.51	7.20	37.26	20.15
Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	
NPLs to Total Gross Loans (%)	5.78	3.71	3.40	2.96	4.87	12.82	14.81	11.68	6.04	

Source: World Development Index (WDI) 2021

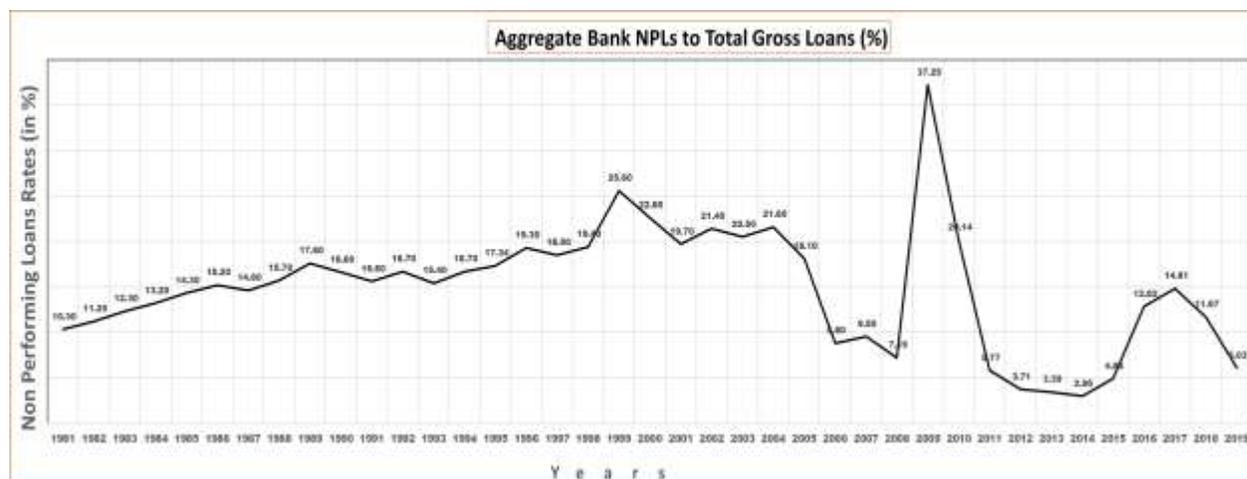


Fig. 1: Nigeria’s NPL ratios for 39 years from 1981 to 2019

Source: World Development Index (WDI) 2020

Figure 1 depicts the trend of non-performing loans (NPLs) in the Nigerian banking industry for the period 1981 to 2019. The NPL ratio which stood at 10.3% in 1981 witnessed a mild increase (though with little decline in some years) till 1998 when it stood at 19.4%. The NPL ratio increased further by 32% in 1999 and stood at 25.6%. It declined with effect from the year 2000 up to 2008. The ratio witnessed successive declines especially effective 2005 to 2008 following the CBN's recapitalization policy which compelled Nigerian banks to beef up their capital from N2billion to N25billion. Higher capital funds of the emerged consolidated and stronger /bigger DMBs improved the NPL ratio as more funds were deployed for lending purposes following a shift in supply of loanable funds. Credit standards were lowered following the supply shift in loanable funds. With keen competition to lend, big-ticket loans were made and loan loss surfaced a few years after. This is in line with [3] proposition. This pushed up the NPL ratio, which peaked at 37.25% in 2009, following the huge loan loss from margin loans, drastic fall in crude oil price, the global meltdown and the collapse of the Nigerian Capital Market.

The post-2009 average of the NPLs ratio is 8.62% (that is, from 2010 to 2019) - the period after the Assets Management Corporation of Nigeria (AMCON) was created. Comparatively, the average NPL ratio of Nigerian DMB's pre-consolidation period (that is, from 1991 to 2005) stood at 10.6%. This portends that the NPL ratio was very high prior to the take-over of the toxic loans by AMCON. An all-year reduction of 17.1% was recorded as the NPL ratio fell from 37.3% in 2009 to 20.1% in 2010 as a result of AMCON's acquisition of the eligible toxic assets of DMBs. This same reason accounts for a further decline of 14.4% in 2011 when the ratio stood at 5.8%. The NPL ratio has maintained a steady rise from about 3.0% in 2014, to about 4.86% in 2015, to 11.7% in 2016 and 6.0% in 2017. In the past two years of 2018 and 2019, the ratio has been declining. The NPL ratio of 6.03% in 2019 is higher than the prescribed CBN tolerance limit of 5%. Also, when we consider the total loan portfolio in excess of N4.7trillion in the books of AMCON as of December 2019, the NPL is in a grave position.

