

Analysis of the Impacts of Domestic Debts on Private Sector Credit, Lending Rate, and Real Output: Evidence from Nigeria

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Abstract It is commonly held that excessive domestic debt reduces private sector credit, raise bank lending rates, and shrink output as the Government competes with the private sector for private savings. Using multivariate vector autoregression approach and annual time series data spanning 1981-2016, this paper analysed the dynamic interactions and impacts of domestic debts on private sector credit, prime lending rate, and real output in Nigeria. The stability and higher-order dynamics of the VAR model were also examined. Our results provide evidence that Government domestic debt exerted statistically insignificant positive impacts on both private sector credit and prime lending rate, and a statistically significant negative impact on real output in Nigeria during the period covered by the study. Policy implications and recommendations have been proffered.

Keywords: *domestic debt, private sector credit, prime lending rate, real output, vector autoregressive model, granger causality*

JEL Classification codes: E02, H63, E44

Cite This Article: Aniekan O. Akpansung, “Analysis of the Impacts of Domestic Debts on Private Sector Credit, Lending Rate, and Real Output: Evidence from Nigeria.” *Journal of Finance and Economics*, vol. 6, no. 3 (2018): 111-123. doi: 10.12691/jfe-6-3-5.

1. Introduction

According to the Central Bank of Nigeria, CBN [1], debt (domestic and external) is a stock of liabilities with different tenors accumulated by government operations in the past and scheduled to be fully repaid by government in the future. Domestic debt refers to all debt issued in the domestic market. It covers only recognized direct financial obligations of government on which government pays interest on redemption. Although the analysis of public debt in developing countries has traditionally focused on external debt, in recent years several countries have looked increasingly to domestic sources when expanding their net borrowing. Unlike external debt which generates a “transfer” problem [2], domestic borrowing only transfers resources within the country [3]. Borrowing is an important tool for financing investment critical to achieving sustainable development, as well as for covering short-term imbalances between revenues and expenditures. Government borrowing can also allow fiscal policy to play a countercyclical role over economic cycles. Countries that run a budget deficit which is not fully matched by donor flows often issue domestic debt because the standard policy advice of the international financial institutions is to limit external borrowing at commercial rates.

Governments’ increasing reliance on domestic debt markets to expand their net borrowing, in most cases

reflect a need to fill the gap created by a decline in official development assistance as a share of total external flows. Resourceful deployment of the debt may enhance productive capacity and economic growth, whereas inefficient and wrong utilization of the debt may create problems for the economy. As noted by UNCTAD [4], using debt to finance investment for economic diversification purposes is even more important in ensuring that countries have the capacities to respond to unforeseen external shocks and muster the ability to repay their debts. However, superfluous domestic borrowing can also become a burden on the national budget partly due to high interest payments, and can also crowd out private investment. Besides, a large domestic public debt has often been at the root of external debt crises [5], as in the cases of Mexican crisis of 1994–1995 and the Russian crisis of 1998 which both originated in the market for short-term domestic currency instruments.

In Nigeria, the issuance of domestic debt instruments is usually intermediated by the banking system, through Treasury Bills and Bonds. The deposit money banks dominate the financial sector and account for 91 per cent of transactions within the financial system, which is measured as percentage of total assets of deposit money banks to all financial institutions [6]. In the recent past, the Nigerian Government’s borrowing from domestic banks has increased tremendously (See Figure 1). Such increasing reliance on the banking sector to finance budget deficits has made lending to the private sector relatively

low as a percentage of total output. A low rate of expansion of the credit volume is not only a symptom of weak economic growth, but can also be one of its causes [7]. Extensive use of domestic borrowing can have severe implications on the economy. Though government domestic borrowing is often thought of as a way of avoiding inflation and external crises, it oftentimes reduces the credit which would otherwise be available to the private sector, putting pressure on domestic interest rates. No matter how interest rates might be controlled, domestic borrowing can still lead to credit rationing and crowding-out of private sector investment.

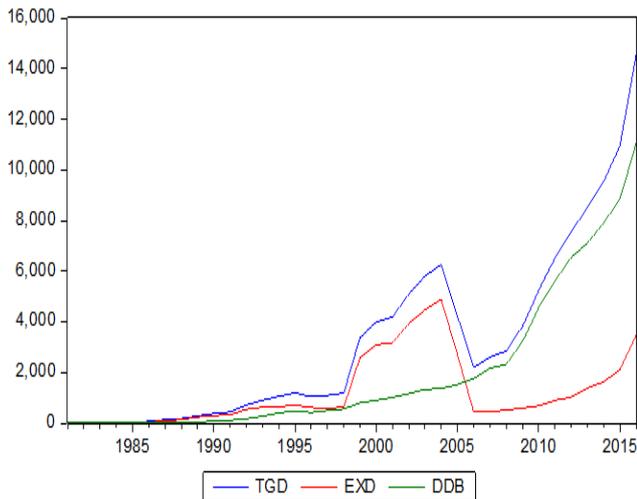


Figure 1. Total, External and Domestic Debts in Nigeria: 1981-2016 (Billions of Naira) (Source: Author's compilation, 2018)

Though the magnitude of these potential adverse consequences may depend on the degree to which government borrowing raises interest rates and/or reduces private credit [8], the effects of such phenomena on private credit and bank lending rate have become especially important for policy analysis. And, even if the financial and banking sectors are fully liberalized in the country, the effects of government borrowing on the private investment might still be mediated primarily through the credit availability.

As earlier confirmed by Anyanwu [9], much less attention has been given to the issue of domestic debt in developing countries, despite its potential significant impact on economic growth, government budgets, macroeconomic stability, and private sector lending. Studies such as Odozi, [10]; Garba, [11]; and Rapu, [12], were limited mostly to theoretical analyses of domestic debt. Others concentrated on the impact of domestic debt on economic growth [9,13-18]. Asogwa and Ezema (2005) only examined the risk characteristics of domestic debt; Christensen (2004) empirically analysed the impact of domestic borrowing on government budgets and private sector credit using a database of 27 non-CFA sub-Saharan African (SSA) countries covering 1980-2000; while Essien *et al* [19] empirically analysed the impact of public sector borrowings on prices, interest rates, and output in Nigeria from 1970-2014. Besides, most studies on the effect of government debts on interest rates are confined to the developed countries and there is paucity of studies on developing countries, including Nigeria. The generalization of the results provided by cross-country

studies on the topic may after all not apply to individual countries as, each country may have different responses against the changes in domestic public debt due to own specific economic and financial conditions. To the best of the author's knowledge, studies specifically investigating the effects of domestic debt on private sector credit, prime lending rate, and real output in Nigeria are nonexistent, a gap that the current study has bridged.

The remainder of the paper is organised as follows: Section 2 assesses the trends in domestic debts in Nigeria, while section 3 undertakes a review of theoretical and empirical literature. Section 4 sets out the empirical framework for the analysis; section 5 reports estimation results, while section 6 provides the summary, policy implications of the analysis, concludes the paper, and proffer recommendations.

