



## Impact of Public Debt on Infrastructural Development in Nigeria (1990 - 2023)

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### ABSTRACT

Public debt management and infrastructure development are critical aspects of economic policy in developing countries. Nigeria, currently, faces challenges in balancing public debt levels with the need for infrastructure investment to foster economic growth and development. This paper seeks to investigate the impact of public debt on infrastructural development in Nigeria from 1990 to 2023. Specifically, it seeks to analyze the impact of external and domestic debt, as well as debt servicing, on capital expenditures in the country. The research covers a comprehensive period from 1990 to 2023, allowing for a longitudinal analysis of the trends and dynamics of public debt and infrastructure spending in Nigeria. Infrastructure is crucial for economic growth and improving living standards, however, Nigeria faces a large infrastructure deficit after decades of underinvestment. To address this, the government has borrowed substantially, both domestically and externally, to finance infrastructure projects. This study investigates how the accumulation of public debt and debt servicing has affected capital expenditure and infrastructure outcomes. An autoregressive distributed lag (ARDL) model is employed to estimate the influence of external debt, domestic debt, and debt servicing on capital expenditure over the period. The results indicate that both external debt and domestic debt have a positive but insignificant relationship with capital expenditure. However, debt servicing exhibits a negative association. This implies increasing domestic borrowing could enhance infrastructure development more than external financing. However, the debt burden constrains infrastructure investment. The study concludes that rising debt has not translated into commensurate gains in infrastructure quantity and quality, underscoring deeper institutional and governance challenges. Effective reforms are needed to ensure debt is invested productively to improve infrastructure. Prudent debt management and greater accountability in executing

projects can help strike a balance between infrastructure financing needs and fiscal sustainability.

**Keywords:** Capital expenditure, Debt servicing, Infrastructure development, Public debt

### I. INTRODUCTION

Nigeria, positioned in the heart of West Africa, boasts of abundance of valuable resources, including extensive reserves of oil, natural gas, and mineral wealth (Smith, 2015a). These resources have historically positioned Nigeria as a significant player in both the African and global economies. However, despite this substantial economic potential, Nigeria has faced persistent and formidable challenges in the creation and maintenance of its infrastructure (Okafor, 2018a). This ongoing struggle has run parallel to the country's noteworthy accumulation of public debt over the past decades (World Bank, 2021).

Infrastructure, encompassing transportation networks, energy production, water supply systems, and telecommunications infrastructure, constitutes the very foundation upon which a nation's development is constructed (UNDP, 2019; Odozi, 2006). It serves as the essential framework upon which economic activities, the provision of social services, and the enhancement of public welfare rest. Throughout the historical period from 1990 to 2022, Nigeria's infrastructure landscape has stood at a critical juncture, a bottleneck that has consistently curtailed the nation's pursuit of sustained economic growth and global competitiveness (World Economic Forum, 2020; Ebohon, 2012). To address these infrastructure deficits and catalyze development, Nigeria's government has frequently resorted to borrowing as a pivotal strategy for financing ambitious infrastructure projects (Adeyemi & Adu, 2017b; Ajaero & Eboh, 2019; Akande, 2017). This strategic approach to financing, while essential for infrastructure development, has resulted in the



significant accumulation of public debt, both domestically and on the international stage (Central Bank of Nigeria, 2020). Consequently, managing this debt effectively while ensuring that it genuinely contributes to the sustainable growth and development of infrastructure in the country has become a multifaceted and intricate task that necessitates meticulous analysis and thoughtful policy formulation (IMF, 2021).

Nigeria's total public debt stock stood at ₦41.6 trillion (\$100 billion) as of the third quarter of 2022 (Nigerian DMO, 2022). This represents a threefold increase in the last decade, driven by increased government borrowing to finance fiscal deficits (Ola & Sadiq, 2022). Domestic debt accounts for 60% of total debt, amounting to ₦24.99 trillion (\$60.3 billion) (Muibi & Sinbo, 2021). This consists primarily of FGN bonds (₦15.01 trillion), Treasury Bills (₦7.53 trillion), Sukuk bonds (₦362 billion), green bonds (₦25 billion), and other instruments (Onakoya & Ogunade, 2017). External debt stands at \$16.37 billion, comprising 40% of total debt (Babatunde, 2019). Multilateral creditors such as the World Bank and African Development Bank hold around 70% of external debt. Other creditors include China, commercial banks, and Eurobonds (Muhtar, 2022). Nigeria's growing debt burden and high debt service costs pose fiscal risks. However, government revenues remain low at just 8% of GDP in 2021 (IMF, 2021). This constrains fiscal space for much-needed development spending. This paper seeks to assess the impact of public debt on infrastructural development in Nigeria between 1990 and 2022, specifically establishing the impact of external debt, domestic debt, and debt servicing on capital expenditure.

Governments in the past have come up with fiscal reforms and debt management strategies aimed at optimizing the allocation of debt for infrastructure (CIA World Factbook, 2020). However, challenges remain in ensuring effective implementation and balancing debt allocation with competing fiscal demands (World Bank, 2021). The problem then lies in determining how the allocation of public debt, including external and domestic debt influences the government's decisions regarding capital expenditure in Nigeria from 1990 to 2022, and what challenges persist in optimizing debt allocation for infrastructure development despite recognition (World Bank, 2021). Debt restructuring, refinancing, and negotiations have been employed by the Nigerian government to alleviate debt service burdens. Nevertheless, the persistent challenge lies in achieving a sustainable balance between debt service obligations and infrastructure investment (Adegbe &

Fakile, 2020). Given the Nigeria's debt and consequent high debt and significant infrastructure deficit recent times, based on the foregoing, this study seek to investigate the impact of public debt on infrastructural development in Nigeria from 1990 to 2023.