2 Brief Literature Review

In the literature, several previous studies (see [4], [5], [6], [7], [8], [9], [10] and [11]) had used different econometric methodologies to assess the impact of non-performing loans in both developing and developed economies, with evidence that quality of bank loans are impacted by factors that are both internal and external to banks.

The internal factors that determine the level of NPLs are referred to as bank-specific variables, which include corporate governance, the size of banks' assets, loan growth pattern, loan-to-deposit ratio, capital adequacy ratio and some other indicators. Factors that are external to the banks are macroeconomic variables. These include inflation, gross domestic product (GDP), exchange rate and so on. Meanwhile, the last GFC of 2007-2009 has left so much to be investigated in both developing and developed economies, due to the negative effect of NPLs, which has characterized past banking distresses and economic crises across the world. Similarly, the on-going COVID-19 global pandemic is a pointer to the fact that economies around the world could be more susceptible to economic shocks that are both domestic and foreign.

The authors in their study in [12] used panel data analysis for a sample taken from 20-Jordanian banks for the years 2006-2014. It explores the macro and micro level variables that predict deterioration in the loan quality at the early stage. The study recommends proactive corrective action from the regulatory authority towards the problematic financial institutions. The study uses a risk-based computation of deposit insurance premium, as well as an enhanced supervisory framework, to control the banking system, thereby securing the stability of the economy. The result of their findings shows that the selected indicators display a significant relationship with the level of NPL ratio. A negative relationship exists between NPL and GDP growth on one hand and profitability and risk on the other hand.

The authors in their study in [13] posit a mixed effect of exchange rate on NPL which is either a balance sheet effect or an income effect. A balance sheet effect postulates that depreciation of domestic currency makes NPL and debt burden to increase. Also, when the nominal exchange rate appreciates, foreign denominated loans increase the debt burden of unhedged foreign loans through increased loan

repayment. Thus, there is a positive relationship between nominal exchange rate and NPL rate.

The authors in their study in [14] which covers the period between 1981 and 2017 on the impact of external reserves shocks on selected macroeconomic indicators find that one standard deviation shock to external reserves negatively impacts the exchange rate throughout the quarters. Also, when there is a strong positive shock to external reserves, the currency tends to appreciate, that is, the exchange rate falls.

The authors in [1] formulate four (4) hypotheses namely the bad luck hypothesis, bad management hypothesis, skimping hypothesis, and moral hazard hypothesis. In their views, in the long-run, banks are liable to experience higher loan delinquencies if they spend less on their loan underwriting and monitoring. Also, banks that devote little or no effort to ensuring that high loan quality is booked, will engage in more cost-efficient debt recovery.

The study in [15] examines the relationship between Return on Assets (ROA) and the Tunisian banking system stability and economic activity indicators -NPL, Credit to Loan Ratio, Solvency Ratio. The study considers 10 banks operating in Tunisia, using quarterly data for the period Q4, 2010 to Q4, 2019. OLS (GMM) method was used to estimate the model. It finds that the profitability of Tunisian banks is significantly affected by the level of NPLs. Thus, banks with lower non-performing loan tend to have higher profitability and there exists an NPL ratio threshold of about 27%, the level at which, the banks' profits may be fully extinguished.

The authors in their study in [16] investigate the rising incidence of NPLs and economic performance in Nigeria. Time series data were used for the study which covers the period of 1984 – 2012 and considers NPLs, inflation rate, gross domestic product, lending rate. An Ordinary Least Square technique with the aid of E-view as the statistical tool was used for its data analysis. The findings reveal that causality between NPLs, lending rate, and the inflation rate is insignificant and the study concludes that non-performing loans have a significant influence on gross domestic product. It is recommended that the government should invest in sectors with growth potentials and pay their loan as at when due as well as ensure early payment of contractors and other suppliers.

The authors in their study in [7] investigate the determinants of non-performing loans in Nigeria.

They found that bank size has a positive and significant relationship with NPL. ROA has a negative insignificant relationship with the NPL, loan-to-deposits ratio has a positive and significant relationship with NPL. Inflation was found to have a positive but insignificant relationship with NPL. The lending rate increases the NPL ratio while the exchange rate increases the NPL ratio. Also, an increase in the real GDP was found to reduce NPLs both in the short and long-run with the impact being significant only in the long-run. Finally, their study finds that a reduction in the unemployment rate improves the NPL ratio.

