External Debt Burden and Infrastructural Development Nexus in Nigeria: An ARDL Approach (1981-2020)

Chinonye Emmanuel Onwuka (emmanuelonwuka15@gmail.com)
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EXTERNAL DEBT BURDEN AND INFRASTRUCTURAL DEVELOPMENT NEXUS IN NIGERIA: AN ARDL APPROACH

(1981-2020)

Chinonye Emmanuel Onwuka

Tel: +2348100543232

E-mail: emmanuelonwuka15@gmail.com

Abstract

This study focused on external debt burden and infrastructural development nexus in Nigeria using data spanning between the periods 1981 to 2020 by employing the use of Autoregressive Distributed Lag Model (ARDL) and granger causality test as the major statistical techniques of analysis. From the findings, the coefficient of error correction term shows that about 70 percent of the discrepancy between the actual and the long run or equilibrium value of infrastructural development is corrected or eliminated each year. The coefficient of determination (R^2) is 0.680 which shows that about 68 percent variations in the infrastructural development were explained by the independent variables. The Augmented Dickey Fuller (ADF) unit root test shows that all variables were stationary at first difference. The results for the Bounds test reveal that there is a long run relationship among the variables. This is because the F-statistics value (5.194) is greater than upper Bounds critical values at 5% level of significant. The ARDL results show that external debt, domestic debt and inflation rate have a negative impact on infrastructural development in the long run while exchange rate and interest rate has a positive effect on infrastructural development in the long run. Also, domestic debt and exchange rate were found to have a significant impact on infrastructural development while external debt, inflation rate and interest rate were found to be insignificant in the long run. Furthermore, the granger causality test results indicate while there is no causality between external debt and infrastructural development, there seems to be a unidirectional causality between domestic debt and infrastructural growth in Nigeria. The study concludes that federal government of the country should cut down excessive borrowings and that the existing ones are invested in projects that would eventually generate enough returns to defray such debts accordingly. Also, an adoption of policy framework that will ensure macroeconomic stability such as price stability, job creation, increased output, political stability, etc. becomes fundamental in getting rid of heavy reliance on external debt in the country.

Keywords: External debt burden, infrastructural development, ARDL, Granger causality test, Nigeria.
JEL classification code: C22, F31, H63, H54

1. Introduction

Governments of nations are continually looking for new ways to raise the ability of their economies to produce goods and services. In this sense, attention has moved to infrastructure development as an important system for raising the productive standard of the economy. Infrastructure is very crucial to the developmental prospect of any nation. The adequacy of infrastructure may be used to determine success or failure in diversification of production, coping with population growth, reducing poverty, improving welfare of citizens (Mobolaji, & Wale 2012).

Hence, infrastructural development has been on the top of priority list for governments worldwide. According to World Bank (2014), improving infrastructure in the world is very fundamental to reducing poverty, increasing growth and achieving the Millennium Development Goals (MDGs). The need for infrastructure development is very important for developing countries, especially Nigeria. Infrastructure contributes to economic development by increasing productivity services, which enhance the quality of life (Babatunde, 2018).

The past few decades has experienced government of nations involved in the construction and maintenance of infrastructure systems. This participation has led governments to take on a large number of function in the infrastructural sector such as; regulator, financer, owner with responsibility for construction and maintenance and also in many cases with heavy involvement in the organizations carrying out services (Hasselgren, 2012). The services produced as a result of an adequate infrastructure base will translate to an increase in aggregate output such as increased electrical generation, transmission and distribution, water and irrigation projects, increase quality of life and urbanization of different areas improved roads, creation of a sea ports, rail links (Akinyosoye, 2010).

Debt has been described as a crucial instrument of fiscal policy available to government to fund the development of a nation. It is used in settlement of expenditures that will ultimately increase productivity and improve the growth of the economy (Muhammad, Ruhaini, Nathan & Arshad, 2017).The issue of debt burden suffered by various developing countries has attracted global attention; this experience which is occasioned by factors including the fall in oil prices, exchange rate volatility, increasing interest rate has exerted a negative effect on the economy of developing economies across the globe especially Nigeria (Muhammad, Ruhaini, Nathan & Arshad, 2017).

Public debt can be defined as national debt owed by the government or the aggregate of borrowings of all government units such as the Federal, State and Local government (Idenyi, Igberi & Anoke, 2016). It can be seen as the aggregate of borrowings acquired by government bodies of a country; this includes funds owed to private organizations, public entities, foreign government, etc. Therefore, it can be domestic or external debt. In the discourse of public debt, future pension payments, government liabilities and good and services received by government on credit are all considered (Idenyi, Igberi & Anoke, 2016).

