PUBLIC DEBT AND ECONOMIC PERFORMANCE IN NIGERIA: STOCK ADJUSTMENT MODEL (1990-2019)

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Abstract

Economic performance has become a challenge for most countries around the world with public debt becoming inevitable. Therefore, the main reason of this study is to examine the impact of public debt on future economic performance in Nigeria using the period from 1990 to 2019. Stock adjustment technique was employed in the analysis. Gross domestic product, which proxied economic performance, was made the dependent variable while public debt, broken into domestic debt and external debt, stood as the independent variable. The result showed that, in both short and long run periods, domestic debt had a positive and significant impact on economic performance while external debt also had a positive but insignificant effect on economic performance. The study therefore recommends that the government should not relent from its borrowings when the need arises, and priority should be given to domestic debt since it has significant impact on the performance of the economy at present and future periods. Prudent measures should be put in place to ensure that all externally borrowed funds are tailored to the right direction and purpose of obtaining them. Also, government should improve product development by encouraging the development of varieties of money and capital market instruments.

Keywords: Domestic debt, External debt, Public debt, Stock Adjustment Model
Jel. Code: C22, E62, H11

1.0 INTRODUCTION

Nigeria's debt profile is quite worrisome and the government is still longing to obtain more debt even with the adverse effect it has on the economy. A high level of public debt outstanding means high debt servicing due to an increase in the budget deficit, financed by raising public borrowings thereby increasing the level of the nation's public debt profile. The talk of Nigerian people is on how the government pays off her debt in order to stop debt servicing (Eze et al., 2019). Generally, countries borrow for the purpose of improving investment and consumption, so these imply that countries borrow to improve economic performance as well as reduce poverty level in the economy.

The effect of public debt depends on the amount of debts, amount of debt servicing to total budget, total revenue and its purpose. Usually, the amount of debt to be borrowed is measured using the debt-to-GDP ratio. It becomes a concern when the is high like what is presently obtained in Nigeria, such as 24.1% in 2018 and 28% in 2019 (Budgit, 2019).

Specifically, the amount of money Nigeria's government spends on servicing debt is quite disturbing. Apart from the amount previously owed by the government, which is still being accumulated, the cost of servicing this debt averagely increases on yearly basis, and this calls for meaningful attention and the need to study the impact of such public debt on future performance of the economy. When President Muhammadu Buhari came into power in 2015, the public debt profile inherited was put at $2.09 trillion, and a total amount of $378.9 billion was used to service external debt in that year. Nevertheless, the cost of servicing debt continues to increase averagely. It is worthy to note that payment on debt servicing stood at $1.43 billion in 2018 and $1.31 billion in 2019.

Accumulatively, the external debt servicing stood at about $3.95 billion in the last five years (between 2015 and 2019).

The debt service is both for domestic and foreign debts. Economists have insisted that the continuous borrowing by Nigeria was not good for the economy, going by the huge amount spent on servicing these debts (Agabi, Sunday & Iloani, 2020). More so, the places, other than the target sectors, cause a lot of porosities which make useless of the fund mainly meant for such sectors like infrastructure and food security.

Analytically, an instance was in 2018, when debt-to-GDP was 24.1%, while debt servicing-to-revenue stood at a very high side of 61.4%, but revenue-to-GDP was quite low at 7.8%. This shows an indication of great concern, when international evidence shows that a minimum of 12.75% is linked to significant acceleration in growth and development of an economy (World Bank,