2. Trends in Domestic Debt in Nigeria (1981-2016)

The revised data from the CBN [1] shows that between 1981 and 1985, Nigeria's total debt was driven largely by domestic debt. Total domestic debt which was ₦11.1926 billion in 1981 rose to ₦27.9491.6 billion in 1985, showing an increase of ₦16.7565 billion between the two periods. It increased to ₦84,093.1 billion in 1990 and later rose to ₦794.8066 billion in 1999, showing an increase in ₦710.7135 billion between the two periods. By 2001 domestic debt had grown to a four-digit figure of ₦1016.98 billion showing an increase of ₦222.1734 billion between 1999 and 2001.

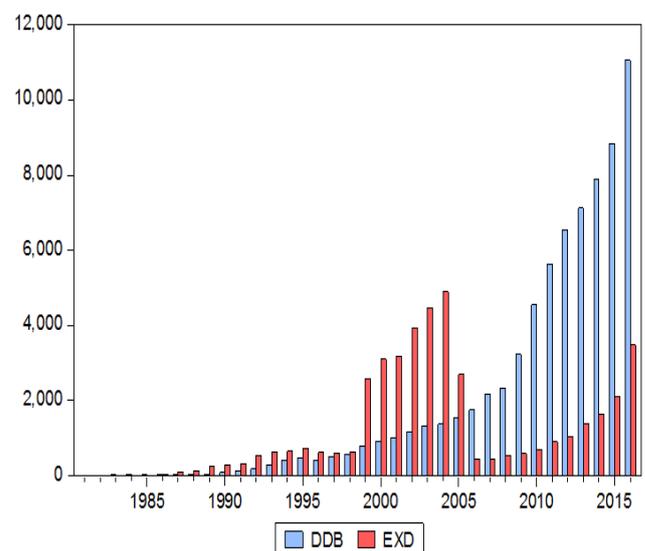


Figure 2. Domestic and External Debt in Nigeria (1981-2016) in Billions of Naira (Source: Author's compilation, 2018)

In 2012, Nigeria's total debt profile ballooned from ₦7564.431 billion to ₦9535.542 in 2014 and to ₦14537.12 billion in 2016. During those years, domestic debt accounted for higher percentage of Nigeria's fiscal exposure, increasing from ₦6537.527 billion in 2012 to ₦7904.02 billion in 2014, and to ₦11058.2 billion in 2016. The 2016 figure represented an increase of ₦2,221.21 billion or 25.14 per cent of 2015 outstanding domestic debt of ₦8,837.00 billion. The increase was due to new

borrowings to partly fund the 2016 appropriated budget deficit and the refinancing of matured debt obligations (DMO, 2016). The FGN's Domestic Debt Outstanding by Instruments, 2015 and 2016 shows that as at end-December, 2016, the FGN's domestic debt stock comprised mainly FGN bonds (68.41 per cent), Nigerian Treasury Bills (29.64 per cent) and Treasury Bonds (1.95 per cent). Table 1 also shows the trend of the FGN's domestic debt outstanding by instruments from end of 2012 to end-December, 2016.

Table 1. Trend in Domestic Debt Outstanding by Instruments, 2012-2016 (N' Billion)

Instruments	2012	2013	2014	2015	2016
FGN Bonds	4080.05	4222.03	4792.28	5808.14	7564.94
Treasury Bills	2122.93	2581.55	2815.52	2772.87	3227.28
Treasury Bonds	334.56	315.39	296.22	255.99	215.99
Total	6537.54	7118.97	7904.02	8837.00	11058.21

Source: DMO (2016).

The holding of the domestic debt which was mostly taken up by the CBN from 1981 to 2003 changed such that the Deposit Money Banks (DMBs) and the Non-Bank Public surpassed the CBN and became major players in the domestic debt market with the DMBs taking the lead [19]. The FGN's domestic debt outstanding by holders' category as at end-December, 2016, shows that the Non-Bank Public and the Banks held a total of about 83.47 per cent of the domestic debt stock, with each holding ₦5,493.54 billion or 49.68 per cent and ₦3,736.02 billion or 33.79 per cent, respectively [20].

The inclusion of the Nigerian Government in the globally traded J.P. Morgan government bond index emerging markets series in 2012 represented independent external recognition that the Nigerian domestic debt market had been transformed, leading to foreign participation in domestic debt instruments [4].

3. Literature Review

3.1. Theoretical Framework

Borrowing can arise when: i). Savings (S) are less than Investment (I): $S - I < 0$; ii). Exports (X) are less than Imports (M): $X - M < 0$; iii). Government expenditure (G) is greater than Taxes (T): $G - T > 0$. Increased public borrowing from the domestic market will cause a shortage of funds due to increased demand for investible funds. This can stifle available credit to the private sector borrowing and increase the level of interest rates charged by banks, leading to the reduction of private borrowing and hence limiting private investment. There are however diverse opinions amongst economists on the impact of domestic debt. From the *neo-classical economics* perspective, excessive domestic borrowing could result in higher interest rates which discourages private investment and crowds-out private sector investment as the government competes with the private sector for available funds. The Keynesians maintain that unwarranted domestic debt will lead to little or no increase in the interest rate and instead

an increase in output and income and hence a crowding-in rather than crowding-out.

Panizza [21], asserts that domestic borrowing could lead to pressure on institutional investors and banks to absorb "too much" government debt and this may have a negative effect on financial stability and crowd out private issuers. Correspondingly, Reinhart, Kirkegaard, and Sbrancia [22] have argued that government debts could have no effect on interest rates but have significant effect on private credit due to intervention by the government such as administrative controls imposed on interest rates, high legal reserve ratio, existence of direct intervention on credit allocation, government ownership or control of financial institutions, barriers that limit other institutions seeking to enter the market, or by moral suasion. With the existence of these 'artificial' constraints, private credit will not be allocated according to the expected returns on the projects, but according to the quality of collateral, loan size, political pressure, and covert benefits to loan officers [23].

3.2. Empirical Review

The empirical studies reviewed in this section are arranged chronologically from the earlier to the recent works to show the progress made so far on the research area.

In his work, Anyanwu [24] applied regression analysis to pooled cross-section and time-series data for Nigeria, Ghana and the Gambia. The author's results indicated that fiscal deficits and government debts had a positive impact on interest rates. Anyanwu and Erhijakpor [9] results showed that: (1) current domestic debt outstanding as a ratio of GDP had a significantly negative effect on economic growth: one percent increase in current domestic debt outstanding as a percentage of GDP reduces economic growth by 0.38 per cent; (2) past domestic debt accumulated positively and significantly affects economic growth: a one per cent increase in past-accumulated domestic debt as a percentage of GDP increased economic growth by 0.30 per cent - thus rejecting the domestic debt overhang hypothesis.

In a panel regression analysis involving 27 sub-Saharan African countries (including Kenya), Christensen [25] examined the role of domestic debt markets and also sought to establish whether domestic borrowing crowded out private sector lending in the period 1980–2000. The study found that domestic debt markets in these countries were generally small, highly short term, and had a narrow investor base. Domestic debt was found to have significantly crowded out private sector lending: an expansion in domestic debt of 1 per cent relative to broad money causes the ratio of private sector lending to decline by 0.15 percent. The author noted that these results may not apply for the period after 2000 since Kenya undertook a series of financial sector and debt management reforms which resulted in a complete reversal of the composition of domestic debt in favour of Treasury bonds.