In Nigeria, the origin of external debt in Nigeria started in 1958 when a loan of USD28 Million was obtained from the World Bank to construct a railway and other developmental projects (Mbah, Umunna & Agu, 2016). In 1985, the problem of debt servicing began as the total external debt of Nigeria rose to USD19 billion, but the government was able to repay the foreign creditors (Paris Club) more than USD35 billion while the borrowed money was then less than USD15 billion. Following the apparent debt overhang in Nigeria, the Obasanjo's led government in 2003-2007 intensely pursued debt revocation which consequently resulted to a reduction of the external debt up to USD3.4 billion in 2007 (Adedoyin, Babalola, Otekunri & Adeoti, 2016).

The succeeding administrations after President Obasanjo's tenure swiftly resumed the borrowing to such a level that Nigeria's debt profile (comprising loans from Multilateral, Bilateral, Euro Bond, Diasporal Bond, and others) started rising again from N438.89 Billion in 2007; N523.25 Billion in 2008; N590.44 Billion in 2009; N689.84 Billion in 2010; N896.85 Billion in 2011; N1,026.90 Billion in 2012; N1,387.33 Billion in 2013; N1,631.50 Billion in 2014; N2,111.51 Billion in 2015; N3,478.91 Billion in 2016; N5,787.51 Billion in 2017 to N7,759.20 Billion in 2018 to N32,921 Billion in 2020 (CBN, 2020).

Despite the huge amount of debts which the country has continued to incur over the years, the inability of Nigeria to effectively meet her debt obligations has adverse effect on the economy, as interests arrears accumulate over the years, thereby creating a much greater debt burden on the nation resulting in a greater percent of her revenue being spent on debt service arrears (Udofia & Akpanah, 2016). Debt servicing remains a huge resource leakage in Nigeria. It occupies a significant portion in the country's recurrent expenditure profile. Meeting debt obligations continues to pose a threat to growth and development of Nigeria since paying it means sacrificing welfare and capital projects for social and economic development (Nwagwu, 2014).

Several empirical studies (Mbah, Umunna & Agu, 2016; Ideniyi, Ogonna & Ifeyinwa, 2016; Udofia & Akpanah, 2016; Ugwuegbe, Okafor & Azino, 2016; Ndubuisi, 2017; Elwasila, 2018;

Matuka & Asafo, 2018; Matandare & Tito, 2018; Said & Yusuf, 2018; Shkolnyk & Koilo, 2018) have analyzed the question of whether the rising of external debt shows positive or negative effects on the economic growth of an economy. However, little or no study has been done on the relationship between external debt burden and infrastructural development in Nigeria. It is against this background that this study seeks to ascertain the nexus between external debt burden and infrastructural development in Nigeria.

The remaining of this paper is organized as follows; Section two review theoretical and empirical literatures. The third section focuses on methodology. Section four looks at the presentation and analysis of results while the final section provides conclusion and recommendations.

2. Literature Review

2.1 Theoretical Framework

The theoretical framework for the study is based on the dual gap model. The dual gap model by Chenery (1996) is generally used in order to analyse the requirements of foreign aid to bridge the two gaps that prevail in developed and developing countries via savings gap and trade gap. Basically, the theory postulates that investment is a function of savings and investment that requires domestic savings is not sufficient to ensure economic development, thereby necessitating complementary external goods and services. According to Root (1978), the gross domestic product identity is of the form:

$$\mathrm{GDP} = \mathrm{C} + \mathrm{S} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Alternatively;

$$\mathrm{GDP} = \mathrm{C} + \mathrm{I} + (\mathrm{X} - \mathrm{M}) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

Where,

C = Consumption

I = Investment

X = Exports

M = Imports

S = Saving In this model, investment includes both private sector investment and government investment expenditure. That is,

$I_p = I_g$ ..... (3)

Where;

I_p = government expenditures

I_g = private sector investment

Since GDP equals domestic consumption plus the domestic saving, it follows from equations (1) and (2) that the demand for domestic investment equals the sum of domestic savings and the import balance on current accounts, which is financed by net borrowing from abroad.