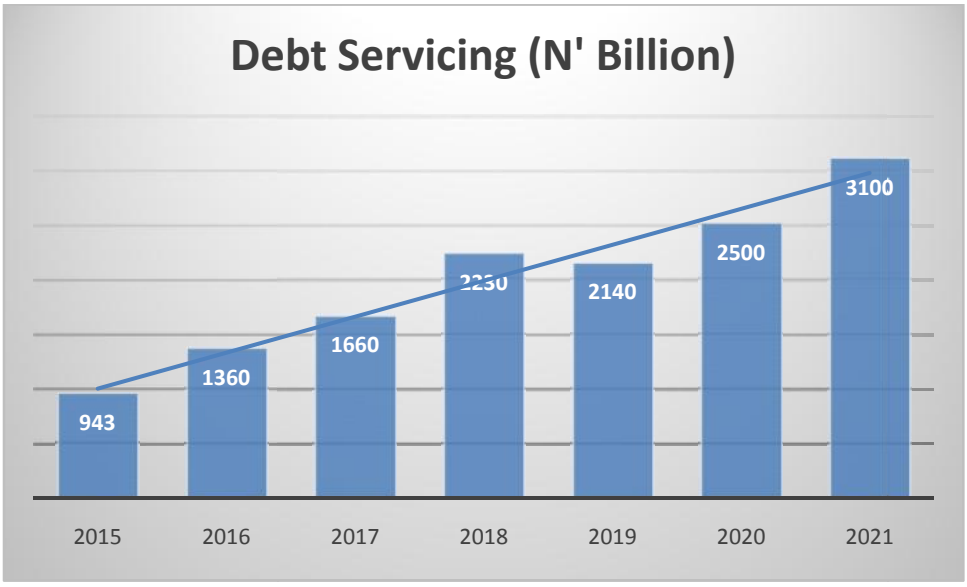
Thus, this study aims at contributing to the existing studies made on public debt in Nigeria. Specifically, it seeks to assess the structural influence of public debt on Nigeria economic performance proxy by GDP at current market price. This paper will examine specifically, the extent to which Nigeria debt structure contributed to the nation's economic performance using stock adjustment model.

The rest of this paper was organized as: section two explained related literature on this topic; section three showcased the methodology; section four presented the data analysis and interpretation of results; section five discussed the result and implication of findings; and finally, section six presented conclusion and recommendation of the study.

1.1 Stylized Facts about Nigeria's Public Debt and Debt Servicing Expenses (2001-2020)

In 2001, the external debt of Nigeria was 28.5 billion. Four years later, it was reduced to $9 billion due to the debt arrangement with the Paris and London Clubs of Creditors. As at the end of 2005, the total revenue of Nigeria was about $9 billion with a debt profile of around $36 billion which was seen as being unsustainable. In this regard, at the tail end of the same year, the agreement was reached with these Clubs to buy back about $30 billion of Nigeria's $32 billion external debts through a one-time cash payment of $12 billion. This arrangement drastically reduced the country's debts and consequently, its cost of debt servicing. However, the domestic debt still remained N1.52 trillion, and by 2011, domestic debt had taken over the foreign debt to around N4.8 trillion (Open Budget Survey [OBS], 2019).

According to the Debt Management Office (2020), the public debt of the country rose again after the debt agreement of 2005 to reach $1.28, $1.14 and $2.09 trillion in 2012, 2013 and 2015 respectively.



Source: Debt Management Office (2020).

Figure 1: Nigeria's Debt Servicing Trend.

As could be seen in figure 1, the debt servicing continues to increase even before 2015. The breakdown showed that the country spent N943 billion for debt servicing in 2015, N1.36 trillion in 2016 and N1.66 trillion in 2017. The trend also showed that in 2018, the federal government spent N2.23 trillion on debt servicing while in 2019, it spent N2.14 trillion. In 2020, the government planned some N2.5 trillion on debt servicing and it estimates to spend N3.1 trillion on the same item line next year.

The N3.1 trillion is the proposed amount for servicing debt in 2021, which is more than the proposed total capital expenditure of the country. Accordingly, the government debt service burden, in cumulative average, will hit above N13.5 trillion if the N3.1 trillion allocated for the item in the 2021 budget proposal is added to funds already expended on same by this present administration. When looked into critically, the debt servicing is presently competing with other major components of the country's budget allocation. This is quite worrisome.

2.0 REVIEW OF RELEVANT LITERATURE

2.1 Conceptual review

Public borrowing is known as the legal responsibility of the state to pay back the principal and interest to the holders of the predetermined rights in accordance with a certain schedule. Public credit in state borrowing in the economic literature mean debts taken by government or other public institutions (Sibel, 2018).