Abdel-Kader [26] sampled 19 state-owned and private banks and 351 firms from various sectors in Egypt to investigate the extent of credit decline to the private sector in Egypt and whether the decline was due to supply factors (credit crunch), demand factors (credit slowdown),

or other factors (e.g., crowding out). He found that noninterest lending criteria were tightened and that interest rates were no longer the decisive factor in lending decisions. In addition, due to the problem of non-performing loans, banks were becoming more risk-averse as reflected by the reduction in private credit and investment in more liquid and less risky assets, such as treasury bills and government bonds. As a result, Egypt was experiencing credit crunch.

Abbas and Christensen [27] found moderate level of marketable domestic debt as a percentage of GDP to have significant positive effect on economic growth. They also provided evidence that debt level exceeding 35% of total bank deposits have negative impact on the economic growth.

Mukhtar and Jakaria [28] examined the relationship between government debt and long-term interest rates with the Cointegration analysis and Granger causality test from 1960-2005 and concluded that budget deficits do not have a significant effect on nominal interest rates. Obi and Nurudeen [29] conducted an empirical test on the effects of fiscal deficits and government debts on interest rates in Nigeria using a Vector Auto Regressive (VAR) approach. Their findings confirmed a positive interest rate effect of debt and fiscal deficits. This implies that interest rates react to changes in credit markets in Nigeria, Ghana and Gambia. Maana, Owino and Mutai [30] found that significant rise in domestic debt resulted in higher domestic interest payments in Kenya, but found no evidence that the growth in domestic debt crowds-out private sector lending in Kenya.

Emran and Farazi [31] provided estimates of the magnitude of the crowding out effect of government borrowing on private credit using a panel data set on 60 developing countries for 32 years (1975-2006). They found a significant crowding out effect of government borrowing from the domestic banks on private credit; a \$1.00 more of government borrowing reduced private credit by \$1.40. De-Bonis and Stacchini [32] also investigated the role of total government debt on the size of bank loans to the private sector in 20 emerging economies. They found that government debt reduces the size of private sector credit and low private credit is associated with a large size of government activities.

Baldacci and Kumar [33] examined the impact of fiscal deficit and public debt on interest rates for a panel of 31 advanced and emerging market economies over the period from 1980 to 2008 with fixed effect and system GMM estimation. Results suggested that higher deficits and public debt lead to a significant increase in long-term interest rates but this is greater in countries with weak initial fiscal conditions; weak or inadequate institutions; structural factors (such as low domestic savings); and limited access to global capital.

Adofu and Abula [13] showed that domestic debt had negative effect on Nigeria's economic growth during 1994-2008 period. The authors suggested reducing government domestic borrowing and increasing revenue through tax reforms. Onyeiwu [18] applied error correction modeling approach to regression analysis to assess the relationship between domestic debt and economic growth in Nigeria for the period, 1994 to 2008. The variables used were GDP, foreign exchange rate,

credit to private sector, budget deficit and money supply. The author found that the domestic debt holding of government was far above the healthy threshold of 35 per cent of bank deposits, which resulted in a negative effect on economic growth.

Fyed [34] used a cointegration approach to investigate the relationship between public borrowing and private credit in Egypt. The paper focused on the volume of private credit and concluded that government borrowing from the domestic banks led to a more than one to one crowding out of private credit. This result implies that government borrowing from banks is not the sole reason behind crowding out private credit. The study noted that increase in banks' holdings of securities and treasury bills also reflects banks' preference to invest excess liquidity in a low risk high return investment.

Claeys, Moreno, and Suriñach [35] noted that the crowding out effects of increasing public debt have usually been found to be small or non-existent. Thus, after testing for crowding out, and measuring the degree of integration of government bond markets, using spatial modelling techniques, the authors found from a panel of both OECD and emerging market economies over the period 1990-2005 that the crowding out effect of public debt on domestic long term interest rates is small: a 1 per cent increase in the debt ratio pushes up domestic rates by 2 percentage points at most. Arising from the study was that emerging markets are not as well integrated into international capital markets, causing a stronger crowding out effect.

Using 1990-2010-time series data, Obiwuru, Okwu and Ekezie [36] found that domestic debt and credit to the economy had significant positive effects while interest rate had negative but not significant effect, on economic growth in Nigeria. Shetta and Kamaly [37] used a VAR model on quarterly data spanning 1970-2009 to test the crowding out effect of government domestic borrowing on private credit in Egypt. They found that \$1.00 more of government borrowing reduced private credit by \$1.80.

Cebula [38] provided empirical evidence on the impact of net U.S. government borrowing (budget deficits) on the nominal interest rate yield on ten-year Treasury notes using annual data for the period 1972-2012. The Generalized Linear Model estimates implied that the federal budget deficit exercises a positive and statistically significant impact on the nominal interest rate yield on ten-year Treasury notes. Ahmed [39] used 3SLS to estimate bank supply side equation in Pakistan from 1990-2013, and found that government borrowing leads to crowding credit away from possible productive use by the private sector. Choudhary, Khan, Pasha, and Rehman [40] similarly analyzed the pressure fiscal expansion exerts on the economy via credit markets in Pakistan from 1975-2008. The authors concluded that government borrowing leads to crowding out of private credit and rise in interest rate spreads.

Essien, Agboegbulem, Mba, and Onumonu [19] used a Vector Autoregressive framework, the Granger causality test, impulse response, and variance decomposition of the various innovations to examine the impact of public sector borrowings on prices, interest rates, and output in Nigeria. They found that shock to external debt stock increased prime lending rate, but with a lag. External and domestic

debt had no significant impact on the general price level and output.

Okwu, *et al* [41] examined the impact of domestic debt and economic growth in Nigeria for the 1980-2015 periods. The results showed evidence of significant short- and long-run positive effect for domestic debt stock; negative effect for domestic debt servicing expenditure but insignificant negative effect for bank lending rate. Real gross domestic product (RGDP) was used as a proxy for economic growth.

Anyanwu, Gan and Hu [42] examined the crowding out effect of government domestic borrowing using a panel data model for 28 oil-dependent countries over the period 1990-2012. They estimated the model, using both fixed effects and generalised method of moments estimators and found that a one per cent increase in government borrowing from domestic banks significantly decreased private sector credit by 0.22 per cent and had no significant impact on the lending rate banks charge to the private sector. This finding suggests that government domestic borrowing resulted in the shrinking of private credit and worked through the credit channel and not the interest rate channel.

Using data from 2007-2011, Prah and Tenakwah [43] examined the relationship between interest rate, inflation and domestic debts in Ghana, using linear regression method. The results revealed that 57 per cent of the variation in interest/lending rate could be explained by domestic debts and at an alpha level of 0.05. The researchers concluded that there is a significance relationship between debts and interest/lending rates; about 64 per cent of the variation in inflation could be accounted for by domestic debts. It was recommended that there should be an improvement in public finances in order to generate a surplus on recurrent operations and also Government must be cognizant of the use of domestic credit by the statutory bodies.