## II. MATERIALS AND METHODS

### Conceptual Review

Capital expenditure in Nigeria, spanning the period from 1990 to 2023, holds significant importance in the nation's economic and developmental landscape. It denotes the substantial financial investments made by the Nigerian government and various institutions in critical infrastructure projects and long-term assets. These investments have been directed towards sectors of paramount significance, including transportation, energy, water supply, telecommunications, and public facilities, with the overarching goal of stimulating economic growth, enhancing the quality of life for citizens, and fostering sustainable development (Economic Intelligence Unit, 2020; Economic Commission for Africa. 1999).

Capital expenditure has not been limited to utilities but has also extended to essential services like water supply. Nigeria has invested in expanding access to clean and potable water sources, a crucial step for public health and sanitation. Ensuring that a larger portion of the population has access to safe drinking water has been essential in reducing waterborne diseases and enhancing overall well-being (Ezeaku & Ohazurike, 2016). However, challenges, including inefficient resource allocation and infrastructure maintenance, have affected the optimal delivery of these services (Okafor, 2018b).

Capital expenditure in Nigeria from 1990 to 2022 has played a vital role in promoting economic growth, enhancing living standards, and fostering sustainable development. However, challenges related to project execution, resource allocation, and the interplay between public debt and infrastructure development have underscored the need for careful analysis and policy consideration in Nigeria's ongoing efforts to address its infrastructure deficits and achieve its developmental goals.

Public debt in Nigeria between 1990 and 2023 signifies the cumulative financial obligations that the Nigerian government, at various administrative levels (federal, state, and local), undertook to address budgetary shortfalls and finance critical development projects. These obligations primarily encompass both external debts, owed to foreign creditors, and domestic debt, owed to creditors within Nigeria's borders. Public debt serves



as a financial instrument allowing the government to bridge the gap between its revenues and expenditures, facilitating investments in vital sectors such as infrastructure, education, healthcare, and social services.

External debt forms a substantial component of Nigeria's public debt landscape. This category includes loans, bonds, and financial commitments owed to foreign entities, encompassing foreign governments, international financial institutions like the World Bank and International Monetary Fund, and commercial lenders from other nations. External borrowing often becomes necessary when domestic resources fall short of the funding required for critical infrastructure projects and other development initiatives. External debt can manifest in both concessional forms, featuring low-interest, long-term loans, and non-concessional forms, such as commercial loans with market-related terms. Prudent management of external debt is critical to avoid overreliance on foreign financing and to uphold fiscal sustainability (Central Bank of Nigeria, 2020).

In contrast, domestic debt includes various financial instruments issued within Nigeria's borders, such as government bonds, treasury bills, and bonds issued by state and local governments. These financial instruments are primarily employed to raise funds domestically when the government encounters budgetary deficits or seeks resources for specific projects. Managing domestic debt necessitates the issuance of securities with differing maturities and interest rates to optimize cash flow and sustain debt without causing disruptions in the financial system (Oyejide & Adenikinju, 2003). Effective management of domestic debt is essential for preventing liquidity crises and upholding financial stability (National Bureau of Statistics [NBS], 2021).

In essence, public debt in Nigeria from 1990 to 2023 represents the financial commitments entered into by the government to address budgetary gaps and support essential development projects. It encompasses both external and domestic debt, and the prudent management of debt service obligations is pivotal for fiscal sustainability and the efficient utilization of borrowed funds for infrastructure development and overall economic growth.

In Nigeria, the concept of debt service revolves around the consistent and periodic payments made by the Nigerian government to fulfill its financial commitments arising from both external and domestic debt. These payments encompass two primary components: interest payments and principal repayment. Interest payments represent the interest accrued on the outstanding debt, serving as compensation to lenders and bondholders for

providing funds to the government. These interest payments are made at predetermined intervals, typically annually or semi-annually. Principal repayment, on the other hand, pertains to the repayment of the borrowed capital itself. Over time, as the government services its debt, it systematically repays portions of the initial borrowed amount. This repayment is structured according to amortization schedules, ensuring that the entire borrowed principal is repaid by the end of the debt's maturity (IMF, 2021).

Within the Nigerian fiscal landscape, debt service holds a pivotal role. It constitutes a substantial portion of the government's annual budget and represents a non-negotiable obligation. Timely and consistent debt service is of paramount importance for maintaining the government's creditworthiness and access to international financial markets. Failure to meet these obligations can have severe repercussions, including credit rating downgrades, elevated borrowing costs, and potential defaults, all of which can inflict significant economic consequences.