External borrowing is the funds provided from a foreign country that is repaid with principal interest at the end of a certain period. External borrowing has effects on national income, it increases when it is taken and decreases when it is paid (Sibel, 2018). Domestic borrowing is the part of the total government debt in a country that is owed to lenders within the country such as commercial banks and other financial institutions.

2.2 Theoretical review

2.2.1 The Ricardo Theory of Public Debt

The Ricardo Public Debt Theory was propounded by David Ricardo in 1819. He developed the theory of public debts by stating that the ordinary and extraordinary spending of government are mainly payments that are made to support ineffective labourers. Therefore, savings from government expenses would be included in the income if not to the capital of the contributors. Ricardo in a letter written to McCulloch in 1816 believed that public expenditure was wasteful venture undertaken by the state. Ricardo theory of public debts was based on the fact that the primary burden to the community was derived from the wasteful nature of public expenditure itself rather than from the methods adopted to finance such expenditure (Lucky &Godday, 2017). The theory postulated that financing public expenditure should be focused on drawing the funds from the resources of the community. Implicatively, the theory does not support embarking on obtaining public debt but rather, making use of the available resources to achieve maximum benefit. Also, public expenditure should be made within the confines of the expected income.

2.2.2 The Keynesian Theory of Public Debt

Keynesian theory of public debt was developed partly as a result of the economic crisis created by the great depression of the 1930s. In the theory, constant unbalanced budgets and rapid increase in public debt affect the nations' financial stability. It indicates that public borrowing is more of a national asset than a liability. Therefore, continuous government spending influences economic growth and performance of its nations, because it leads to full employment (Lucky &Godday, 2017). The Keynesian theory shows that the economy tends to be at equilibrium at full employment level when public borrowing is made to achieve this status. While this theory supports the obtaining loans from within and outside the country, the borrowing is expected to fund budget deficit which will in turn lead to growth and development of the economy.

The assumption of this theory is majorly that borrowed fund should be used for development project and that is the only time that this borrowing will benefit the economy by increasing aggregate demand, consumption and investment and thereby leading to full employment, which will result in increase in per capita income, increase in tax revenue and consequently, development improves. However, in countries where corruption is the order of the day, where embezzlement has become a norm, such borrowing for development projects might not achieve as such.

2.3 Empirical review

Cristina and Philip (2010) investigated the impact of government debt on per-capita GDP growth in twelve euro area countries from the year 1970 to 2010. The results of the study finds a non-linear impact of debt on growth with a turning point-beyond which the government debt-to-GDP ratio has a deleterious impact on long term growth at about 90-100% of GDP. Confidence interval for the debt turning point shows that the negative growth effect of high debt is about 70-80% of GDP.

Markus and Rainer (2016) examine the relationship between public debt and economic growth over a period of 1971 to 2010. the research adopted growth regression with panel data for a sample of 111 OECD and developing countries. The result of this study shows that public debt apparently exerts neutral or even positive growth effects while for Nordic countries a nonlinear relationship is discovered, with negative debt effects kicking in at public debt values of around 60% of GDP.

Sami and Mbah (2018) examine the relationship between government external borrowing and economic growth from a period of 1990 to 2015. The study adopted the autoregressive distributed lag cointegration approach, and the study outcome reveals a negative and significant influence of external debt on economic growth in Oman. Panagiotis (2018) empirically investigated the relationship between public debt and the determinants of economic growth. Auto-regressive distributed lag (ARDL) model was adopted in the research. The results of the ARDL model show a long-run relationship between the variables. It also reveals that private and government consumption, investment and trade openness had positive effects on economic growth and performance while government debt and population growth had a negative impact on growth. The study also addresses the break effects issue between economic growth and government debt.