4. Methodology

4.1. Data Description and Sources

The data employed in this paper were yearly observations (1981-2016) of Nigeria's domestic debt stock outstanding (DDB), prime lending rate (PLR), private sector credit (CPS), and real gross domestic output (RG). Domestic debt measures the claims on the central government by the domestic deposit money banks and other financial institutions. Prime lending rate is used as proxy for interest rates. It measures the bank lending rate that usually meets the short- and medium-term financing needs of the private sector. Private sector credit is the credit provided by the banking system to the private sector. Real output is an indicator of growth, as rapidly growing economies are likely to have greater demand for and supply of credit [31,44]. Every variable had 36 sample sizes. To get a better result of fitting and make the three variables in the same order of magnitude, we carried out logarithmic transformations of private sector credit, domestic debt stock, and real output whose units are billion; and we allowed prime lending rate to stay the same. Since the order of magnitude for all variables are

the same, it would improve the results of models and impulse response function greatly.

The secondary data were primarily sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin and Annual Report & Statement of Accounts, and Debt Management Office (DMO).

4.2. Model Specification

This study adopted a Vector Autoregression (VAR) model to analyse the impact of domestic debt on private sector credit and interest rates in Nigeria. VAR processes have become standard tools for macroeconomic analyses following Sims [45] critique of the poor performance of standard classical econometric modeling in some respects, and his suggestion that vector autoregressions (VARs) are useful statistical devices for evaluating alternative macroeconomic models. The lack of consensus about the appropriate structural model to use has led many economists instead to favour the use of a VAR model to examine the effects of different policies.

According to Kilian and Lütkepohl [46], VAR models are estimated by regressing each model variable on lags of its own as well as lags of the other model variables up to some pre-specified maximum lag order, p . In other words, each equation has lagged values of all the included variables as dependent variables, including the dependent variable itself. In most practical applications, the VAR model does not include more than five or six variables because otherwise the number of parameters becomes too large [47]. One important characteristic of a VAR(p)-process is its stability: it generates stationary time series with time-invariant means, variances, and covariance structure, given sufficient starting values.

The basic p -lag vector autoregressive (VAR(p)) model used in the study has the form:

$$\mathbf{Z}_t = \delta + \gamma_1 \mathbf{Z}_{t-1} + \gamma_2 \mathbf{Z}_{t-2} + \dots + \gamma_p \mathbf{Z}_{t-p} + \varepsilon_t$$

Where \mathbf{Z}_t is a vector of K observed time series variables, δ is a constant, γ_s are $(K \times K)$ parameter matrices attached to the lagged values of \mathbf{Z}_t , p is the lag order or VAR order to be determined, and ε_t is an error process with its usual assumption. We restricted our endogenous variables to four, since the central problem in VAR analysis is that the number of estimated parameters in a VAR expands quickly when additional variables are included [48], we allowed the variables $(PLR_t, \text{Log}(CPS)_t, \text{Log}(DDB)_t)$ to be determined by their joint history and assumed the case of $p = 1$ lag (to minimize space), such that:

$$PLR_t = \gamma_1 + \pi_{11} PLR_{t-1} + \pi_{12} \text{Log}(CPS)_{t-1} + \pi_{13} \text{Log}(RG)_{t-1} + \pi_{14} \text{Log}(DDB)_{t-1} + \varepsilon_{1t}$$

$$\text{Log}(CPS)_t = \gamma_2 + \pi_{21} PLR_{t-1} + \pi_{22} \text{Log}(CPS)_{t-1} + \pi_{23} \text{Log}(RG)_{t-1} + \pi_{24} \text{Log}(DDB)_{t-1} + \varepsilon_{2t}$$

$$\text{Log}(RG)_t = \gamma_3 + \pi_{31} PLR_{t-1} + \pi_{32} \text{Log}(CPS)_{t-1} + \pi_{33} \text{Log}(RG)_{t-1} + \pi_{34} \text{Log}(DDB)_{t-1} + \varepsilon_{3t}$$

$$\text{Log}(DDB)_t = \gamma_4 + \pi_{41} PLR_{t-1} + \pi_{42} \text{Log}(CPS)_{t-1} + \pi_{43} \text{Log}(RG)_{t-1} + \pi_{44} \text{Log}(DDB)_{t-1} + \varepsilon_{4t}$$

Where γ s and π s are constants and coefficients of marginal impact between variables, respectively.

If we denote:

$$Z_t = \begin{pmatrix} PLR_t \\ \text{Log}(CPS_t) \\ \text{Log}(RG_t) \\ \text{Log}(DDB_t) \end{pmatrix}, \theta_1 = \begin{pmatrix} \pi_{11} & \pi_{12} & \pi_{13} & \pi_{14} \\ \pi_{21} & \pi_{22} & \pi_{23} & \pi_{24} \\ \pi_{31} & \pi_{32} & \pi_{33} & \pi_{34} \\ \pi_{41} & \pi_{42} & \pi_{43} & \pi_{44} \end{pmatrix}$$

$$\text{and } \varepsilon_t = \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \end{pmatrix}.$$

Then the above model can be compactly written as:

$$Z_t = \gamma + \theta_1 Z_{t-1} + \varepsilon_t$$

Where Z_t is a vector of four endogenous variables. We assumed that the disturbances (structural shocks), ε_t are white noise innovations, normally distributed, with zero mean and constant variance. This implies that observations on ε_t are statistically independent as well as uncorrelated. Since there are no contemporaneous variables included as explanatory, right-hand side variables, the model is a reduced form, and hence estimable. Thus, all the equations have the same form since they share the same right-hand side variables. This model is linear both in the slope parameters and in the lagged model variables.

4.3. Structural Analysis

Since the above VAR model has many parameters, it may be difficult to interpret due to complex interactions and feedback between the variables in the model. As a result, the dynamic properties of the VAR were summarized using various types of structural analysis, such as (1) Granger causality tests; (2) impulse response functions (that measure the effects of the different shocks on the variables of study); and (3) variance decompositions (which measures the relative importance of the different shocks to the variation in the different variables). Prior to model estimation and structural analysis, the time series properties of the data were examined, including unit root test, optimal lag length of the VAR, and stability conditions of the VAR. Serial correlation in the residuals of the VAR model was tested using the LM test proposed by Breusch [49] and Godfrey [50]

5. Results and Discussions

5.1. Unit Root Tests

Stationarity is required for the construction of many types of models and for the application of many data analysis techniques. In this study, Philip-Perron (P-P) [51] and Kwiatkowski, Phillips, Schmidt and Shin (KPSS) [52] unit root tests were carried out on the variables to ascertain their order of integration, and especially to ensure that no series exceeded I(1) order of integration. Compared to Augmented Dicky Fuller (ADF) unit root test, PP test is more advantageous over the ADF tests: PP tests are robust to general forms of heteroskedasticity in

the error term; and the user does not have to specify a lag length for the test regression. Though ADF and PP test are asymptotically equivalent, P-P has better small sample properties than ADF [53]. A simplified version of KPSS, without the time trend component was used to test level stationarity. The KPSS tests statistics are fairly sensitive to the choice of lag length, p , and for every series the value of the test statistic decreases as p increases [52]. If p is too large then the power of the test will suffer (Wang, 2006). Because the KPSS test is based on linear regression (which assumes normal distributions) and the fact that the log-transformation can convert exponential trends possibly in a data into a linear trend, it was necessary to take logs of the data before applying the KPSS test [54].