Effectively managing debt service goes beyond merely making payments; it involves ensuring the sustainability of these payments without imposing excessive strains on the government's finances. This requires a delicate balancing act, where the government must allocate resources to meet its debt service obligations while simultaneously addressing other pressing financial commitments, including critical areas such as infrastructure development, healthcare, and education (IMF, 2021; Bello, 2002). Consequently, debt service in Nigeria is not isolated but interwoven with broader fiscal management strategies, shaping the government's approach to financial stability and economic management (Adeyemi & Adu, 2017a). In essence, debt service in Nigeria signifies the government's financial commitment to servicing its debt. It is an integral facet of the country's fiscal policy and economic governance, underscoring the importance of responsible financial management and resource allocation. Recognizing the significance of debt service is fundamental in comprehending Nigeria's financial landscape, where the efficient management of debt obligations plays a central role in the nation's economic sustainability and development (International Monetary Fund, 2021).

### **Empirical Review**

The study by Ani *et al.* (2024) investigated the impact of government debt on social infrastructure development in Nigeria. The research utilized ex-post facto research design and secondary



data extracted from the Annual Report and Statement of Accounts of companies in Nigeria. The study focused on variables like external debt, internal debt, debt service, expenditure on education, and expenditure on health. Multiple regression analysis was employed to determine the impact of government debt on expenditure in the education and health sectors. The results indicated a positive significant relationship between government external debt and expenditure on education, while external debt had a negative non-significant effect on expenditure on health. Internal debt showed a positive non-significant effect on education expenditure but a negative non-significant effect on health expenditure. Additionally, growth in education and health expenditures was positively affected by debt service fees.

The study concludes that government debts have varying effects on social infrastructure development in Nigeria, with external debt positively influencing education spending but negatively impacting health expenditures. Internal debt also plays a role in education spending but not health. The main recommendation suggests that policymakers should implement transparent policies to ensure proper funding allocation to the education sector and focus on authentic medications and efficient staff in healthcare to enhance health development. While the study offers recommendations for policymakers, further elaboration on implementation strategies and potential challenges in executing these recommendations could enhance their practicality and effectiveness.

Kabemba and Kabwe (2024) analyzed the effects of public debt (domestic and external) on economic growth in Zambia from 2011-2021. Quantitative research using time series data Autoregressive Distributed Lag (ARDL) model with variables: real GDP (dependent), external debt, domestic debt, exchange rate, prime lending rate, Data from sources like IMF, Bank of Zambia Used E-Views, Microsoft Excel for data analysis. External debt had a significant negative effect on economic growth, Domestic debt also had a significant negative effect on growth, Exchange rate showed a positive significant relationship with growth. The study Concludes that public debt (both external and domestic) had a detrimental effect on Zambia's economic growth during 2011-2021, lending support to theories like debt overhang. Exchange rate volatility impacted growth positively. The Main Recommendation is that Policymakers should ensure Zambia borrows for productive purposes rather than consumption to foster growth. A robust macroeconomic database is needed for better policy

guidance. Scope limited to Zambia; findings may not generalize well to other economies. Some variables like investment, trade openness which affect growth not considered and Methodology focused only on estimating relationships, lacking causal analysis.

Ekuma (2024) assessed the effect of increasing government debt profile (domestic debt, external debt, and cost of borrowing) on economic prosperity (measured by GDP) in Nigeria. The study covered a period from 1970 to 2022, using data from the Central Bank of Nigeria and Debt Management Office. The methodology involved a multiple regression analysis to test the hypotheses. The main findings indicated that domestic debt had a positive and significant effect on GDP, while external debt had a negative and non-significant effect. The cost of borrowing showed a positive but non-significant effect on GDP. The study concluded that economic prosperity is facilitated by domestic borrowing, while external borrowing should be avoided due to its negative impact. It recommended that the government should explore internal sources of funding over foreign sources, reduce or avoid external borrowing, and properly utilize borrowed funds for economic prosperity. The study's criticism lies in its reliance on secondary data, which may not fully capture the complexities of the relationships examined. Additionally, the regression analysis assumes linearity, which may not accurately reflect the real-world dynamics between government debt and economic growth.

Ariyibi *et al.* (2023) examined the impact of foreign debts on Nigeria's infrastructure development. The study covers the period from 1983 to 2019, using annual time series data. The study employed Auto-regressive Distributed Lag (ARDL) to analyze the relationship between foreign debt and infrastructure development in Nigeria. The ARDL model was chosen to account for the long-run and short-run dynamics of the variable. The study revealed that ARDL long-run coefficient revealed that both Bilateral and Multilateral Financial Instruments (BMFI and BBFI) have a negative and positive significant effect on infrastructure (INFRA) in Nigeria, while Foreign Direct Investment (FDI) and Trade Openness (TOPEN) have a positive and negative significant effect on infrastructure. The study concludes that foreign debt can improve the level of growth in an economy, but the government should ensure that the foreign debt is used for infrastructural development and implement policies to recover the foreign debts. The main recommendation is for the government to proactively manage foreign debt to enhance infrastructure development and implement policies to recover



foreign debts. The study acknowledges the dual gap theory, which postulates that external debt can improve growth but also highlights the need for effective management to avoid negative consequences. The study could have covered the optimal level of foreign debt for infrastructure development and the role of domestic savings in mitigating the need for foreign borrowing.