This study is a departure from most of the existing studies by proposing a more robust methodology, which is Autoregressive Distributed Lag (ARDL) to investigate the effect of macroeconomic and bank-specific variables on Nigerian DMBs' NPL ratio.

3 Theoretical Framework

The theory argument of non-performing loans as it links to bank stability is traceable to three important pillars, which are information asymmetry, adverse selection and moral hazard theories. According to [17], information on the basic issues around loan default further degenerates into banking system instability. In the literature, the author in [18] pioneered the information asymmetry theory. This theory posits that the task of selecting good borrowers from bad ones is onerous and may lead to the problems of adverse selection and moral hazard.

Adverse selection theory as initiated by [18] was later extended by [19]. The theory emanates from the view or, on the assumption that banks (lenders) are not always, well equipped with adequate information to identify credit-deserving borrowers from or amongst the numerous loan seekers, who have various credit risk exposures at the point of requesting a loan. Also, in keeping with the 'lemons' outcome, banks are incentivized to offer only their worst loan assets for sale, rather than selling better quality assets at prices that would undervalue them [20]. If the lending banks can recoup the loans, why then would they want to sell the loan to a bad loan bank at a higher discount? This bothers on moral hazard.

Financial intermediaries, especially bankers, are more likely prone to give out loans to high-risk borrowers in their pursuit of profitability objectives

thereby taking an excessive risk, [1]. Low-quality/high-risk borrowers tend to default on loans and may be unconcerned about harsh lending conditions, [21]. In furtherance to this, the need for lenders to share and reveal important information on loan seekers, cannot be overemphasized, thereby reducing adverse selection problems. The Credit Bureau Management System (CBMS) that is in place in Nigeria today whereby banks upload the quality status, exposures and collateral details of their borrowing customers in a repository system hosted by the CBN and private domains increases information sharing amongst banks.

3.1 Method of Analysis

This study examines the effect of macroeconomic determinants of NPLs in Nigerian Deposit Money Banks. In addressing the issues arising from this objective, this study uses a multivariate econometric technique which is Autoregressive Distributed Lag (ARDL) to analyse the objective with annual data covering thirty-nine years for the period 1981-2019.

3.2 Model Specification

The basic model for the study is presented in its linear regression form, which links NPLs to the macroeconomic and bank-specific determinants. This is presented in its implicit function form:

$$NPL_t = f(\text{UNEMP}_t, \text{GDPG}_t, \text{INF}_t, \text{EXRT}_t, \text{LDR}_t) \quad (1)$$

Where:

NPL_t which is non-performing loans is the dependent variable over a period t ;

UNEMP_t represents the unemployment rate of the Nigerian economy over a period t ;

GDPG_t represents the gross domestic products growth rate over a period t ;

INF_t represents the inflation over a period t ;

EXRT_t represents the exchange rate over a period t ; and

LDR_t represents the loans to deposits ratio over a period t ;

The variables in equation (1) are described in the underlisted explanations:

i) **Non-Performing Loans (NPLs):** These are part of the total loan portfolio that borrowers are unlikely and unable to repay. The higher the non-performing

loans, the higher the loan losses and the lower the income accruable from the loan portfolio. Bank management has to ensure that they maintain a healthy loan portfolio thereby keeping loan losses at the minimum.

ii) **Unemployment Rate (UNEMP):** The unemployment rate is the proportion of people that are out of work due to the unavailability of jobs relative to the total labour force. During a period of high unemployment, the loan default rate increases as households are unable to service their loan obligations. The types of unemployment include cyclical or Keynesian, structural, frictional and classical unemployment. This study adopts unemployment as one of the determinants of macroeconomic variables because of its negative effect on individuals' incomes which may likely result in loan defaults.

iii) **Gross Domestic Product Growth (GDPG):** This is the total value of goods and services produced in a nation in a particular year, adjusted for inflation. The GDP value is calculated at factor-cost, that is, excluding taxes imposed and subsidies on goods and services. Empirical studies show that there is a relationship between a bank loan and GDPG, and it is one of the determinants of non-performing loans, [22], [23] and [24].