In P-P hypothesis testing, we rejected the null hypothesis if p-value < 0.05, and concluded that the variable was stationary, otherwise we accepted it. The KPSS results differ from P-P test as KPSS does not provide a p-value, showing different critical values instead. In this case we compared the test statistic value with the critical value on 0.05 significance level. We rejected the null hypothesis (variable is stationary) if the LM stat was greater than the critical value, and concluded that the series was non-stationary. Table 2 reports the results of the unit root tests for both P-P and KPSS, which suggest that one of the variables under consideration (i.e. prime lending rate (PLR)) was stationary of order I(0). while private sector credit, real output, and domestic debt outstanding were integrated of order I(1). Specifically, for the PLR, KPSS test statistic was equal to 0.174763 and was lower than any of critical values provided, so we could not reject the null hypothesis about stationarity of residuals (The KPSS asymptotic critical values for 1% level, 5% level and 10% level of significance were 0.739000, 0.463000 and 0.347000 respectively). Overall, the results showed that all variables were stationary at first difference.

Table 2. Unit Root Tests

P-P Test					
Variable	Level		1st Difference		Order of Integration
	Test values	Prob.	Test values	Prob.	
PLR	-3.382478**	0.0185	-9.402272**	0.0000	I(1)
LOG(CPS)	-0.115871*	0.9399	-4.135155**	0.0028	I(1)
LOG(RG)	1.212147*	0.9976	-3.044716**	0.0407	I(1)
LOG(DDB)	-1.528144*	0.5079	-4.467325**	0.0011	I(1)
KPSS Test					
Variable	Level LM Stat		1st Difference LM stat		Order of Integration
PLR	0.174763**		0.192901**		I(1)
LOG(CPS)	0.702152*		0.113922**		I(1)
LOG(RG)	0.681047*		0.373121**		I(1)
LOG(DDB)	0.703065*		0.215068**		I(1)

** Significant at 5% level; * not significant at 5% level.

Since all the variables were integrated of a higher order (I(1)), we proceeded with the VAR estimation for the system.

5.2. VAR Estimation

We estimated an unrestricted VAR equation using two (2) lag lengths, and computed lag length selection order

criteria to gauge whether we have included sufficient lags in the VAR. Introducing too many lags wastes degrees of freedom, while too few lags leave the equations potentially misspecified and are likely to cause autocorrelation in the residuals [55] or induce spurious significance of the parameters, as unexplained information is left in the disturbance term [56]. The test for the optimal lag length (Table 3) shows that all the test criteria (SIC, LR, HQ, AIC, and FPE) selected one-lag length. The AIC criterion asymptotically overestimates the order with positive probability, whereas the BIC and HQ criteria estimate the order consistently under fairly general conditions if the true order p is less than or equal to $p \max$ [57].

Further tests using higher lags did not yield any different result. Consequently, we re-estimated the VAR equations using the selection test criteria of one-lag length.

Table 3. VAR Lag Length Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-137.8165	NA	0.083085	8.863531	9.046748	8.924262
1	31.09814	285.0434*	5.93e-06*	-0.693634*	0.222451*	-0.389978*
2	43.39791	17.68091	7.88e-06	-0.462369	1.186584	0.084212
3	59.57316	19.20812	8.93e-06	-0.473323	1.908498	0.316184
4	78.96176	18.17681	9.62e-06	-0.685110	2.429579	0.347321

The asterisks (*) indicate the best (that is, minimized) values of the respective information criteria, AIC = Akaike criterion, SC = Schwarz Bayesian criterion, and HQ = Hannan-Quinn criterion. LR represents sequential modified Likelihood ratio test statistic (each test at 5% level); while FPE denotes Final prediction error.

The VAR estimation results are just the coefficient estimates for each equation in the VAR. The coefficient estimates of lag 1 VAR are summarized as:

$$\begin{pmatrix} PLR_t \\ \text{Log}(CPS)_t \\ \text{Log}(RG)_t \\ \text{Log}(DDB)_t \end{pmatrix} = \begin{pmatrix} 44.21[0.66] \\ -1.83[-0.67] \\ 2.01[3.44] \\ 0.56[-0.26] \end{pmatrix} + \begin{pmatrix} 0.49[2.79] & 0.08[0.03] & -0.40[-0.56] & 0.87[0.31] \\ 0.01[1.09] & 0.87[6.74] & 0.20[0.67] & 0.11[0.99] \\ 0.005[2.96] & 0.10[3.63] & 0.78[12.36] & 0.07[2.79] \\ 0.02[3.57] & 0.14[1.36] & 0.09[0.41] & 0.77[8.70] \end{pmatrix} \times \begin{pmatrix} PLR_{t-1} \\ \text{Log}(CPS)_{t-1} \\ \text{Log}(RG)_{t-1} \\ \text{Log}(DDB)_{t-1} \end{pmatrix} + \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \end{pmatrix}$$

The numbers in parenthesis [] are the t-statistics. In both the prime lending (interest) rate and private sector credit equations, the coefficients of the lagged domestic debt were found to be positive but insignificant at 5 per cent significance level. This finding suggests that government domestic debt did not crowd out private sector credit in Nigeria during the period covered by the study. In the real output estimates, the coefficient of the lagged domestic debt was found to be negative and statistically significant at 5 per cent significance level.

5.4. Normality and Stability of the VAR Model

The normality and stability of the re-estimated VAR-lag 1 model were tested. The Jarque-Bera normality test showed that all the variables were normally distributed at 5% level of significance (see Table 4).

Table 4. VAR Residual Normality Tests

Component	Skewness	Chi-sq	df	Prob.
1	1.076913	6.765162	1	0.0093
2	1.244984	9.041587	1	0.0026
3	-0.055968	0.018273	1	0.8925
4	-1.234636	8.891904	1	0.0029
Joint		24.71693	4	0.0001

Component	Kurtosis	Chi-sq	Df	Prob.
1	5.008179	5.881140	1	0.0153
2	4.140470	1.896813	1	0.1684
3	4.039368	1.575417	1	0.2094
4	5.951826	12.70686	1	0.0004
Joint		22.06023	4	0.0002

Component	Jarque-Bera	Df	Prob.
1	12.64630	2	0.0018
2	10.93840	2	0.0042
3	1.593690	2	0.4507
4	21.59877	2	0.0000
Joint	46.77716	8	0.0000

Stability of the VAR requires the moduli of the eigenvalues of the dynamic matrix to lie within the unit circle. In line with Lütkepohl [58], we analyzed the stability of the empirical VAR(4,1) by evaluating the reverse characteristic polynomial. The result of the stability test of the VAR model shows that none of the roots of the model lied outside the unit circle, implying that the VAR equation satisfied the stability condition (see Table 5). The variables entering the VAR were ordered based on a Block Exogeneity test.

Table 5. Stability Tests

Root	Modulus
0.990926	0.990926
0.853317	0.853317
0.535479 - 0.100223i	0.544778
0.535479 + 0.100223i	0.544778

No root lies outside the unit circle.

VAR satisfies the stability condition.