$I = S + (M - X)$ ..... (4)

Where, (M - X) = net foreign borrowing

To answer the question of why external debt tends to increase rapidly, we recall the two-gap model described by Chenery and Strout (1966). In their model, net external borrowing is known as basic transfer (BT). Mathematically, it is measured as the difference between the net capital inflow (gross capital minus the amortization on past debt) and interest payments on remaining accumulated foreign debt.

$BT = Dd - rD$ ..... (5A)

where, D= total accumulated foreign debt d = percentage rate of increase in total debt r = average annual interest rate Dd = net capital inflow or the rate of increase in total external debt rD = total annual interest rate payments Equation (5A) shows losses or gains in foreign exchange from international capital flows by a country in a given year. BT indicates gain if d > r and loss otherwise. Generally, if borrowing is linked with productive use when rates of return exceeds r and BT is positive, increasing the external debt will not hamper the economy of the recipient country in the long run.

Given that the aforementioned theory relates to inter-temporal budget constraint in a period-to-period flow, the following equation becomes applicable:

$(D_t - D_{t-1}) = Y_t - rD_t - C_t - I_t - G_t$ ..... (5B)

Where;

$(D_t - D_{t-1})$ = net change in debt from a period t to a period t+1

Y_t = GNP in period t (net remittance is included)

C_t = consumption in period t

I_t = domestic investment in time

G_t = government expenditure in time t

In Equation (5B), the debt size in a given period can be reduced by an increase in a country's output and a reduction in consumption, domestic investment, and government expenditure. The failure of a country to do a period-to-period flow analysis and to reach the level where the sum of output, consumption, domestic investment, and government expenditure is less than the basic transfer will lead to a debt crisis as shown below:

$$C_t + I_t + G_t - Y_t < dD_t - rD_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (6)$$

Based on the above stated models, it can be deduced that output growth (which stand for infrastructural growth) is determined by domestic savings, debt burden, capital, and other macroeconomic variables such as exchange rate, inflation rate, interest rate and so on.

2.2 Empirical Review

Ideniyi, Ogonna and Ifeyinwa (2016) examined public debt and public expenditure in Nigeria. The qualitative research method was used as secondary time series data spanning thirty-five years (1980-2015) was gathered in the study. The econometrics estimation techniques such as co integration, vector error correction model and Wald test were employed in analyzing the study's data. Findings from the study revealed that there is no long run relationship between public debt and public expenditure in Nigeria, the study also discovered that government capital and recurrent expenditure has significant positive relationship with public debt in the Nigerian economy. Based on these findings, the study advocated for the introduction of planning-programming budgeting systems (PPBS) and Zero based budgeting (ZBB) in preference to the current practice of incremental budgeting (IB) in our public finance at both federal and state level. Udofia and Akpanah (2016) investigated the impact of external debt on economic growth of Nigeria. The issue was empirically examined using co-integration test and the error correction test for Nigeria over the period 1980- 2012. Finding from this study supported that traditional view between external debt and growth. It also found the non-existence of debt overhang problem for Nigeria. It is recommended from the study that development activities in Nigeria be financed through increased export earnings spearheaded by export led by growth strategy as well as investment in human capital as these can be the best alternative to external debt in the long run. Ugwuegbe, Okafor and Azino (2016) used annual time series data to investigate the effect of external borrowing and foreign aid on economic growth in Nigeria from 1980 to 2013. They used GDP as a parameter for economic growth and external debt, foreign aid, exchange