iv) **Inflation (INFL):** This is a persistent rise in the general level of prices of goods and services in an economy. Inflation makes borrowers to be unable to service their loans following a fall in the value of money (thus, the value of money is measured in terms of the quantity of goods and services that it can buy). So, borrowers would have to ration their limited income amongst competing bills. Inflation in Nigeria has remained predominantly in a double digit in the past three (3) decades, [11]. From the literature, INFL is one of the determinants of non-performing loans, [9] and [4].

v) **Exchange Rate (EXRT):** This is the value for which a nation's currency exchanges with another currency. The rise or fall of the real exchange rate indicates the weaknesses or strength of a nation's currency relative to international currencies. It also serves as the standard for explaining the attractiveness of local industries in the global market. The exchange rate is a significant macroeconomic

variable used in formulating economic policies and reforms. These policies assist in accelerating the achievement of set macroeconomic objectives. Generally, the exchange rate of a nation depends on the demand for and supply of a nation's currency. The rate appreciates with increased demand while increase in the supply makes the currency to depreciate, *ceteris paribus*. Similarly, changes in consumers' tastes and preferences for foreign products, changes in relative income, inflation rate, interest rate, and speculative activities on a nation's currency may change the demand for that nation's currency, and the exchange rate is thus modified.

vi) **Loans to Deposits Ratio (LDR):** This is the ratio that relates the total loan portfolio to total deposit liabilities. It is one of the liquidity indicators and it indicates if the bank is not over-lending thereby putting liquidity at risk. Banks as financial intermediaries are expected to keep some funds in liquid form so that they will not suffer a lack of liquidity should the depositors and creditors suddenly opt for the repayment or liquidity of their matured investments in the bank. LDR is one of the determinants of non-performing loans, [25].

3.3 Technique of Estimation

Autoregressive Distributed Lag (ARDL)

To achieve the specific objective, which is to examine the effect of macroeconomic determinants on NPLs in Nigerian DMBs, the study adopts Autoregressive Distributed Lag (ARDL) model approach. This estimation technique of analysis is also regarded as the Bounds test, as advanced by [26]. Unlike many other previous cointegration techniques; including [27], the ARDL cointegration approach is more reliable, because it takes into cognizance, a sample size of around 25 years. It also allows for the variables with different orders of integration to be analysed together. The combination of the series of $I(0)$ and $I(1)$ in ARDL presents a better approach to the cointegration test in the literature. The analysis procedure includes the following:

i) Test for Stationarity

This is a test for unit root among variables of interest in a model. Stationary series provide plausible regression as compared to series that are not. A non-stationary series tends to give spurious results. Therefore, this study applied the Augmented Dickey-

Fuller (ADF) unit root test to ascertain the level of stationarity of the variables in the model.

ii) Unit Root Test

The application of Autoregressive Distributed Lagged (ARDL) and Vector Autoregression (VAR) approaches requires the absence of unit roots in variables, as demonstrated by [28]. This assumption explains a position in standard regression analysis that all the variables being tested must not have a unit root. However, many macroeconomic time series variables are often not found stationary, these variables trend up and down over time. Hence, before any meaningful regression analysis can be carried out on time series variables, it is expected that the test for stationarity should be done to avoid biased estimates and spurious results. From the literature, stationary series has a finite variance, transitory shocks from the mean, and a tendency for the series to return to their mean value. This explains that a stationary series has a mean and variance; and is consistent over time.

iii) Cointegration Test

There are various estimation techniques identified in the macroeconomic literature that can be adopted to estimate the co-integration relationship among variables. For instance, Johansen's approach can be used for multivariate cointegration analysis [27]. However, this study adopts the ARDL -Bounds test approach. This approach was made popular by [26]. This is because ARDL gives a more plausible output when the series is a combination of $I(0)$ and $I(1)$. The study uses this methodology to estimate the model and empirically analysed the long-run relationship, so as to be able to explain the dynamic interactions amongst the variables of interest. This approach is built on the error correction model (ECM) technique. The ECM involves estimating the ARDL model by Ordinary Least Square (OLS). This is with a view to testing if a long-run relationship exists amongst the variables or not. [29] posit that ECM estimation tests if the variables are statistically significant at their lagged levels or not.