Lucky and Godday (2017) investigated the relationship between the public debts structure and the growth performance of the Nigerian economy for the period of 1990 to 2015 using simple and multiple regression analyses. The results of the simple regression show that total public debt has a positive and significant impact on gross domestic product in Nigeria. Also, the results of the multiple regression analysis indicate that the external debt has a negative significant to economic growth, the domestic debt has a positive and significant effect on the economic growth in Nigeria. Therefore, the study recommended that Nigeria should pursue domestic debts policies as against its external debts counterpart.

Eze et al. (2019) analyzed the effect of public borrowing on Nigeria's economic growth over the period of 1981 to 2017 the research adopted ex-post facto research design and Multiple regression analysis was utilized in the research where the ARDL model and Chow Breakpoint test were the methods used in the analysis. Therefore, the result showed that an external debt has negative and significant effects on GDP, while a domestic debt has a negative and insignificant effect on GDP. Thus, the study recommends that government should discontinue the use of financial debt in financing budget deficit in the economy but can intensify efforts to stimulate revenue internally through efficient investment and economic diversification.

3.0 METHODOLOGY

Public debt comprises of the domestic debts and the external debts. The gross domestic product is employed as proxy for economic performance in Nigeria. The models for this study are presented as follows;

$$GDP = F(DD, EXD) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where;
GDP is Gross domestic product represents

DD is Domestic Debt represents
ED is External Debt represents
Since the optimum level of GDP is the linear function of DD and ED, we have

$$GDP^* = \beta_0 + \beta_1 DD_t + \beta_2 ED_t + u_t \quad (2)$$

where GDP^*= optimum or desire level of gross domestic product
β_0= Constant term
β_1 = Regression coefficient for domestic demand
β_2 = Regression coefficient for external demand
$_t$= Error term
Since the desired level of GDP^* is not clearly observed, we use the stock adjustment model;

$$GDP_t - GDP_{t-1} = \lambda(GDP^*_t - GDP_{t-1}) \quad (3)$$

where $GDP_t - GDP_{t-1}$ is actual change and $GDP^*_t - GDP_{t-1}$ desired change and $\lambda(0 < \lambda \leq 1)$ is the coefficient of adjustment. Due to discrepancies between actual and desired change in GDP brought about equation (3).
Substitute equation (2) in equation (3)

$$GDP_t - GDP_{t-1} = \lambda[(\beta_0 + \beta_1 DD_t + \beta_2 ED_t + \mu_t) - GDP_{t-1}] \quad (4)$$

$$GDP_t - GDP_{t-1} = \lambda\beta_0 + \lambda\beta_1 DD_t + \lambda\beta_2 ED_t + \lambda\mu_t - \lambda GDP_{t-1} \quad (5)$$

$$GDP_t = \lambda\beta_0 + \lambda\beta_1 DD_t + \lambda\beta_2 ED_t + GDP_{t-1} - \lambda GDP_{t-1} + \lambda\mu_t \quad (6)$$

$$GDP_t = \lambda\beta_0 + \lambda\beta_1 DD_t + \lambda\beta_2 ED_t + (1-\lambda)GDP_{t-1} + \lambda\mu_t \quad (7)$$

Therefore, equation (7) can be represented by taking the natural logarithm of both sides to reduce variations in the model as follows:

$$LGDP_t = b_0 + b_1 LDD_t + b_2 LED_t + \beta_3 LGDP_{t-1} + v_t \quad (8)$$

where, $b_0 = \lambda\beta_0$, $b_1 = \lambda\beta_1$, $b_2 = \lambda\beta_2$, $\beta_3 = (1-\lambda)$ and $_t = \lambda\mu_t$

Equation (2) represents the long-run level of economic performance; equation (8) is called the Short run level of economic performance. Once we estimate the short run function and estimate of the adjustment coefficient λ (from the coefficient of $LGDP_{t-1}$), we can easily derive the long run function by simply dividing b_0 , b_1 and b_2 by λ (coefficient of $LGDP_{t-1}$) which is derived from $1 - \beta_3$.

4.0 RESEARCH FINDINGS/RESULTS

This chapter presented results of analysis of the data employed and discussed finding of the analysis, implication of the results of impact of public debt on economic performance in Nigeria.