Henry (2023) determined the asymmetric and dynamic effects of public debt on private investment in Nigeria from 1990 to 2019. Because of the nature of data stationarity, the study then adopted the Nonlinear Autoregressive Distributed Lag (NARDL) modelling technique, which can produce both long-run and short-run parameter estimates of negative and positive decomposed values of domestic and foreign investment. The study used the Augmented Dickey-Fuller (ADF) test to ascertain the true order of integration for the study variables. The findings for the NARDL model showed a stable long-run cointegration among private investment, domestic debt, foreign debt, economic growth, inflation, and real exchange rate for the study period. The results show an asymmetric relationship between domestic and foreign debts and private investments in the long run. The estimated results further show that private investment is a significant positive function of positive and negative changes in foreign debt, and a significant negative function of positive and negative changes in domestic debt in the long run, while there was a significant instant positive on impacts on domestic and foreign debt shocks in the short run.

Iliyasu & Gambo (2022) tested the crowding-out hypothesis among federal capital, non-debt servicing recurrent, and debt servicing expenditure components in Nigeria. The study covered the period from 1961 to 2018. The authors employed the Auto Regressive Distributive Lag (ARDL) bound testing approach to cointegration and the Toda-Yamamoto Granger non-causality test to analyze the time-series data. Debt servicing expenditure crowded out both capital and non-debt servicing recurrent expenditure, with a larger adverse effect on capital expenditure. The level of income positively affected both capital and non-debt servicing recurrent expenditure. Retained revenue affected only capital expenditure. Improved governance indicators increased capital expenditure and reduced non-debt servicing recurrent expenditure. The Toda-Yamamoto Granger causality test confirmed bidirectional causality among the three expenditure components. The study concluded that federal debt servicing expenditure crowded out both capital and non-debt servicing recurrent

expenditure in Nigeria. The authors recommended an optimal combination of increased revenue generation, debt financing, and non-debt deficit financing to address the crowding-out effect. However, the study employed robust econometric techniques and covered a long period, a key limitation was the use of interest payment as a proxy for debt servicing, which ideally should include both interest and principal repayment.

Aladejana *et al.* (2021) evaluated debt burden and implications for infrastructural development in Nigeria for the period 1986-2019. The study embraced annual time-series data and employed the Fully Modified Ordinary Least Squares (FMOLS) estimation techniques to examine the relationship between the variables. The findings revealed that both current and lagged coefficients showed a positive and significant relationship between domestic debt and infrastructural development, while the current and lagged coefficient of external debt showed a negative relationship with infrastructural development and was not statistically significant during the study period. The findings imply that increases in domestic debt of the federal government lead to an increase in Infrastructural development (in the short run) while federal government external debt hitherto has not resulted in any improvement in infrastructural development. The study concluded that the external debt has not contributed significantly to the development of Nigeria's infrastructure and that the huge external debt profile of Nigeria even before the debt forgiveness of 2005/2006 to date is not justifiable and is uncalled for. The study recommended that external loans should be restricted to specified identifiable infrastructural or productive projects.

Iiyambo and Kaulihowa (2020) investigated the relationship between government expenditure, government revenue, and public debt in Namibia by employing the data of these variables for the period 1980 to 2018. An error correction model (ECM) was employed to analyze the short-run dynamics and a positive relationship between government expenditure and government revenue was found. Similarly, there was supporting evidence that an increase in public debt would stimulate government expenditure. The study recommended that policymakers should thoroughly review government expenditure and bring it to optimal levels to prevent the widening of public debt.

Babatunde *et al.* (2020) investigated the impact of foreign debt on sustainable development goals in Nigeria. The research employed the standard Ordinary Least Square analytical technique. The



study found that only foreign debt stock was statistically insignificant while the explanatory variables of foreign debt servicing and inflation, as well as the Gross Domestic Product, are found to be statistically significant. Nevertheless, from the OLS output, it was observed that the foreign debt stock coefficient contributes less. Again, the coefficient of foreign debt servicing contributes significantly to sustainable development goals in Nigeria. This means its significant contribution to the economy's sustainable goals. Also, the model is claimed to be freed from the serial correlation of residuals and there exists a direct correlation between the variables under investigation. The study concluded that despite the cost-benefit imbalance of sustainable development goals, the foreign debt portfolio continued to soar. provided that the negative effect of foreign debt far exceeds the benefit, it's apparent that external debt is distressing to the economy.

Stephen and Christianah (2019) investigated the causal relationship between total public debt and public expenditure in Nigeria from 1980 to 2015. Applying co-integration, vector error correction model, and Wald test econometric tools of analysis to public debt, government capital expenditure, government recurrent expenditure, and interest rate variables within the study period. The findings of the VEC test indicated that government capital and recurrent expenditure have a significant positive relationship with public debt in the Nigerian economy. An obvious implication of the result was that government borrowing in Nigeria is triggered by government deficit budgeting. The study therefore recommended the introduction of planning-programming-budgeting systems (PPBS) and zero-based budgeting (ZBB) in preference to the practice of incremental budgeting (IB) in our public finance at both federal and state levels.

### **Theoretical Framework**

The study on the "Impact of Public Debt on Infrastructural Development in Nigeria (1990 - 2023)" is anchored in several theoretical frameworks and economic theories that provide a foundation for understanding the dynamics between public debt and infrastructure development. This theoretical review delves into key theoretical perspectives that underpin the study's research questions and objectives.