Also, Breusch-Godfrey Lagrangian multiplier test for autocorrelation showed that there was no serial autocorrelation in the model. The first order autocorrelation had a LM-Stat of 20.91366 and a p-value of 0.1819. The

rejection of the alternative hypothesis for first order autocorrelation was further confirmed by the behavior of the residuals for each model as shown in the residual graphs in Figure 3. The residuals of the prime lending rate oscillated within the ± 4 band in most of the years, but recorded highest spikes outside the band in 1989 (9.6%) and 1992 (10.8%). The minimum spike was recorded in 1997 (-6.2 per cent). In 2016, the prime lending rate recorded a spike of 0.2 per cent and trended within the band. Apart from 1993 and 2008 which recorded the minimal spikes of 0.39 per cent and 0.44 per cent respectively, the residuals of the private sector credit drifted within the ± 0.15 standard deviation error bands during the study period.

The real output residuals fluctuated within the ± 0.04 bands, attained minimum in 1983 (-0.087 per cent) and reached maximum values in 1985 (0.066 per cent) and 2002 (0.061 per cent). The residuals of the model for domestic debt swung within the ± 0.1 band but drifted

away from the interval in 1989 (-0.27 per cent), 1994 (0.25 per cent), 1996 (-0.23 per cent) and 1999 (0.22 per cent) periods.

5.5. Granger Causality

A Wald-type instantaneous causality test was used to examine the causal link between the endogenous variables. The test is characterized by testing for non-zero correlation between the error processes of the cause and effect variables [58]. The results of the VAR Granger Causality (or Block Exogeneity Wald) Tests on the estimated VAR (4,1) model is shown in Table 6. The test showed that the current values of the prime lending rates were not influenced by the previous year's values of either private sector credit or domestic debt. In Granger causality sense, private sector credit, domestic debt, and real output failed to Granger –cause prime lending rates in Nigeria during the years under study.

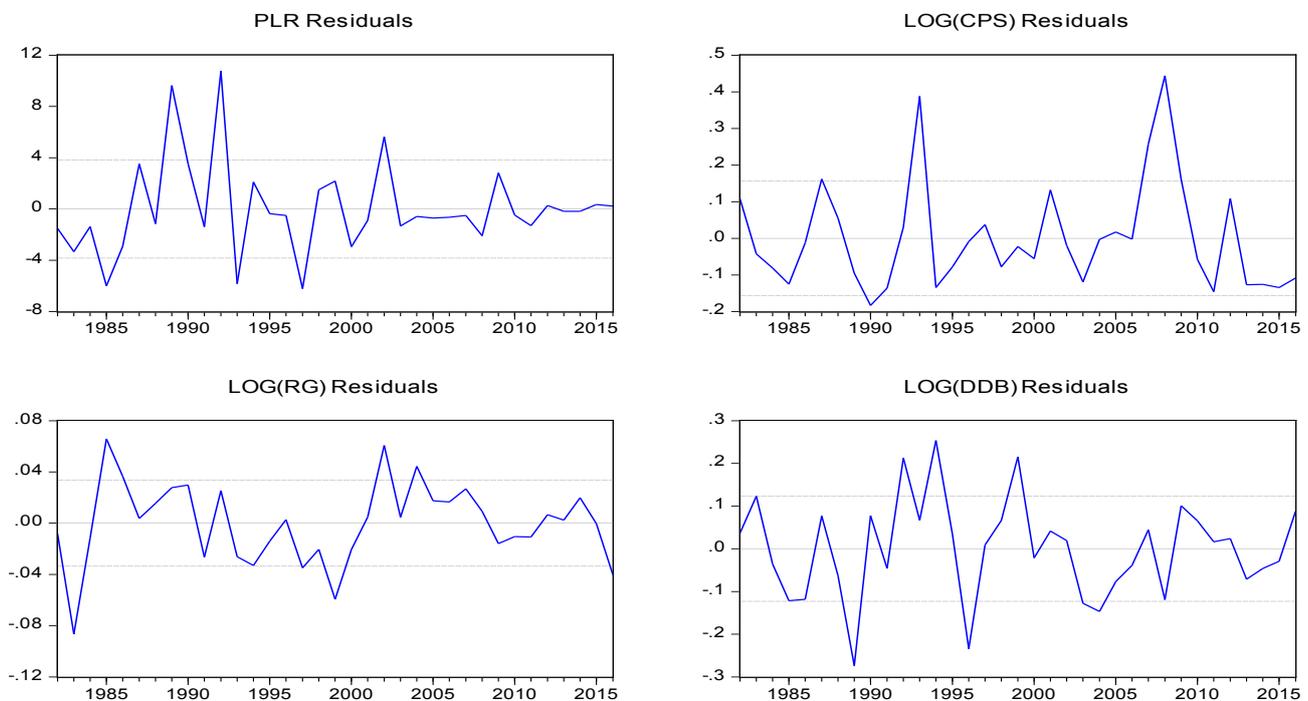


Figure 3. Residual Series of the VAR model

Table 6. VAR Granger Causality/Block Exogeneity Wald Tests

Dependent variable: PLR				Dependent variable: L(RG)			
Excluded	Chi-sq	Df	Prob.	Excluded	Chi-sq	df	Prob.
L(CPS)	0.000730	1	0.9121	PLR	8.759314	1	0.0031
L(RG)	0.308621	1	0.7643	L(CPS)	3.19120	1	0.0003
L(DDB)	0.098672	1	0.8849	L(DDB)	.797626	1	0.0052
All	0.924713	3	0.8195	All	21.38573	3	0.0001
Dependent variable: L(CPS)				Dependent variable: L(DDB)			
Excluded	Chi-sq	Df	Prob.	Excluded	Chi-sq	df	Prob.
PLR	1.182990	1	0.2767	PLR	12.74399	1	0.0039
L(RG)	0.443716	1	0.5053	L(CPS)	1.855992	1	0.0121
L(DDB)	0.984596	1	0.3211	L(RG)	0.166640	1	0.0055
All	5.386624	3	0.1456	All	15.14548	3	0.0017

Similarly, the past values of prime lending rates, real output, and domestic debt did not Granger cause the current private sector credit. Hence, the null hypothesis was accepted. Further analysis of the Wald test showed that growth in real output was influenced by past values of prime lending rate, private sector credit, and domestic debt; whereas the current values of the domestic debt outstanding was influenced by the past year's values of prime lending rate, private sector credit, and real output. Hence, in both cases, the null hypotheses were rejected at 5 per cent significance level. The result of the VAR Granger Causality test implies that any increase in Nigeria's domestic debt would impact on lending rates, private sector credit, and real output, which reinforced the impact of government domestic borrowing on the domestic credit market and the real sector of the Nigerian economy.

5.6. Impulse Response and Variance Decomposition

The computations of both impulse response functions and variance decompositions are useful in assessing how shocks to economic variables reverberate through a system. Thus, while impulse response functions trace the effects of a shock to one endogenous variable on to the

other variables in the VAR, variance decomposition separates the variation in an endogenous variable into the component shocks to the VAR. Figure 4 shows the impulse response functions of prime lending rate, private sector credit, and real output to domestic debt for periods of 5-years and 10-years along with Monte Carlo standard errors. If the system of equations is stable, any shock should decline to zero.