4.1 Result of Descriptive Statistic

The table 1 reveals that the average level of GDP over these years is 17.34161, while the level of Domestic debt is 7.382922 and the level of External debt is 7.195709. Therefore, the median level of the GDP is 17.32179, and the median level of Domestic debt is 7.276574 and the median level of External debt is 6.866596. Maximum and minimum value for GDP are 18.06114 and 16.34790; for external debt are 9.107468 and 5.699153; and for Domestic debt are 9.566100 and 4.431925. GDP, External debt and Domestic debt.

Table 1 Descriptive Statistic

	LGDP	LED	LDD
Mean	17.34161	7.195709	7.382922
Median	17.32179	6.866596	7.276574
Maximum	18.06114	9.107468	9.566100
Minimum	16.34790	5.699153	4.431925
Std. Dev.	0.517835	1.011516	1.467227
Skewness	0.031769	0.342335	-0.184023
Kurtosis	1.636447	1.773041	2.075854
Jarque-Bera	2.329144	2.467752	1.236879
Probability	0.312056	0.291162	0.538785
Sum	520.2483	215.8713	221.4877
Sum Sq. Dev.	7.776427	29.67179	62.42986
Observation	30	30	30

Source: Researcher's Computation Using E-views 9.0

GDP mirrors normal skewness and platykurtic (because 1.636447 < 3), External debt indicates normal skewness and platykurtic (because 1.773041< 3), while Domestic debt revealed normal skewness and platykurtic (because 2.075854 < 3). JarqueBera probabilities of (0.31, 0.29 and 0.54) indicate that the null hypotheses are accepted that, these variables are normally distributed.

4.2 Result of Correlation Matrix

	LGDP	**LED**	**LDD**
LGDP	1.000000	0.484062	0.841009
LED	0.484062	1.000000	0.573487
LDD	0.841009	0.573487	1.000000

Table2:Correlation Matrix

Result presented on Table 2 shows the correlation coefficients of association between the variables. All values (0.48, 0.57 and 0.84) show that there is no perfect multicollinearity in the variables of interest, thus suitable for further analysis. More so, they all have positive relationship.

4.3 Result of Unit Root Test

Table 3: Unit Root Test

Variables	ADF Statistics Value Calculated at level	Mackinnon At Test Critical Value	ADF Statistics Value Calculated at 1st diff	Mackinnon Test At Critical Value	Conclusion (Order of Integration)
LGDP	-1.074041	-2.625121	-8.843168	-3.689194	1(1)
LDD	-2.498216	-2.622989	-3.351834	-2.971853	1(1)
LED	-1.779447	-2.625121	-3.706266	-3.689194	1(1)

Source: Researcher's Computation Using E-views

Table 3 presents the result of the unit root test for the variables employed in order to avoid having a spurious regression for the study. All variables were logged to give equal weights to the variables. All the variables employed for this study were stationary at first difference 1(1) since their respective Augmented Dickey-Fuller test (ADF) statistics value is greater than Mackinnon critical value at 5% and at absolute term.

4.4 Result of the ARDL

The model examines the joint impact of the independent variables (Domestic debt and External debts) on the dependent variable gross domestic product (GDP). The result is presented on Table 4.

Table 4: Auto-Regressive Distributed Lag

ARDL Cointegrating And Long Run Form				
Dependent Variable: LGDP				
Selected Model: ARDL(1, 0, 0)				
Cointegrating Form (Short Run)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LGDP(-1)	0.070779	0.196451	0.360290	0.7217
D(LED)	0.008224	0.065921	0.124763	0.9017
D(LDD)	0.289769	0.076971	3.764667	0.0009
CointEq(-1)	-0.929221	0.196451	-4.730031	0.0001
Cointeq = LGDP - (0.0089*LED + 0.3118*LDD + 14.9663)				
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LED	0.008851	0.071016	0.124633	0.9018

LDD	0.311840	0.050749	6.144702	0.0000
C	14.966320	0.454796	32.907759	0.0000

R-squared	0.711558	Mean dependent var	17.36112
F-statistic	20.55750	Durbin-Watson stat	2.119089
Prob(F-statistic)	0.000001		

Source: Authors' Computation, 2020.