This will further explain, whether the null hypothesis of the existence of no long-run relationship will not be rejected or not. To achieve this, a Wald test (which is related to F-statistics for Bounds-testing) for the joint significance of the lagged levels of the variables will be performed, where the null hypothesis is tested against the

alternative. If the F-statistics is above the upper critical value, the null hypothesis of no long-run can be rejected, irrespective of the integration order of the variables. Otherwise, if the statistics fall below the lower critical values, then the null hypothesis can be accepted. However, if the F-statistics falls between the lower and upper critical values, the result is inconclusive. As a result of this, the asymptotic distribution of the F-statistics is non-standard under the null hypothesis of no co-integration, whether the series are I(0) or I(1), [28].

After the long-run relationship was established amongst the variables, we estimated the long-run elasticities using the appropriate lag length. There are three most commonly used information criteria in the literature, these are the Akaike information criterion (AIC), the Bayesian information criterion (BIC) and the Hannan-Quin information criterion (HQIC). This approach entails successively increasing the lags from the smallest to the largest lag selected by the information criteria. Thereafter, use the lag-length that eliminates serial correlation in the residual, [30]. This assists in deriving the related error correction for calculating the adjustment coefficients of the ECM. Hence, the short-run effects of the ECM are captured by the coefficients of the first differenced variables in the ECM model.

Moreover, the ARDL approach help in the estimation of the long-run, short-run and the adjustment process in the model. Hence, Equation (2) is the ARDL representation of how macroeconomic variables impact non-performing loans in Nigeria within the sample period 1981-2019, and this is constructed as follows:

$$\begin{aligned} \Delta NPL_t = & \lambda_0 + \sum_{i=1}^m \lambda_1 \Delta NPL_{t-i} + \sum_{j=1}^n \lambda_2 \Delta UNEMP_{t-j} \\ & + \sum_{k=1}^o \lambda_3 \Delta GDPG_{t-k} + \sum_{l=1}^p \lambda_4 \Delta INFL_{t-l} \\ & + \sum_{m=0}^q \lambda_5 \Delta EXRT_{t-m} \\ & + \sum_{k=1}^r \lambda_6 \Delta LDR_{t-n} + \lambda_7 NPL_{t-i} \\ & + \lambda_8 UNEMP_{t-j} \\ & + \lambda_9 GDPG_{t-k} + \lambda_{10} INFL_{t-l} \\ & + \lambda_{11} EXRT_{t-m} + \lambda_{12} LDR_{t-n} \\ & + \mu_t \dots (2) \end{aligned}$$

Where:

- NPL is the Non-performing Loan;
- UNEMP is the Unemployment Rate of the Nigerian economy;
- GDPG is the Gross Domestic Products Growth Rate;
- INFL is the Inflation Rate;
- EXRT is the Exchange Rate;
- LDR is the Loans to Deposit Ratio.

Also, where:

- λ_0 is the intercept term
- λ_1 is the coefficient of the Non-Performing Loan
- λ_2 is the coefficient of the Gross Domestic Products Growth rate
- λ_3 is the coefficient of the Inflation Rate
- λ_4 is the coefficient of the Exchange Rate
- λ_5 is the Loans to Deposits Ratio
- μ_t is the stochastic error term which signifies all the variables that affect the dependent variable but are not considered in the model.

From equation (2), Δ is the first-difference operator. The $\lambda_1, \lambda_2, \lambda_3, \lambda_4$ and λ_5 are the long-run coefficients, while $\lambda_6, \lambda_7, \lambda_8, \lambda_9$, and λ_{10} are the short-run coefficients. μ_t represents the short-run coefficients.

iv) Wald (Bound) F-Test

The Wald test was applied to establish if amongst the variables, there exists a long-run relationship in equation (2), where:

$$\begin{aligned} H_0: & \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = \lambda_6 = \lambda_7 = \lambda_8 = \\ & \lambda_9 = \lambda_{10} = \lambda_{11} = \lambda_{12} = 0 \\ H_0: & \lambda_1 \neq \lambda_2 \neq \lambda_3 \neq \lambda_4 \neq \lambda_5 \neq \lambda_6 \neq \lambda_7 \neq \lambda_8 \neq \\ & \lambda_9 \neq \lambda_{10} \neq \lambda_{11} \neq \lambda_{12} \neq 0 \end{aligned}$$

The null hypothesis (H_0) shows the non-existence of a long-run relationship for the model series while the alternative (H_1) connotes the presence of a valid long-term influence of the explanatory variable on the explained. In this approach, the F-test computed is examined against its F-ratio. An F-test above the upper bound level leads to the rejection of the null hypothesis, otherwise, it is accepted. However, the F-bounds test between the lower and upper bound is considered indeterminate.

v) Error Correction Term

After establishing the long-run estimation of the model, it is equally important to estimate the short-

run coefficients of the model along the path of the error short-run dynamics. The short-run result ascertains the difference between true values and the values of the estimated parameter. Further, the rate of correction of the short-run movement towards the long-term steady state could be evaluated. The assumption here is that the error estimate is negative and significant statistically and confined within the values of 1 and 0.