### **Debt Overhang Theory in Nigeria**

Debt Overhang Theory suggests that when a country accumulates excessive public debt, it can lead to a situation where the government becomes hesitant to invest in capital expenditure, including

infrastructure projects. Nigeria's experience aligns with this theory in several ways.

During the 1980s and early 1990s, Nigeria faced a significant debt crisis. The country had borrowed heavily from international lenders, and a large portion of its budget was allocated to servicing external debts. This prioritization of debt servicing over critical sectors, such as infrastructure, constrained the government's ability to invest in vital projects (Ezeaku & Ohazurike, 2016). The burden of servicing external debts resulted in a scenario where resources that could have been channelled into infrastructure development were redirected to meet debt obligations. Consequently, the government's ability to invest in capital expenditure was significantly hampered.

### **Crowding Out Theory in Nigeria**

The Crowding Out Theory is equally relevant to Nigeria's situation, particularly in the context of the specified model. This theory posits that government borrowing can lead to increased interest rates and reduced funds available for private investment. In Nigeria, as the government increasingly borrowed to finance budget deficits and infrastructure projects, it created upward pressure on interest rates. High interest rates can discourage private sector borrowing for investment purposes, including infrastructure development. This phenomenon is particularly relevant when the government allocates a significant portion of its resources to debt service (Adeyemi & Adu, 2017).

As Nigeria grappled with servicing its public debt, the government's ability to invest in infrastructure was affected. The high cost of borrowing and limited resources left fewer funds available for capital expenditure. The Crowding Out Theory thus exemplifies how public debt servicing can reduce the availability of resources for infrastructure projects, potentially hindering the nation's efforts to address its infrastructure deficits.

### **Methods and Model Specification**

The research design for the study is meticulously structured to exclusively employ a quantitative approach, providing a comprehensive investigation into the intricate relationship between public debt and infrastructure. Ex post facto research design selected because the secondary data used occurred before the study. The researchers are independent of the data collected as the data are available in the public domain. The research will initiate extensive and systematic data collection, focusing on historical information encompassing public debt metrics, capital expenditure allocations,



and relevant economic indicators in Nigeria throughout the specified period. These data sourced from authoritative institutions, including the Central Bank of Nigeria, the National Bureau of Statistics, and international organizations, ensuring the integrity and reliability of the dataset.

The model for the study is expressed as:

$$CAPEX_t = B_0 + B_1EXD_t + B_2DD_t + B_3DS_t + U_t$$

The model can be explained as follows:

**CAPEX<sub>t</sub>**: This represents Capital Expenditure in a specific year (t)

**EXD<sub>t</sub>**: This represents the External Debt in a specific year t

**DD<sub>t</sub>**: This represents the Domestic Debt in a specific year t

**DS<sub>t</sub>**: This represents the Debt Service in a specific year t

**B<sub>0</sub>**: This is the intercept or constant term in the regression equation.

**B<sub>1</sub>-B<sub>3</sub>**: This is the regression coefficient associated with the variables EXD<sub>t</sub>, DD<sub>t</sub> & DS<sub>t</sub>.

**U<sub>t</sub>**: This represents the error term in the regression equation. Therefore, equation (3.2) is the specification of the Autoregressive Distributed Lagged (ARDL) and ECM model used to examine the impact of capital expenditures on the various forms of debt in Nigeria as specified as follows:

$$capex_t = b_0 + b_1capex_t + b_2exd_t + b_3dd_t + b_4ds_t + \sum_{t=1}^q b_5capex_{t-1} + \sum_{t=1}^p b_6exd_{t-1} + \sum_{t=1}^p b_7dd_{t-1} + \sum_{t=1}^p b_8ds_{t-1} + e_t$$

ECM Model specification

$$\square capex_t = b_0 + \sum_{t=1}^q b_5capex_{t-1} + \sum_{t=1}^p b_6exd_{t-1} + \sum_{t=1}^p b_7dd_{t-1} + \sum_{t=1}^p b_8ds_{t-1} + ecm_{t-1} + e_t$$

### A-priori Expectations

The study expected the following respective interactions between the independent variable and the dependent variable: External debt, Domestic debt, and Debt service are expected to have a positive and significant impact on capital expenditure.

### Variable Description and Measurement

Table 3. 1: Description of the Variables used for the Model

Code	Description	Measurement	Variable
CAPEX	Capital expenditure	The total government capital expenditure in Nigeria for a year measured in Billion Naira	Dependent
EXD	External debt	The government's total external debt for Nigeria in a year measured in Billion Naira	Independent
DD	Domestic debt	The government's local debt in Nigeria for a year measured in Billion Naira	Independent
DS	Debt service	The government's total amount spent in servicing external and domestic of in Nigeria for a year measured in Billion Naira	Independent

Source: Author Compilation, 2024

### III. DATA PRESENTATION AND ANALYSIS

In this section, data are presented in tabular and graphical form and the analysis.