The cointegrating form (short run) coefficients show that, in the short run, LGDP one-lag period, LED and LDD all have positive effects on GDP. However, only LDD has a significant impact on GDP at 1% level of significance as shown by its p-value (0.0009). The CointEq (-1), which is the error correction mechanism (ECM) shows an expected negative sign with a high coefficient (-0.929), meaning that 92.9% of disequilibrium in the economy is corrected by the explanatory variables. More so, its p-value (0.0001) indicates a 1% level of significance. R2, which is the coefficient of determination, shows that 71.2% of the variation in economic performance is explained by public debt in Nigeria.

Also, on Table 4 and equation 9, which both showcase the long run effect of LED and LDD on GDP, there are indications that both LED and LDD have positive impact on GDP but only LDD has significant impact as shown by its p-value (0.0000) at 1% level of significance. In another way, from the obtained results in Table 4, under the short run coefficient, we can obtain an estimate for the adjustment coefficient (λ) by solving for the adjustment coefficient that β_3 = 1- λ, so that, λ will be become 1-0.071 = 0.929. this shows that 92.9% of the difference between the desired and actual economic performance is eliminated in each year. The estimated coefficient in Table 4 is of the short run economic performance and they are the short run elasticities with respect to DD and ED respectively. By dividing the short run coefficients by λ(0.929), it gives the desired GDP and the long run coefficient as,

$$LGDP_t = 14.954 + 0.311LDD_t + 0.008LED_t \quad (9)$$

4.5 Residual Test Result

The result of Breusch-Pagan-Godfrey tests for heteroscedasticity and Breusch-Godfrey Serial Correlation LM Test for serial autocorrelation in the model. Below are test results on Table 5.

Table 5: Residual Diagnostic Test

Diagnosis	**Name of the Test**	**Stat. Value**	**Prob.**
Breusch-Godfrey Serial Correlation	**F-Stat. of LM**	1.221584	0.3132
Heteroskedasticity	**F-Stat of ARCH**	0.805740	0.5026

Source: Authors' Computation, 2020

The Table 5 revealed the heteroscedasticity and serial correlation results which their probability values are far beyond 5 percent indicating the null hypotheses of homogeity and no serial correlation are accepted, meaning that, the model is devoid of heteroscedasticity and serial correlation problems.

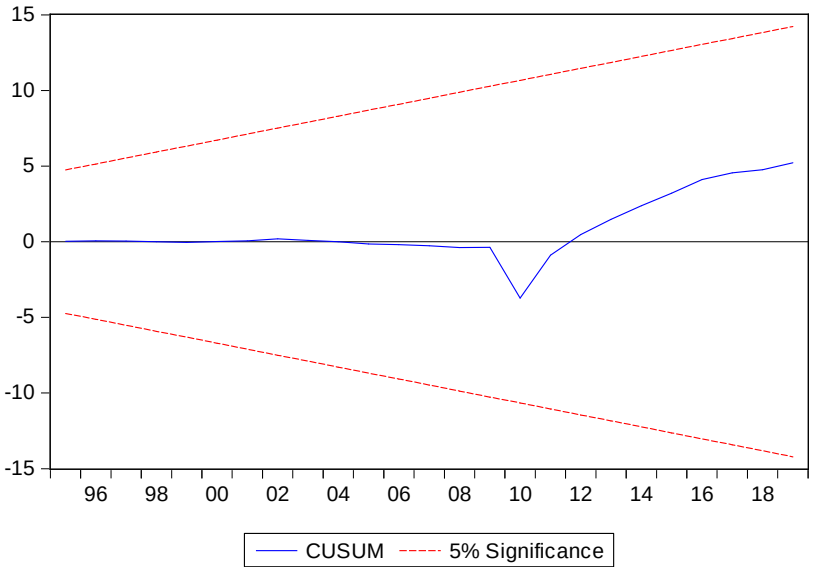


Figure 1: CUSUM of the Parameters.