Table 2. Unit root test

Variables	ADF @ levels	5% critical value	ADF @ 1 st diff	5% critical value	Remarks
NPL	-3.320896	-2.941145	N/A		I(0)
UNEMP	0.335008	-2.941145	-4.760507	-2.943427	I(1)
GDPG	-4.158314	-2.941145	N/A	N/A	I(0)
INFL	-2.913973	0.0531	-5.679381	-2.943427	I(1)
EXRT	1.400113	-2.941145	-4.257516	-2.943427	I(1)
LDR	-4.675762	-2.948404	N/A	N/A	I(0)

Source: Authors' Computation with EViews (2020). Note: N/A = Not Applicable

The study model measures how macroeconomic variables impact non-performing loans in Nigeria within the sample period 1981-2019 is specified as follow:

$$\begin{aligned} \Delta NPL_t = & \lambda_0 + \sum_{i=1}^m \lambda_1 \Delta NPL_{t-i} + \sum_{j=0}^n \lambda_2 \Delta RGDP_{t-j} \\ & + \sum_{k=0}^o \lambda_3 \Delta LDR_{t-k} + \sum_{l=0}^p \lambda_4 \Delta INF_{t-l} \\ & + \sum_{l=0}^p \lambda_5 \Delta ROA_{t-m} + \eta ECM_{t-1} \\ & + \mu_t \dots 3) \end{aligned}$$

where Δ connotes differencing operation, ECM_{t-1} is the lagged error correction term indicating the reaction of the system in adjusting to the equilibrium state in equation (2). In equation (3), η is the value of the speed of ECM during the transition to the long-run and it is expected to exhibit a negative and significant sign for a co-integrating relation to exist in the long-run.

4 Results and Discussion

4.1 Test for Stationarity

Test for stationarity investigates the evidence of unit root in the series. A stationary or integrated series do not vary with time in its functional distribution. Stationary series helps to improve the extent to which the results of the parameter estimate could be relied upon. The Augmented Dickey-Fuller (ADF) test was employed in measuring if the variables are stationary or not.

4.2 Unit Root Test

The ADF test in Table 2 suggests that only three of the variables - NPL, GDPG and LDR are stationary at level, while the remaining variables -UNEMP, INF and EXRT are differenced once to achieve the stationary state. The study result necessitates the utilization of the ARDL as advanced by [26].

4.3 ARDL Bounds Cointegration Test

The ARDL Bound result portrayed in Table 3 describes the existence of co-integrating relations in the study model which establishes that the variables tend not to diverge over the long run. As indicated by the result of the F-statistic (5.402341) being greater than the lower (2.62) and upper (3.79) critical bounds at a 5 percent level of significance.

Table 3. Bound test result

F-bounds test		Null hypothesis: No levels relationship		
Test	Value	Significance level	I(0)	I(1)
F-statistic	5.402341	10%	2.26	3.35
K	5	5%	2.62	3.79
		2.5%	2.96	4.18
		1%	3.41	4.68

Source: Authors' computation using E-Views 10

4.4 Long-run Result

As shown in Table 4, it is obvious that GDPG and EXRT have positive statistically significant relationships with the dependent variable, that is, the NPL ratio. This explains that a one percentage increase in GDPG will bring about a 0.8395 percentage increase in NPL and a one unit increase in EXRT will bring about 0.2376 percentage increase in NPL. Similarly, from Table 4, GDPG and EXRT significantly contributed to the incidence of NPLs at 5 percent and 1 percent levels of significance respectively. This result of EXRT confirms the earlier study by [7], [31] and [32] whose findings show exchange rate is one of the determinants of non-performing loans. However, this is in contrast with the study by [8] that finds EXRT and economic growth are insignificantly related to non-performing loans. From this point of view, even though consistent economic growth should improve the financial stability of borrowers, and subsequently increase their propensity to repay loans, this study finds the relationship between economic growth and NPL to be otherwise, hence indicating a positive and significant. This implies the existence of non-inclusive growth as an increase in the GDPG did not bring down the level of NPL and exchange rate deterioration makes the non-performing loan ratio worsen in the Nigerian banking sector.