Table 4.1: Descriptive Statistics

	CAPEX	EXD	DD	DS
Mean	1184.789	3735.132	5508.066	776.7924
Median	603.0000	1509.415	1961.450	372.3550
Maximum	6335.580	18702.25	22210.36	3265.470
Minimum	24.00000	298.6100	84.09000	19.40000
Std. Dev.	1573.315	4867.506	6464.872	959.2597



Skewness	1.872298	1.775385	1.139003	1.255094
Kurtosis	5.502846	5.136228	3.061933	3.173970
Jarque-Bera	28.73883	24.32620	7.356956	8.969354
Probability	0.000001	0.000005	0.025261	0.011281
Sum	40282.83	126994.5	187274.3	26410.94
Sum Sq. Dev.	81685521	7.82E+08	1.38E+09	30365913
Observations	34	34	34	34

Source: Researcher's Computation (2024) Employing E-Views 12

The above Table 4.1 describes the behaviour of the variables, and normality with Jarque Bera (JB) test considering the Skewness value, Kurtosis value, JB, and P-value for the normality decision. The table shows that Capital expenditure (CAPEX) has a mean value of 1184.789, and a standard deviation (SD) of 1573.315. This is an indication that the CAPEX deviates from both sides of the mean by 1573.315, which means that the data is widely dispersed from its mean. CAPEX also has a minimum and maximum value of 24.00000 and 6335.580 respectively. The data for CAPEX is positively skewed with a coefficient of 1.872298, meaning that most of the data falls on the right side of the normal curve. It has a kurtosis coefficient of 5.502846 and the data is not normally distributed with a JB value of 28.73883 and its P-value of 0.000001. It means when the P-value of JB is less than 0.05 (i.e., 5%), the variable is said to not be normal in behaviour.

The table shows that the External debt (EXD) mean value of 3735.132, with a standard deviation (SD) of 4867.506. This is an indication that the EXD deviates from both sides of the mean by 4867.506, which means that the data is widely dispersed from its mean. The EXD also has a minimum and maximum value of 298.6100 and 18702.25 respectively. The data for EXD is positively skewed with a coefficient of 1.775385 meaning that most of the data falls on the right side of the normal curve. The kurtosis coefficient is 5.136228 and the JB value of 24.32620 and its P-value 0.000005 which is (0.00%). It means when the

P-value of JB is less than 0.05 (i.e., 5%), the variable is said to not be normal in behaviour.

The table shows that the Domestic debt (DD) mean value of 5508.066, with a standard deviation (SD) of 6464.872. This is an indication that the CAPEX deviates from both sides of the mean by 6464.872, which means that the data is widely dispersed from its mean. The DD also has a minimum and maximum value of 84.09000 and 22210.36 respectively. The data for DD is positively skewed with a coefficient of 1.139003, meaning that most of the data falls on the right side of the normal curve. The kurtosis coefficient is 3.061933 and the JB value of 7.356956 and its P-value of 0.025261 which is (0.03%). It means when the P-value of JB is less than 0.05 (i.e. 5%), the variable is said to not be normal in behaviour.

The table shows that the Debt servicing (DS) mean value of 776.7924, with a standard deviation (SD) of 959.2597. This is an indication that the DD deviates from both sides of the mean by 959.2597, which means that the data is widely dispersed from its mean. The DD also has a minimum and maximum value of 19.40000 and 3265.470 respectively. The data for DD is positively skewed with a coefficient of 1.255094, meaning that most of the data falls on the right side of the normal curve. The kurtosis coefficient is 3.173970 and the JB value of 8.969354 and its P-value of 0.011281 which is (0.01%). It means when the P-value of JB is less than 0.05 (i.e. 5%), the variable is said to not be normal in behaviour.

### Unit Root Test

Table 4.2: Augmented Dickey-Fuller Test Result

Variable	ADF Test Statistics	5% critical value	P-Value	Order of integration	Remark
CAPEX	-5.734670	-3.557759	0.0003	I(1)	Stationary
EXD	-3.851653	-3.557759	0.0265	I(1)	Stationary
DD	-3.972221	-3.568379	0.0210	I(1)	Stationary
DS	-5.353802	-3.587527	0.0010	I(1)	Stationary

Source: Researcher's Compilation (2024) Employing E-Views 12

The Table 4.2 shows that all the variables only became stationary at first difference as indicated by the absolute values of the ADF statistics of all the variables which were above the critical values at a 5% level of significance.



**Table 4.3: Co-integration**

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	5.355469	10%	2.01	3.1
K	3	5%	2.45	3.63
		2.5%	2.87	4.16
		1%	3.42	4.84

Source: Researcher's Compilation (2024) Employing E-Views 12

From Table 4.3, the F-statistic value of 5.355469 is greater than the lower I(0) and upper I(1) bounds critical values of 2.45 and 3.63 respectively at the 5%

significance level. It can therefore be inferred that the variables are co-integrated and as such, there is a long-run equilibrium relationship between them.

**Table 4.4: Short-run and Long-run Result**

ECM Regression				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGDS)	-0.312838	0.109427	-2.858877	0.0079
CointEq(-1)*	-0.292435	0.060048	-4.870018	0.0000
R-squared	0.345893	Mean dependent var		0.158698
Adjusted R-squared	0.324793	S.D. dependent var		0.351671
S.E. of regression	0.288971	Akaike info criterion		0.413714
Sum squared resid	2.588639	Schwarz criterion		0.504411
Log likelihood	-4.826278	Hannan-Quinn criter.		0.444231
Durbin-Watson stat	1.860231			
LONG-RUN RESULT				
LOGEXD	0.225198	0.191677	1.174885	0.2499
LOGDD	0.693039	0.352260	1.967405	0.0591
LOGDS	-0.037809	0.373488	-0.101231	0.9201

Source: Researcher's Compilation (2024) Employing E-Views 12

As expected, the lagged coefficient of the Error Correction Term is negative, less than one, and statistically significant at 5% (as captured by -0.292435; and pv of 0.0000). This means that once there is disequilibrium in the system, it will take an average (annual) speed of 29.2435% to restore the long-run relationship (i.e. Speed of adjustment). The long-run result shows that both LogEXD and LogDD have a positive and insignificant relationship with LogCAPEX, while LogDS has a negative and insignificant relationship with LogCAPEX.