The impulse response graphs indicated that for both the 5-year period and 10-year period, a one-standard error shock to domestic debt exerted statistically insignificant positive effects on both the prime lending rate and private sector credit, and a statistically significant negative impact on real output. For the 5-year period, the lending rate responded immediately to shock in domestic debt, starting at point 0 to 0.1 in 2nd and 3rd periods and then to 0.2 percentage point in 4th and 5th year; whereas a shock to the private credit created small positive response, increasing marginally from 0.01 percentage point in the 2nd year, and maintained 0.02 point from the 3rd to the 5th year. Conversely, a one-standard error shock to domestic debt exerted a statistically negative impact on real output, decreasing from -0.007 percentage point in 2nd period, and further to -0.009 point between the 3rd and 4th year, and finally wandered back to -0.007 percentage point in the 5th year.

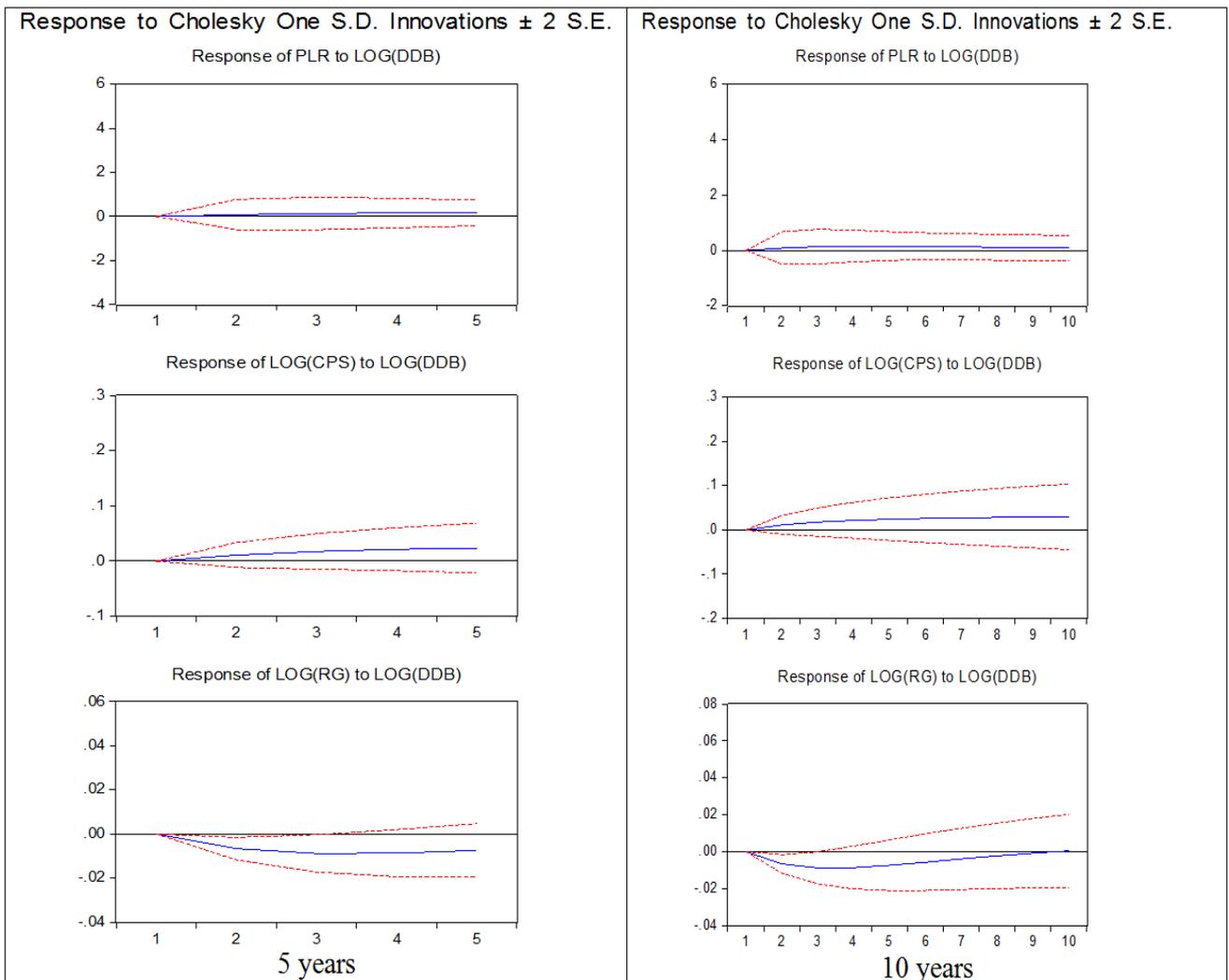


Figure 4. Monte Carlo Impulse Response

For the 10-year period, the lending rate responded instantaneously to a one-standard deviation shock in domestic debt starting at point 0, maintained 0.1 percentage point from 2nd to 3rd year, moved a little to 0.2 between 4th and 5th year, and thereafter reverted to 0.1 point from 6th to 9th year, and finally died out in the 10th year. During the same period, private sector credit responded very quickly after the shock, and moved to 0.01 in 2nd year, maintained 0.02 percentage point between 3rd and 5th year. From the 6th to 10th year, it increased marginally to 0.03 percentage point. Contrariwise, real output responded negatively to the domestic shock, drifting to -0.007 in 2nd year, and further to -0.009 between 3rd and 4th year; it again reduced to -0.007 point on the 5th year, reached -0.001 point in the 9th year, and ultimately, declined to zero point in the 10th year. This implies that the short-run values of real output converged to the long-run equilibrium values in the tenth year.

Generally, though the responses of prime lending rate and private sector credit to a one standard deviation shock in domestic debt were positive, they were marginally equal to zero, implying that shocks to domestic debt only had statistically insignificant positive impact on the prime lending rate and private sector credit, and a significant negative impact on real output during the period covered by the study.

On the other hand, the forecast error variance between domestic debt and prime lending rate; between domestic debt and private sector credit; and between domestic debt and real output were examined using Cholesky Forecast Error Variances Decomposition (FEVD) for a period of five years. This was computed by orthogonalizing the innovations with Cholesky decomposition; the outcome is presented in Table 7.

Apart from real output which explained only 1.2 percentage point of the changes in prime lending rate in the fifth year, innovations in private sector credit (CPS) and domestic debt (DDB) did not contribute to changes in prime lending rate in Nigeria during the period of analysis. This implies that other factors (such as government/CBN's monetary policy) may have contributed to the disparities in prime lending rate during the period covered by the study.

Similarly, private sector credit was not explained by changes in the banks' lending rates, real output and domestic debt, except in the fifth period when both lending rates and domestic debt explained about 12.4 per cent of the variation in the private sector credit, though prime lending rates contributed marginally higher during the period of analysis.

Table 7 further shows that variances in real output were explained more by both private sector credit and lending rate than the domestic debt during the 5-year period. For instance, in the fifth year, private credit contributed about 34.9 per cent, lending rate contributed 15.7 per cent, while domestic debt contributed only 3.4 per cent to the observed variation in real output. Contrariwise, apart from domestic debt's "own" contribution of 63.2 per cent, real output contributed about 32.2 per cent of the variation in domestic debt in the first year. Prime lending rate was found to account for changes in the domestic debt up to 3.7 and 51.0 per cent in the first and fifth year, respectively. Private sector credit contributed about 10.3

per cent to domestic debt in the fifth year. Generally, it was found that while the contributions of prime lending rate and private sector credit kept increasing over the years, real output was declining, further buttressing the negative impact of domestic debt on real output in Nigeria during the study period.