The coefficients of UNEMP and INFL are insignificant and appear not to influence the NPL level of Nigerian DMBs. This position aligns with [7] whose study finds that UNEMP and INFL are insignificant in the determination of NPL. Our result also finds INFL to be insignificant. This is consonant with the study by [8]. In the study by [33], UNEMP and INFL are found to be insignificant in the determination of NPL in the Sri Lanka banking

sector. However, the study by [8] contradicts this study in terms of UNEMP which finds it significant. Meanwhile, contrary to expectation, the coefficient of inflation is insignificant and as a result, does not affect NPLs. This position is not different from the earlier argument of [8], who established in their study that the increase in non-performing loans ratio in Nigerian banks is attributed to deficiencies in credit administration including poor credit assessment, undue meddling in loans processing, deficient collateral security, amongst others. This is evident in the case of Nigeria, where, despite the high rate of inflation in the last few decades, the economy is still growing. Therefore, we can conclude that inflation may not be a critical determinant of NPLs in Nigeria.

The loan-to-deposit ratio (LDR) which measures banks' total loan portfolio to total deposit liability is significant though positively related to NPLs at a 10 percent level of significance. From Table 4, a percentage increase in the LDR of banks will bring about 23.17 percentage increase in the NPL ratio. This means that the more the loans that are generated from the available total deposit liabilities, the higher the NPL of Nigerian DMBs since interest paid on deposits are usually higher than on equity funds.

Conclusively, the R-squared (0.826848) and Adjusted R-squared (0.579488) show that the explanatory variables jointly explain about 82.68 percent and 57.94 percent, respectively, of variations in non-performing loans. The Prob. (F-statistic) of 0.012408 indicates a high significance level. The Durbin-Watson statistic at 2.225091 suggests that the model has no serial auto-correlation errors.

Table 4. Long-run Coefficients results

Variable	Coefficient	Std. error	t-statistic	Prob.*
UNEMP	-1.969847	3.102077	-0.635009	0.5357
GDPG	0.839515	0.302462	2.775610	0.0149**
INFL	0.112164	0.075325	1.489069	0.1586
EXRT	0.237621	0.070713	3.360366	0.0047***
LDR	0.231761	0.111049	2.087009	0.0557*
C	-42.97765	12.40838	-3.463598	0.0038***
<i>R-squared</i>	0.826848			
<i>Adjusted R-squared</i>	0.579488			
<i>F-statistic</i>	3.342691			
<i>Prob(F-statistic)</i>	0.012408	Durbin-Watson stat		2.225091

Source: Authors' computation with E-Views (2020). Note: *, **, ***, 1%, 5%, 10% significance level.

4.5 Error Correction Model (ECM) Results

Table 5 presents the short-run estimates and Error Correction Term (ECT) of the model. In the short-run result, the GDPG and EXRT have a significant and positive relationship with NPLs. However, UNEMP and INFL have an insignificant relationship with NPLs. Looking at the coefficient, a percentage increase in GDPG will increase NPLs by 0.84 percent and a percentage increase in EXRT will increase NPL by 0.24 percent. The result further presents the adjustment or error correction mechanism, with a coefficient of -0.9639, which indicates that about 96.39 percent of past errors are corrected in the current period. Thus, there exists a high speed of convergence from short-run to long-run equilibrium conditions. Unemployment had an insignificant negative relationship with NPLs while inflation though positively related with NPLs is not significant. Further insight from the short-run result shows that lending rate accounted for a 0.23 percentage increase in NPLs at a 10 percent significant level.

This points to the nature of the high interest rate by deposit money banks in Nigeria. Despite the fact that the high cost of capital has the potential of discouraging investors from borrowing from banks, it can also increase the tendency for default among bank clients. It is thus, pertinent, that adequate consideration is given to cost of capital and servicing of the deposit money banks' loans in a bid to make bank loans more attractive which will invariably help to reduce the rate of default. A high cost of capital could also increase total overhead cost and the cost of production of goods and services thereby introducing

inflationary pressure in the economy, and leading to reduced demand for goods and services.