### Results of some Diagnostic Tests

The results of the diagnostic tests applied to the Autoregressive Distributed Lag (ARDL) model are summarized in Table 4.5, which provides insights into the model's reliability and validity.

**Serial Correlation:** The test for serial correlation shows an F-statistic of 0.140007 with a P-value of 0.8700. The F-statistic for the Breusch-Godfrey Serial Correlation LM Test indicates no

evidence of serial correlation in the residuals of the model. Since the P-value (0.8700) is significantly greater than the 5% significance level, we fail to reject the null hypothesis of no serial correlation. This suggests that the residuals are independent, which is a desirable property for a reliable regression model.

**Heteroscedasticity:** The test for heteroscedasticity shows an F-statistic of 0.695228 with a P-value of 0.6316. Again, this P-value exceeds the 5% significance level, indicating that we do not reject the null hypothesis of homoscedasticity. This means that the variance of the residuals is constant across observations, which is essential for the validity of the regression results.

**Normality of Residuals:** The Jarque-Bera test assesses the normality of the residuals. With a coefficient of 0.441761 and a P-value of 0.8018, we again do not reject the null hypothesis of normality. This indicates that the error terms are normally distributed, which is important for making valid inferences from the model.



Model Stability: CUSUM and CUSUMSQ Tests: The results from the CUSUM and CUSUMSQ tests, illustrated in Figures 4.1 and 4.2, demonstrate that the model is stable over the sample period. The plots of these tests lie within the critical bounds at the 5% significance level, confirming that the regression equation is correctly specified and that the parameters of the model do not change over time.

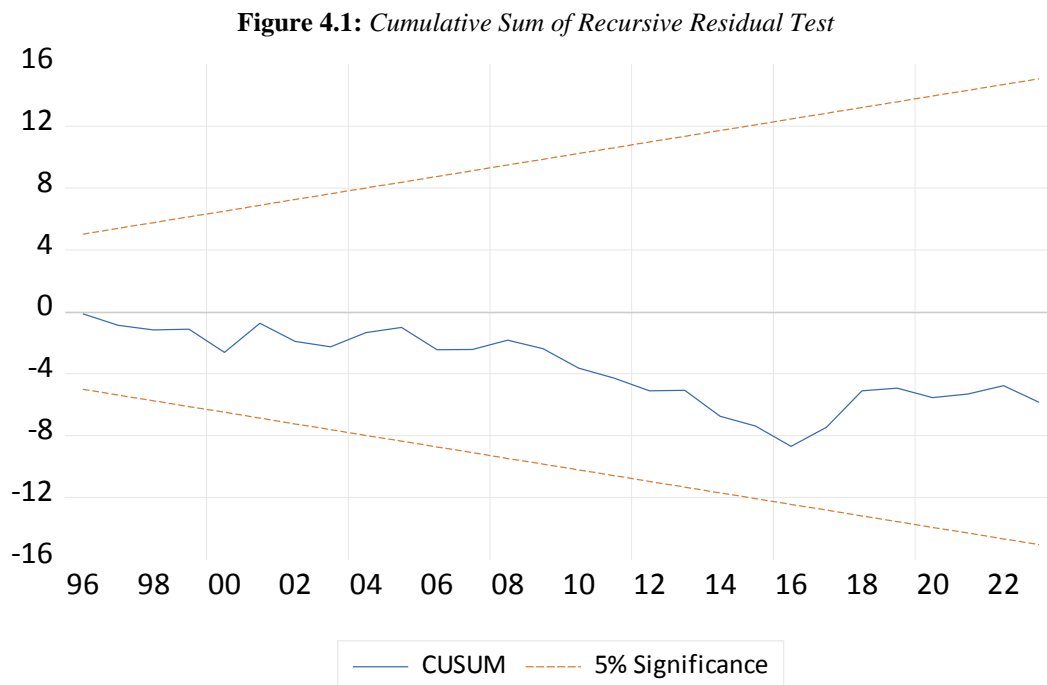
Overall, the diagnostic tests provide strong evidence that the ARDL model is well-specified,

with no issues of serial correlation or heteroscedasticity, and that the residuals are normally distributed. The stability of the model further supports the reliability of the results obtained from this analysis. These findings enhance the credibility of the model and the conclusions drawn from it, making it a robust tool for understanding the relationships among the variables studied.