Table 7. Variance Decomposition

Variance Decomposition of PLR:					
Period	S.E.	PLR	L(CPS)	L(RG)	L(DDB)
1	3.831393	100.0000	0.000000	0.000000	0.000000
2	4.267668	99.75849	0.001320	0.200477	0.039710
3	4.375665	99.32316	0.003225	0.540729	0.132888
4	4.412986	98.82750	0.020512	0.896295	0.255692
5	4.432294	98.36130	0.058282	1.200225	0.380188
Variance Decomposition of L(RG):					
Period	S.E.	PLR	L(CPS)	L(RG)	L(DDB)
1	0.033589	5.531989	0.317729	94.15028	0.000000
2	0.052233	16.27859	9.819415	72.29190	1.610101
3	0.066535	17.95427	19.51062	59.79233	2.742781
4	0.077547	17.03209	27.94677	51.76087	3.260278
5	0.086299	15.74304	34.94849	45.94640	3.362074
Variance Decomposition of L(CPS):					
Period	S.E.	PLR	L(CPS)	L(RG)	L(DDB)
1	0.156255	2.577515	97.42249	0.000000	0.000000
2	0.207764	1.806081	97.91099	0.004855	0.278070
3	0.246318	3.853419	95.43685	0.014211	0.695516
4	0.280218	7.243701	91.61248	1.115309	1.115309
5	0.311508	10.87810	87.58506	0.048346	1.488491
Variance Decomposition of L(DDB):					
Period	S.E.	PLR	L(CPS)	L(RG)	L(DDB)
1	0.123285	3.675873	0.853337	32.23630	63.23449
2	0.181993	27.80520	3.180274	22.65509	46.35943
3	0.230857	41.33408	5.644628	17.18177	35.83952
4	0.269946	47.87634	8.049632	14.20567	29.86837
5	0.301288	51.00195	10.33535	12.43438	26.22833

Cholesky Ordering: PLR L(CPS) L(RG) L(DDB).

6. Summary, Concluding Remarks, Policy Implications and Recommendations

In the recent past, the Nigerian Government's borrowing from domestic banks has increased tremendously. Such superfluous domestic borrowing can have severe implications on the economy, if not judiciously used. This study analysed the trends in Nigeria's domestic debt profile from 1981 to 2016; and adopted a Vector Autoregression (VAR) model to analyse the impact of domestic debt on private sector credit, prime lending rates, and real output. The data were sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin and Annual Report & Statement of Accounts, Debt Management Office (DMO), and National Bureau of Statistics (NBS).

Prior to model estimation and structural analysis, the time series properties of the data were examined. All study variables were stationary at first difference and normally distributed, without any serial correlation at 5% significance level, while the specified VAR model satisfied the stability condition, implying that short-run values of the variables converged to the long-run equilibrium values. In both the prime lending rate and private sector credit equations, the coefficients of the lagged domestic debt were found to be positive but statistically insignificant, suggesting that government domestic debt did not crowd out private sector credit in Nigeria during the period covered by the study. In the real output estimates, the coefficient of the lagged domestic debt was found to be negative and statistically significant.

Private sector credit, domestic debt, and real output failed to Granger –cause prime lending rates; and neither the past values of prime lending rates, real output, and domestic debt Granger –caused current private sector credit. Growth in real output was influenced by past values of prime lending rate, private sector credit, and domestic debt; whereas the current values of the domestic debt outstanding were influenced by the past year's values of prime lending rate, private sector credit, and real output. For both 5-year period and 10-year period, shocks to domestic debt exerted statistically insignificant positive effects on both the prime lending rate and private sector credit, and a statistically significant negative impact on real output during the period covered by the study. Cholesky Forecast Error Variances Decomposition showed that: 1) Innovations in private sector credit, real output and domestic debt did not contribute to changes in prime lending rate, implying that other factors (such as government/CBN's monetary policy) may have contributed to the disparities in prime lending rate during the period covered by the study; 2). Changes in private sector credit was not explained by changes in the banks' lending rates, real output and domestic debt.; 3). Variances in real output were explained more by both private sector credit and lending rate than the domestic debt. 4). The prime lending rate and private sector kept increasing over the years, while real output was declining, further buttressing the negative impact of domestic debt on real output in Nigeria during the study period.

On the bases of the findings, the paper concluded that Government domestic debt exerted statistically insignificant positive impacts on both prime lending rate and private sector credit, and a statistically significant negative impact on real output in Nigeria during the period covered by the study.

Our results agree with earlier studies, including Pandit [59] who found evidence of a positive but insignificant relationship between debt and interest rate in Nepal for the period 1975-2003; Onyeiwu [18], which found that domestic debt resulted in a negative effect on economic growth in Nigeria from 1994 to 2008; Mukhtar and Zakaria [28] which did not find any significant influence of debt on nominal or real interest rates for Pakistan; Obi and Nurudeen [29], which confirmed a positive interest rate effect of debt in Nigeria, Ghana and Gambia; Maana, Owino and Mutai [30], which found that significant rise in domestic debt resulted in higher domestic interest

payments in Kenya, but found no evidence that the growth in domestic debt crowds-out private sector lending in Kenya; and Anyanwu, Gan and Hu [42], which found that increase in government borrowing from domestic banks had no significant impact on the lending rate banks charge to the private sector. However, the findings are contrary to those of Essien *et al* [19], which found that (external and) domestic debt had no significant impact on the (general price level and) output in Nigeria for the 1970 - 2014 period. It also negates the Okwu, *et al* [41] result which found evidence of significant short- and long-run positive effect of domestic debt stock on economic growth in Nigeria for the 1980-2015 periods. Notwithstanding the results incongruences, the empirics should be interpreted with caution because of data improbabilities, scope and methodological issues.

The findings of the present study have some implications for monetary and fiscal policies in Nigeria. The paper found that domestic debt led to insignificant increase in both prime lending rate and private sector credit. This implies that domestic debt did not crowd out private sector credit in Nigeria during the period covered by the study. The increased private sector borrowing and high level of interest rates charged by banks may have resulted from higher aggregate credit supply resulting from increasing financial deepening in the financial sector. Deposit money banks in Nigeria may have responded to higher government borrowing by adjusting their loan portfolio optimally given the risk-return characteristics of different assets and liabilities. Such endogenous response by banks could 'crowd-in' private credit or partially offset the traditional crowding-out effect [31,42].

This finding therefore underscores the need to design sound monetary and credit policy that would promote financial discipline and ensure sustained availability of loanable funds to the private sector. The statistically significant negative impact of domestic debt on real output implies that Government domestic borrowings were not employed for production or growth-oriented purposes in the economy.

On the bases of the findings this paper recommends that the Nigerian government and indeed the Debt Management Office (DMO) should strive to settle its outstanding domestic debts and maintain a workable domestic debt ceiling to ensure proper conduct of monetary policy in the economy. The Government should also improve its financial base (via effective financial and tax reforms) in order to generate surpluses on recurrent operations; as well as monitor/or regulate the use of domestic credit by the legislative agencies. Besides, available funds should be shrewdly used to develop infrastructure aimed at promoting real sector productions and private sector investments in the country.

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