The direct relationship between economic growth, exchange rate and NPLs in the short-run estimates supports the long-run estimates. These results suggest growth that is not inclusive enough and high exchange that reflects over-dependence on foreign goods and services. It is therefore important that more emphasis should be placed on local content development and encouragement of local and international investors. This will veritably help to transform the productive base of the economy for a more inclusive growth experience and favourable exchange as veritable macroeconomic tools for controlling NPLs.

Table 5. Short-run estimates and Error Correction Term of the ARDL model

Variable	Coefficient	Std. error	t-statistic	Prob.
D(UNEMP)	-1.969847	3.102077	-0.635009	0.5357
D(UNEMP(-1))	-8.075697	2.641465	-3.057280	0.0085***
D(UNEMP(-2))	-5.722537	3.306237	-1.730831	0.1055
D(UNEMP(-3))	-7.268704	3.245119	-2.239888	0.0418**
D(GDPG)	0.839515	0.302462	2.775610	0.0149**
D(GDPG(-1))	0.824837	0.341609	2.414567	0.0300**
D(GDPG(-2))	0.707057	0.384533	1.838742	0.0873*
D(GDPG(-3))	0.625814	0.354092	1.767376	0.0989*
D(INFL)	0.112164	0.075325	1.489069	0.1586
D(EXRT)	0.237621	0.070713	3.360366	0.0047***
D(EXRT(-1))	0.172138	0.092428	1.862409	0.0837*
D(LDR)	0.231761	0.111049	2.087009	0.0557*
D(LDR(-1))	-0.233854	0.109688	-2.131993	0.0512*
D(LDR(-2))	-0.238117	0.094027	-2.532434	0.0239**
CointEq(-1)*	-0.963969			
R-squared	0.824131			
Adjusted R-squared	0.685287			
Durbin-Watson stat	2.225091			

Source: Authors' computation with E-Views (2020). Note: *, **, *** 1%, 5%, 10% significance level.

This paper in essence has been able to investigate the determinants of NPLs from two integrated perspectives of macroeconomic and bank-specific variables employing more recent observations under a dynamic model estimation algorithm. Previous alternative studies have been carried out with a major focus on either of the two aspects while some others have examined the effect of NPLs on the stability of the financial institutions, [7], [17], [34]. In the present study, a robust estimation procedure that accounts for dynamic relationships within the system has been incorporated through the autoregressive distributed lag (ARDL) approach. In this process, the long-run and short-run estimates and the systemic mechanism in the adjustment process from the short-run to the long-run stable state, have been ascertained. The evidence from this robust analysis showed a high level of convergence of the system considering the significant contributory positive effect of integrated macroeconomic and bank-specific determinants factors of the NPLs phenomenon.

5 Recommendations and Conclusion

This study, using ARDL model, investigates the effect of macroeconomic and bank-specific variables on non-performing loans in Nigerian Deposit Money

Banks using data set from 1991 to 2019. The method enables us to assess the significant relationships between the dependent variable (non-performing loans) and the independent variables (unemployment rate, GDP growth, inflation, exchange rate and loans to deposits ratio) in the long and short-run. The study establishes that the level of non-performing loans in Nigeria is affected by the macroeconomic indicators, which are the independent variables. As expected, the variables are in line with our *a priori* expectation, however, inflation is insignificant and appears not to affect non-performing loans in Nigeria. Therefore, the outcome of this study would help stakeholders to mitigate the challenging effects of non-performing loans in a developing economy like Nigeria. The study recommends that the bank regulatory body should ensure that the exchange rate of the Nigerian naira is strengthened through the formulation of policies that limit imports and boost exports. This is because of EXRT's positive and significant influence on NPL. Also, the Deposit Money Banks should be mandated to improve their drive on liability products which will boost total deposits (especially the demand deposits) while the total loan portfolio is monitored thereby lowering the LDR since it positively correlates with non-performing loans. Similarly, a robust economy is important for borrowers to be able to redeem their loan obligations.

Thus, the economic growth impact on non-performing loans is positive and significant. This indicates the existence of non-inclusive growth as an increase in the GDPGR does not bring down the level of NPL in the Nigerian banking sector. This can be achieved by ensuring that loans are channeled to more productive sectors of the economy.

In conclusion, this study suggests that future studies can include more independent variables such as corporate governance, credit growth and so on, in order to see how non-performing loans respond to other macroeconomic factors and performance indicators in more developing and emerging markets.

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