4.6 Result of Stability Test

Figures 1 and 2 present the results of stability test based on CUSUM and CUSUM squares of the parameters employed. Figure 1 (CUSUM) indicates that the parameters are stable since the blue line is within the 5% bound of red lines, and means the variables do not arbitrarily change over time. However, the CUSUM squares in figure 2 shows that the parameters could not pass the test employed.

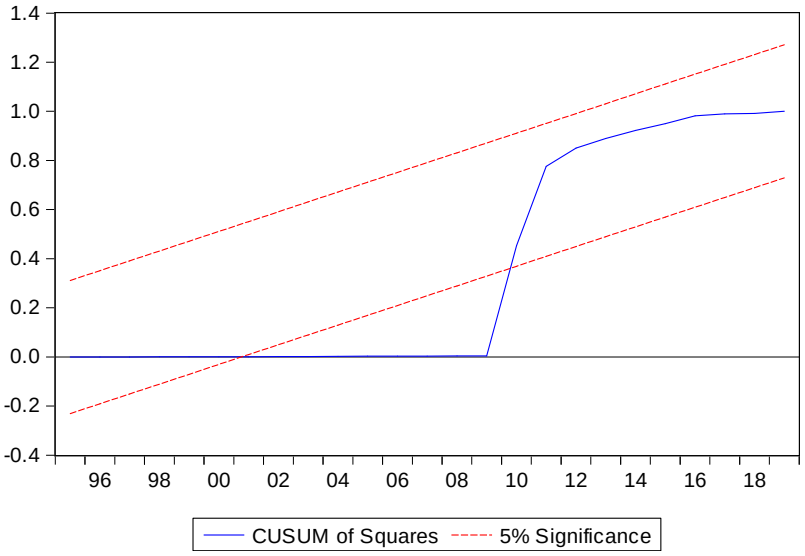


Figure 1: CUSUM of Squares of the Parameters.

5.0 Discussion of Results and Implication of Findings

The study examines the effect of public debts on economic performance in Nigeria from 1990 to 2019 using the Stock adjustment model. The unit root test shows that both the external debt and domestic debts are stationary at level and are non-stationary at first difference, which is not special with times series data. The results

revealed that, in the short run,both external debt (ED) and domestic debt (DD) havepositive effect on GDP, but only DD has significant effect. The result is in line with Panagiotis (2018) empirically investigation on the relationship between public debt and the determinants of economic growth that there are positive effects of government debt on economic growth and performance while government debt and population growth had a negative impact on growth. This finding is also supportedby the result of Lucky and Godday (2017) in the Nigerian economy using simple and multiple regression analyses. However, the result is different from that of Sami and Mbah (2018) who examined the relationship between government external borrowing and economic growth from a period of 1990 to 2015, and found out that a negative and significant influence of external debt exist on economic growth in Oman.

Implicatively, the result means that, though there exists a positive impact of public debt on economic performance, only domestic debt has a significant effect on this performance, which also shows that the economy makes significant utilization of fund borrowed from domestic source than those from external source. This could be due to some bottlenecks involved in conditions given by the creditors from international bodies like Paris Club of Creditors, International Monetary Fund and London Creditors. More so, the result implies that the economic performance of the economy highly depends on public borrowing.

6.0 Conclusion and Recommendations

This study examined the impact of public debts and economic performance in Nigeria using the stock adjustment model from the period of 1990 to 2019. ARDL model was utilized in the analysis. Data was sourced from the Central Bank of Nigeria (CBN) statistical bulletin on gross domestic product (GDP), domestic debt (DD), external debt (ED). GDP represented economic performance and made the dependent variable, while the public debt of DD and ED were the independent variables in the study. The stationarity test result indicated that GDP, ED and DD were stationary at first difference. The results of the ARDL model revealed that domestic debt (DD) has a positive and significant impact on economic performance (GDP) while external debt also has a positive but insignificant effect on GDP.