rate regime and foreign reserve as the exogenous variables. Econometric techniques of Ordinary Least Square (OLS) multiple regression, Augmented Dickey Fuller (ADF), Johansen Cointegration, Error Correction Method (ECM) were applied. The results show that external debt has a positive and significant effect on economic growth, foreign aid has positive and insignificant effect on economic growth in Nigeria. Ndubuisi (2017) extended the study on the impact of external debt on the economic growth of Nigeria from 1985 to 2015 using the ordinary least squares method and some other statistical tools. The control variables employed were the exchange rate and external reserve while the major independent variable includes external debt stock and external debt servicing. The study also employed the GDP as the dependent variable. Thus, the findings revealed that debt service payment had an insignificant negative impact on economic growth while the external debt stock had a significant positive impact on the economic growth of Nigeria. The control variable which includes external reserve and exchange rate had significant impacts on GDP. Thus, the study recommended the use of external debt for infrastructural development. Elwasila (2018) investigated the effect of external debt on the economic growth of Sudan from 1969 to 2015, using vector error correction method (VECM). The study also employed exchange rate and foreign direct investment as the controlling factors. The dependent variable was the GDP while the external debt to exports ratio was the proxy for the external debt which is the main explanatory variable. Thus, the findings revealed the Effect of Foreign Debt on the Economic Growth of Nigeria that external debt to export ratio had impacted positively on Sudan's economy while the control variables (the exchange rate and FDI) employed exerted a negative influence on GDP growth in Sudan. Matuka and Asafo (2018) examined the impact of external debt on economic growth in Ghana using co-integration analysis and an error correction methodology. The study made use of annual time series data covering a period from 1970 to 2017. The findings indicated that external debt impacted positively on economic growth in Ghana, both in the long and short terms. Matandare and Tito (2018) evaluated public debt and economic growth in Zimbabwe. The study employed quantitative research design. Secondary time series data spanning thirty six years (1986-2016) were gathered from the World Development Indicators database. Data gathered in the study were analyzed inferentially. Findings revealed in the study showed that there exists a negative significant relationship between external debt and economic growth in Zimbabwe. The study also ascertained that exchange rate and inflation were also found to have negative significant relationships with economic growth in Zimbabwe and external exerts a significant positive relationship with economic growth. Based on the findings, the authors advanced that the government should step up efforts to boost sources of domestic revenue to finance its growth

plans as external debt accumulation weighs down economic growth and suggested the need to diversify the economy is crucial as government should develop new sectors which can generate revenue to contribute towards economic growth. Said and Yusuf (2018) examined public debt and economic growth in Tanzania. The quantitative research approach was adopted as secondary time series data spanning forty-five years was collated. Co-integration and Vector Error Correction Mechanism (VECM) Approach were used in analyzing data collated in the study. The VECM estimate showed that there is a negative relationship between public debt and economic growth in Tanzania over the study period. In addition, granger causality test revealed that there is no causal relationship between public debt and economic growth. Premise on these findings, the study suggested Government and policy makers should stop the accumulation of external debt stock overtime and prevent concealing of the motive behind external debt; external debts should be used only for productive investment of highest priorities that would help in yielding returns for economic reasons (productive purposes) and not for social or political reasons. Shkolnyk and Koilo (2018) empirically examined the relationship between external debt and economic growth in Ukraine from 2006 to 2016 using different econometric techniques. The study established that a high level of external debt and macroeconomic instability impede economic growth. The study further revealed that the debt burden on Ukraine as found in other emerging economies had denied them expected economic improvement. AL-Tamimi and Jaradat (2019) investigated the impact of external debt on economic growth in Jordan using annual time series data covering a period from 2010 to 2017. The empirical finding revealed that external debt had a significant negative impact on economic growth. Thus, the study suggested foreign direct investment as an alternative method of financing.

3. Methodology

3.1 Model Specification

The specification of an appropriate econometric model borders on the prevailing economic circumstance(s) and the availability of economic data relating to the variable(s) being examined (Koutusoyiannis, 1997). Therefore, following the dual-gap theory above, the model for the study can be modified as;

$$INFD = f\,(EXD, DDT, EXR, INFL, INTR) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

The econometric form of the model above is stated as;

$$INFD_t = \beta_0 + \beta_1 EXD_t + \beta_2\, DDT_t + \beta_3\, EXR_t + \beta_4\, INFL_t + \beta_5\, INTR_t + U_t \quad \ldots\ldots\ldots\ldots\ldots\ldots (8)$$

Where;

INFD = infrastructural development (proxied by government expenditure on infrastructure)

EXD = External debt

DDT = Domestic debt

EXR = Exchange rate

INFL = Inflation rate

INTR = interest rate

U_t = stochastic error term

β_0 = constant term

β_1 to β_5 = coefficients of the variables

3.2 Data and Sources

The study employed the use of time series secondary data sourced from the Central Bank of Nigeria (CBN) between the periods 1981 to 2020.

3.3 Techniques of Analysis

The study adopts an ARDL model as a statistical tool of analysis. The autoregressive distributed lag (ARDL) model is an ordinary least square (OLS) based model which is applicable for both non-stationary time series as well as for time series with mixed order of integration. However, the ARDL model has difficulties in identifying the relationships between the data variables which contain a unit root as issues of spurious correlation may occur. However, co-integration and modeling the variables in differences may be used to avoid problems relating to unit roots. Hence, in this study, the ARDL model is employed to ascertain long-run equilibrium between the variables. The study also employed granger causality test to ascertain the direction of causality between the variables used for the study.

4. Presentation and Analysis of Results

4.2 Empirical Analysis

4.2.1 Unit Root Test

Table 1: Augmented Dickey Fuller Test at level and First Difference

VARIABLES	ADF TEST STATISTICS	ADF CRITICAL VALUE			ORDER OF INTEGRATION	REMARKS
		1% Level	5% level	10% level		
IFD	-1.555654	-3.610453	-2.938987	-2.607932	I(0)	Non-Stationary
EXT	3.937519	-3.610453	-2.938987	-2.607932	I(0)	Non-Stationary
DDT	-1.830751	-3.615588	-2.941145	-2.610263	I(0)	Non-Stationary
EXR	2.164814	-3.610453	-2.938987	-2.607932	I(0)	Non-Stationary
INFL	-3.560729	-3.615588	-2.941145	-2.610263	I(0)	Non-Stationary
INTR	-2.542623	-3.610453	-2.938987	-2.607932	I(0)	Non-Stationary

VARIABLES	ADF TEST STATISTICS	ADF CRITICAL VALUE			ORDER OF INTEGRATION	REMARKS
		1% Level	5% level	10% level		
D(IFD)	-7.900526	-3.610453	-2.938987	-2.607932	I(1)	Stationary*
D(EXT)	-3.763713	-3.610453	-2.938987	-2.607932	I(1)	Stationary*
D(DDT)	-3.762857	-3.615588	-2.941145	-2.609066	I(1)	Stationary*
D(EXR)	-4.124295	-3.615588	-2.941145	-2.609066	I(1)	Stationary*
D(INFL)	-6.452276	-3.621023	-2.943427	-2.610263	I(1)	Stationary*
D(INTR)	-6.907695	-3.615588	-2.941145	-2.610263	I(1)	Stationary*

Source: Authors' Computations using Eviews 10.0, 2021.

Table 1 above shows the results of unit root test for Augmented Dickey Fuller Test. It shows that in the process of comparing the test statistic value against the Mackinnon critical value at 1%, 5% and 10% level of significance, it was noticed that D(IFD), D(EXT), D(DDT), D(EXR), D(INFL)

and D(INTR) were found to be stationary at first differenced. Hence, having tested for the stationarity of the variables, we proceed to test for the long run relationships of the variables which give us the co integration result in table 2 below;

4.2.2 Bound Test Approach to Cointegration

The cointegration test was conducted to determine the long run relationship among the variables used in the private investment model. The study employed the ARDL Bounds test to test whether there is a long run relationship among variables. The model has an unrestricted trend with no constant. The Bounds test results are reported in Table 3 below:

Table 2: Bounds test results

Significance	Lower bound value	Upper bound value	F-Statistic value	Null Hypothesis
10%	2.26	3.35	5.193838	No cointegration
5%	2.62	3.79		No cointegration
2.50%	2.96	4.18		No cointegration
1%	3.41	4.68		No cointegration

Source: Authors' Computations using Eviews 10.0, 2021.

The results for the Bounds test reveal that there is a long run relationship among the variables. This is because the F-statistics value (5.194) is greater than upper Bounds critical values at 5% level of significant, and thus the null hypothesis of no cointegration is rejected.

4.2.3 Long-run ARDL Model Estimate

Though there is a presence of cointegration, it was necessary to estimate the long-run ARDL in order to calculate the elasticities. Thus, the long run ARDL was estimated or unrestricted ECM was estimated and the results are presented in Table 4 below.

Table 3: Unrestricted Error Correction Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Short run Estimate				
EXT	-0.015081	0.017695	-0.852299	0.4018
DDT	-0.026632	0.023524	-1.132127	0.2679
EXR	1.269669	0.916963	1.384646	0.1779
INFL	-0.624747	0.758997	-0.823121	0.4179
INTR	1.224664	3.787758	0.323322	0.7490
ECM	-0.702602	0.124065	-5.663172	0.0000
Long run Estimate				
EXT	-0.009411	0.010721	-0.877739	0.3881
DDT	-0.054422	0.021893	-2.485768	0.0197
EXR	1.253655	1.177817	2.564389	0.0169
INFL	-0.389833	0.471623	-0.826578	0.4160
INTR	0.764172	2.367057	0.322836	0.7494
C	8.264513	8.860816	0.932703	0.3596
R-squared = 0.680 Adjusted R-squared = 0.661 F-test = 5.932 DW-stat = 2.207				

Source: Authors' Computations using Eviews 10.0, 2021.

Table 3 above shows the Autoregressive distributed lag model results, the long run estimates shows that external debt, domestic debt and inflation rate have a negative impact on infrastructural development at about 1%, 39% and 5% respectively in the long run while exchange rate and interest rate has a positive effect on infrastructural development in the long run. Also, domestic debt and exchange rate were found to have a significant impact on infrastructural development while external debt, inflation rate and interest rate were found to be insignificant. The findings also show that in the short run, none of the variables have significant effect on infrastructural development.

Furthermore, the coefficient of Error correction term (ECM) shows that about 70 percent of the discrepancy between the actual and the long run or equilibrium value of infrastructural development is corrected or eliminated each year. Notice that the coefficient of the ECM has a negative sign as expected and is significant at 1% probability level. Also, the coefficient of determination (R^2) is 0.680 which shows that about 68 percent variations in the infrastructural

development were explained by the independent variables. The F-stat is 5.932 shows that the overall test is significant. Finally, the Durbin-Watson statistics is 2.207 and it shows that there is no autocorrelation in the model.

4.2.4 Granger Causality Test

Table 4: Granger causality test Result

Null Hypothesis:	Obs	F-Statistic	Prob.
EXT does not Granger Cause INFD	38	0.25188	0.7788
INFD does not Granger Cause EXT		0.66785	0.5196
DDT does not Granger Cause INFD	38	3.66354	0.0366
INFD does not Granger Cause DDT		1.18179	0.3194
EXR does not Granger Cause INFD	38	5.98351	0.0061
INFD does not Granger Cause EXR		0.73344	0.4879
INFL does not Granger Cause INFD	38	0.56263	0.5751
INFD does not Granger Cause INFL		0.42596	0.6567
INTR does not Granger Cause INFD	38	2.13689	0.1341
INFD does not Granger Cause INTR		0.02802	0.9724

Source: Authors' Computations using Eviews 10.0, 2021.

Table 4 above shows the granger causality test results at 5% significance level, the findings shows that there is no causality between external debt and infrastructural development in Nigeria. The results also show that there is unidirectional causality between domestic debt and infrastructural development. In other words, domestic debt granger causes infrastructural development in Nigeria. Furthermore, the findings show that there is unidirectional causality between exchange rate and infrastructural development. Also, inflation rate shows no causality with infrastructural development in Nigeria. Finally, the results also show that interest rate granger cause infrastructural development in Nigeria and not vice versa.

4.3 Post- Diagnostic Test

4.3.1 Confirmation of the absence of Serial Correlation

Table 5: Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test			
F-statistic	1.091	Prob. F(2,21)	0.3485
Obs*R-squared	2.56384	Prob. Chi Square(2)	0.2775

Source: Authors' Computations using Eviews 10.0, 2021.

H_0: The residuals are not serially correlated

H_1: The residuals are serially correlated

Decision Rule

Probabilities > 0.05 accept the null hypothesis

Probabilities < 0.05 reject the null hypothesis

The above table 5 present the result of Breusch-Godfrey Serial Correlation LM Test. Based on the findings, the probability of the chi-square (2) is 0.2775 and this is greater than 0.05 at 5% significance level and therefore the null hypothesis is accepted. This implies and therefore confirms the absence of serial correlation.

4.3.2 Confirmation of Absence of Heteroscedasticity

Table 6: Breusch-Pagan-Godfrey Heteroscedasticity Test

Breusch-Pagan-Godfrey Heteroscedasticity Test			
F-statistic	0.488245	Prob. F(5,33)	0.9154
Obs*R-squared	8.705976	Prob. Chi-Square(5)	0.8494
Scaled explained SS	7.380561	Prob. Chi-Square(5)	0.9190

Source: Authors' Computations using Eviews 10.0, 2021.

H_0: Homoscedasticity

H_1: Heteroscedasticity

Decision Rule

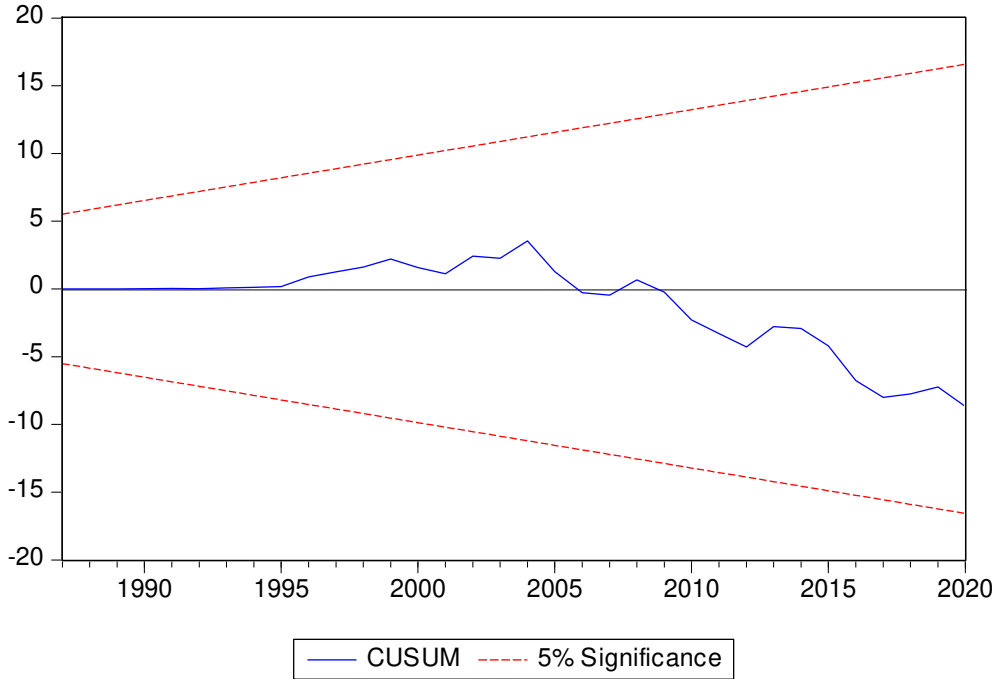
Probabilities > 0.05 accept the null hypothesis

Probabilities < 0.05 reject the null hypothesis

The above table 6 present the Breusch-pagan-Godfrey Heteroscadaticity test, the probability of chi-square (5) is 0.8494 and this is greater than 0.05 at 5% significant level and therefore the null hypothesis is accepted. This implies and therefore confirms the absence of heteroscedasticity in the model. In essence, they have constant variance in repeated sampling.

4.3.3 Parameter Stability Test (CUSUM Test)

Fig 1: CUSUM Test



Hypotheses

There are two hypotheses governing the CUSUM and they are expressed below.

H_0: parameters are stable

H_1: parameters are not stable.

Decision Rule

If the blue/dotted line is found between/within the two parallel red lines, we accept the null hypothesis (stable) and reject the alternative hypothesis (not stable). But if the blue line is found across/outside the red lines, we accept the alternative hypothesis (not stable) and reject the null hypothesis (stable).

From the figure 1 above, the CUSUM remained within the 5 percent critical lines throughout the whole period thus, signifying parameter stability during the course of assessment.

5.0 Conclusion

This study focused on external debt burden and infrastructural development nexus in Nigeria using data spanning between the periods 1981 to 2020 by employing the use of Autoregressive Distributed Lag Model (ARDL) and granger causality test as the major statistical technique of analysis. The ARDL results shows that external debt, domestic debt and inflation rate have a negative impact on infrastructural development in the long run while exchange rate and interest rate has a positive effect on infrastructural development in the long run. Also, domestic debt and exchange rate were found to have a significant impact on infrastructural development while external debt, inflation rate and interest rate were found to be insignificant. Furthermore, the granger causality test results indicate while there is no causality between external debt and infrastructural development in Nigeria, there seems to be a unidirectional causality between domestic debt and infrastructural growth in Nigeria. The study concludes that federal government of the country should cut down excessive borrowings and that the existing ones are invested in projects that would eventually generate enough returns to defray such debts accordingly. Also, an adoption of policy framework that will ensure macroeconomic stability such as price stability, job creation, increased output, political stability, etc. becomes fundamental in getting rid of heavy reliance on external debt in the country.

Declarations

Ethics approval and consent to participate

Not applicable

Consent for Publication

Not applicable

Availability of data and materials

The data for this study were sourced from the database of National Bureau of Statistics (NBS) and Central Bank of Nigeria (CBN) Statistical Bulletin (https:/www.cbn.gov.ng).

Competing interests

The author declares that there are no competing interests associated with this manuscript.

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Author's contributions

The author was the overall contributor to the development of all the sections in this manuscript.

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