**Table 4.5:** Breusch-Godfrey Serial Correlation LM Test

Test	F-Stat /Coefficient	Prob.
Normality Test	0.441761	0.8018
Serial Correlation (LM)	0.140007	0.8700
Heteroskedasticity	0.695228	0.6316

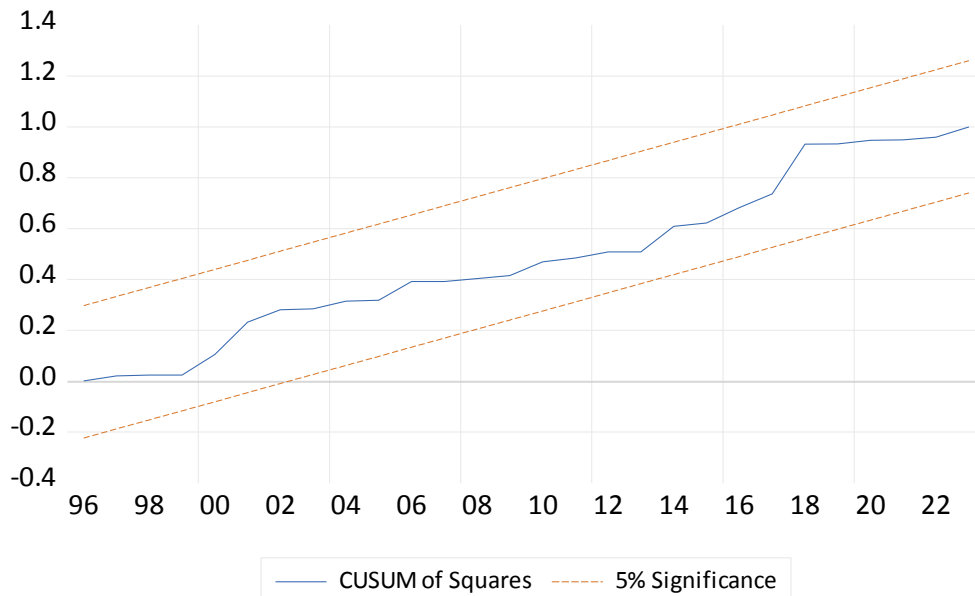
Source: Researcher's Compilation (2024) Employing E-Views 12



Source: Researcher's Computation (2024) Employing E-Views 12



Figure 4.2: Cumulative Sum of Squares Recursive Residual Test Result



Source: Researcher's Computation (2024) Employing E-Views 12

#### IV. CONCLUSION AND RECOMMENDATIONS

This study investigates the influence of external debt (LogEXD), domestic debt (LogDD), and debt servicing (LogDS) on capital expenditure (LogCAPEX) in Nigeria from 1990 to 2023 using the Autoregressive Distributed Lag Model (ARDL). The findings reveal the following:

**External Debt (LogEXD):** The relationship between external debt and capital expenditure is positive but statistically insignificant. Specifically, a 1 percent increase in external debt is associated with a 0.225 percent increase in capital expenditure. While this aligns with the theoretical expectation that external debt should positively impact capital expenditure, the insignificance is attributed to factors such as mismanagement, prioritization issues, and lack of political will. This result corroborates the findings of Babatunde et al. (2020), which indicated that foreign debt had an insignificant effect on sustainable development goals (SDGs) in Nigeria.

**Domestic Debt (LogDD):** Domestic debt also exhibits a positive but statistically insignificant relationship with capital expenditure. A 1 percent increase in domestic debt corresponds to a 0.693 percent increase in capital expenditure. This finding supports the expectation that domestic debt positively impacts infrastructure development. It aligns with Aladejana et al. (2021), which found a positive and significant effect of domestic debt on infrastructural development in Nigeria. The insignificance in this

study might be due to the complexities of debt allocation and usage.

**Debt Servicing (LogDS):** The analysis reveals a negative and statistically insignificant relationship between debt servicing and capital expenditure. A 1 percent increase in debt servicing is associated with a 0.038 percent decrease in capital expenditure. This result is consistent with the expectation that debt servicing negatively impacts capital expenditure, likely due to the diversion of funds and corruption. It is also consistent with the findings of Babatunde et al. (2020), who reported that foreign debt servicing had an insignificant impact on SDGs in Nigeria. Overall, while external and domestic debts exhibit positive relationships with capital expenditure, these effects are statistically insignificant. Debt servicing, conversely, negatively affects capital expenditure, albeit insignificantly. Based on the findings, the following recommendations are proposed:

- i. **Enhance Debt Management and Prioritization:** Develop and implement a comprehensive debt management strategy that ensures efficient allocation of debt funds, prioritizing infrastructural development and strengthening oversight and transparency to prevent mismanagement.
- ii. **Improve Debt Servicing Efficiency:** Restructure existing debt to reduce servicing costs, allocate sufficient budgetary resources for debt servicing, and implement a debt service reduction plan to alleviate fiscal pressure.



- iii. Strengthen Institutional Frameworks for Capital Project Execution: Enhance project management practices, promote public-private partnerships (PPPs) for additional resources and expertise, and improve accountability and governance to ensure effective execution of capital projects.

#### Suggestions for Further Study

Future research could explore the following areas to build on these findings:

- i. This present study is domiciled at the federal level, further research is encouraged on a state-by-state basis analysis or geo-political basis.
- ii. Micro-Level Analysis: Investigate the impact of debt on specific types of capital expenditure and projects to understand variations in effectiveness.
- iii. Comparative Studies: Conduct comparative studies between Nigeria and other countries with similar debt profiles to identify best practices in debt management and capital expenditure.

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