The study therefore recommends that government should reduce its borrowings and if need be, priority should be given to domestic debt since it has significant impact on the performance of the economy and to enhancesmore in both short and long run periods.Also, more prudent measures should be put in place to ensure that all externally borrowed funds are tailored to the right direction.

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Appendix
Results of analysis

Dependent Variable: LGDP
Method: ARDL
Date: 08/03/20 Time: 10:35
Sample (adjusted): 1991 2019
Included observations: 29 after adjustments
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (0 lag, automatic): LED LDD
Fixed regressors: C

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LGDP(-1)	0.070779	0.196451	0.360290	0.7217
LED	0.008224	0.065921	0.124763	0.9017
LDD	0.289769	0.076971	3.764667	0.0009
C	13.90701	2.989102	4.652572	0.0001

R-squared	0.711558	Mean dependent var	17.36112
Adjusted R-squared	0.676945	S.D. dependent var	0.515661
S.E. of regression	0.293091	Akaike info criterion	0.510775
Sum squared resid	2.147559	Schwarz criterion	0.699368
Log likelihood	-3.406241	Hannan-Quinn criter.	0.569840
F-statistic	20.55750	Durbin-Watson stat	2.119089
Prob(F-statistic)	0.000001		

ARDL Cointegrating And Long Run Form
Dependent Variable: LGDP
Selected Model: ARDL(1, 0, 0)
Date: 08/03/20 Time: 10:54
Sample: 1990 2019
Included observations: 29

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LED)	0.008224	0.065921	0.124763	0.9017
D(LDD)	0.289769	0.076971	3.764667	0.0009
CointEq(-1)	-0.929221	0.196451	-4.730031	0.0001

Cointeq = LGDP - (0.0089*LED + 0.3118*LDD + 14.9663)

Long Run Coefficients

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LDD	0.311840	0.050749	6.144702	0.0000
C	14.966320	0.454796	32.907759	0.0000

ARDL Bounds Test
Date: 08/03/20 Time: 10:54
Sample: 1991 2019
Included observations: 29
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	8.118827	2

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	3.17	4.14
5%	3.79	4.85
2.5%	4.41	5.52
1%	5.15	6.36

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.221584	Prob. F(2,23)	0.3132
Obs*R-squared	2.784711	Prob. Chi-Square(2)	0.2485

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.805740	Prob. F(3,25)	0.5026
Obs*R-squared	2.556765	Prob. Chi-Square(3)	0.4651
Scaled explained SS	16.62361	Prob. Chi-Square(3)	0.0008

	LGDP	LED	LDD
Mean	17.34161	7.195709	7.382922
Median	17.32179	6.866596	7.276574
Maximum	18.06114	9.107468	9.566100
Minimum	16.34790	5.699153	4.431925
Std. Dev.	0.517835	1.011516	1.467227
Skewness	0.031769	0.342335	-0.184023
Kurtosis	1.636447	1.773041	2.075854
Jarque-Bera	2.329144	2.467752	1.236879
Probability	0.312056	0.291162	0.538785
Sum	520.2483	215.8713	221.4877

Sum Sq. Dev.	7.776427	29.67179	62.42986
Observations	30	30	30

	LGDP	LED	LDD
LGDP	1.000000	0.484062	0.841009
LED	0.484062	1.000000	0.573487
LDD	0.841009	0.573487	1.000000

	LGDP	LED	LDD	LGDP(-1)
LGDP	1.000000	0.453863	0.842560	0.722368
LED	0.453863	1.000000	0.526168	0.425426
LDD	0.842560	0.526168	1.000000	0.832097
LGDP(-1)	0.722368	0.425426	0.832097	1.000000

Ramsey RESET Test
Equation: UNTITLED
Specification: LGDP LGDP(-1) LDD LED C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	1.012382	24	0.3215
F-statistic	1.024917	(1, 24)	0.3215
Likelihood ratio	1.212727	1	0.2708

F-test summary: