



Debt Financing, Governance Quality and Government Capital Expenditure in Nigeria

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ABSTRACT

This study examined the impact of debt financing and governance quality on Nigeria's infrastructure delivery from 1996 to 2024, using data from the CBN, DMO, and World Bank. Grounded in Keynesian deficit financing theory, the analysis employed the ARDL model to capture short- and long-run dynamics. The bounds test confirmed a long-run relationship among infrastructure delivery, total debt stock, debt servicing, government effectiveness, and corruption control. Long-run estimates revealed that while total debt stock had a positive but insignificant effect on infrastructure, debt servicing and government effectiveness exerted negative but insignificant effects. Crucially, control of corruption had a positive and statistically significant impact, underscoring governance's critical role. The significant error correction term indicated a moderate adjustment speed to long-run equilibrium. The model demonstrated good fit and passed all diagnostic tests. The study recommends that Nigeria enhance the productive use of public debt through transparent project selection and fiscal discipline. Strengthening governance and anti-corruption measures is essential to ensure borrowed funds translate into sustainable infrastructure development

INTRODUCTION

In recent years, Nigeria has experienced a marked escalation in public debt concomitant with continuing deficits in infrastructure delivery. According to the Debt Management Office, by the end of 2024 Nigeria’s total public debt stock stood at N144.66 trillion, compared with N97.34 trillion in 2023, representing a large increase (DMO, 2025). Moreover, government data following GDP rebasing in early 2025 placed the debt-to-GDP ratio in the first quarter of 2025 at 39.4%, bringing it a little below the government’s self-imposed ceiling of 40% (Business Times, 2025; NBS, 2025). However, projections from the International Monetary Fund (IMF) indicate that past levels approached 52–53% of GDP in 2023-2024, reflecting both increased borrowing and depreciation effects tied to external debt liabilities. The IMF further projects that, under current fiscal and growth trajectories, the debt-to-GDP ratio may decline to around 45.4% by 2030, provided spending is more judicious and revenues improve. At the same time, infrastructure in Nigeria continues to suffer from chronic under provision, delays, cost overruns, and poor maintenance - issues often linked to weak governance. Infrastructure delivery depends not only on the volume of investment or debt financing, but also on governance quality: how projects are selected, procured, supervised, and maintained (Obasi, 2025). Many stakeholders have raised concerns that increased borrowing has not always translated into commensurate infrastructure outcomes, especially where governance weaknesses reduce efficiency, raise costs, or lead to misallocation of resources. Nigeria’s escalating public borrowing and its urgent infrastructure needs pose a central policy dilemma: how can the country mobilize and use debt financing so that it reliably translates into improved infrastructure service delivery? Although borrowing has expanded - driven by fiscal shortfalls and renewed access to international markets - evidence suggests that governance weaknesses in project selection, procurement, and monitoring frequently blunt the effectiveness of debt-financed investment.

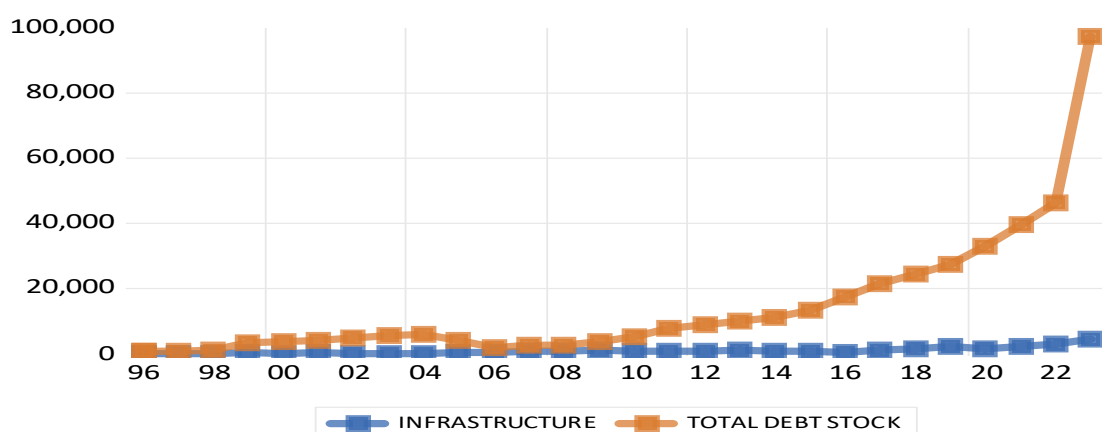


Figure 1. Public Infrastructure Expenditure VS Total Debt Stock in Nigeria (1996-2024)

Source: Researcher’s Computation

Statement of the Problem

Nigeria has experienced a rapid expansion of public borrowing in recent years, with official records showing a sizable increase in the nation's total public debt stock and continued sizable debt-service obligations (DMO, 2025). At the same time, government capital expenditure which is critical for financing roads, power, water, and other public infrastructure has repeatedly fallen short of planned allocations and implementation targets, producing persistent funding gaps and incomplete projects (BudgIT, 2025; Punch, 2025). These two trends create a central public-finance dilemma: does higher public indebtedness and the attendant debt-service burden crowd out and weaken the capacity for government capital expenditure, or can borrowing be mobilised to expand infrastructure spending without undermining fiscal sustainability?

The problem is compounded by governance weaknesses. Nigeria's scores on World Bank governance indicators, notably Government Effectiveness and Control of Corruption, remain moderate to low relative to peers, reflecting weaknesses in procurement, project selection, contract management and accountability systems that shape how borrowed funds are used (World Bank WGI, 2024). Where governance is weak, debt-financed projects are more prone to cost overruns, delays, and misallocation, so rising debt need not translate into improved infrastructure outcomes (NISER; PwC, 2025). At the sub-national level states also report that high debt servicing, wage pressures and weak revenue mobilization reduce their capacity to prioritise and complete capital projects (Punch, 2025).

This study therefore investigates how total debt stock and debt servicing influence government capital expenditure in Nigeria and whether government effectiveness and control of corruption condition those relationships.

Objectives of the Study

The broad objective of this study is to examine the impact of debt financing and governance quality on government capital expenditure in Nigeria. Specifically, the study seeks to:

1. Assess the effect of total debt stock on infrastructure delivery in Nigeria.
2. Examine the impact of debt servicing on infrastructure delivery in Nigeria.
3. Evaluate the influence of government effectiveness on infrastructure delivery.
4. Determine the effect of control of corruption on infrastructure delivery in Nigeria.

Research Questions

Based on the objectives of this study, the following research questions are formulated:

1. To what extent does total debt stock affect infrastructure delivery in Nigeria?
2. What is the impact of debt servicing on infrastructure delivery in Nigeria?
3. How does government effectiveness influence infrastructure delivery in Nigeria?
4. What effect does control of corruption have on infrastructure delivery in Nigeria?

Research Hypotheses

The following null hypotheses are developed in line with the stated objectives and research questions:

H₀₁ : Total debt stock has no significant effect on infrastructure delivery in Nigeria.

H₀₂ : Debt servicing has no significant effect on infrastructure delivery in Nigeria.

H₀₃ : Government effectiveness has no significant influence on infrastructure delivery in Nigeria.

H₀₄ : Control of corruption has no significant effect on infrastructure delivery in Nigeria.

Justification and Significance of the Study

Infrastructure remains a critical driver of economic growth and development, and capital expenditure is one of the key channels through which governments provide public goods and services. In Nigeria, however, the persistent gap between rising public debt and low levels of infrastructure delivery raises important questions about the effectiveness of fiscal and governance frameworks. This study is justified by the need to provide empirical evidence on whether increased debt financing - particularly total debt stock and debt servicing - translates into tangible increases in capital expenditure, and how governance quality conditions this relationship.

Moreover, recent fiscal trends have shown a steep rise in Nigeria's debt profile alongside declining budgetary allocations to capital expenditure, as recurrent spending and debt service costs absorb a growing share of public resources (DMO, 2025; BudgIT, 2025). While borrowing is often justified on the grounds of financing infrastructure, weak governance indicators such as low government effectiveness and poor control of corruption raise concerns about the actual utilization and impact of these borrowed funds (World Bank WGI, 2024). Understanding these dynamics is crucial for designing sustainable borrowing strategies, strengthening public financial management, and improving the efficiency of infrastructure delivery.

The findings of this study are significant for policymakers, as they will offer evidence-based insights to guide debt management strategies and governance reforms. Development partners and international financial institutions will also find the results useful in evaluating fiscal sustainability and institutional quality in Nigeria. Furthermore, the study will contribute to empirical literature by integrating debt financing and governance quality into a single analytical framework for explaining variations in government capital expenditure.

Scope of the Study

The scope of this study is both temporal and thematic. Temporally, the study covers the period 1996 to 2024. This period is chosen because it captures key fiscal and governance episodes in Nigeria, including the return to democratic governance (1999), debt relief under the Paris Club (2005–2006), oil boom and fiscal expansion years, the increasing trend in domestic and external borrowing from the mid-2010s, and recent macroeconomic reforms (2023–2024).

Thematically, the study focuses on the relationship between debt financing and government capital expenditure, incorporating governance quality as a moderating factor. The variables of interest include:

1. Infrastructure Delivery proxied by Government Capital Expenditure (dependent variable)
2. Infrastructure Delivery proxied by Government Capital Expenditure (dependent variable)
3. Total Debt Stock (independent variable)
4. Debt Servicing (independent variable)
5. Government Effectiveness (governance variable)
6. Control of Corruption (governance variable)
7. The study relies on secondary data sourced from the Debt Management Office (DMO), Central Bank of Nigeria (CBN) Statistical Bulletin, World Bank World Governance Indicators (WGI), and the National Bureau of Statistics (NBS).

LITERATURE REVIEW

1. Conceptual Literature Review

A. Debt Financing, Total Debt Stock and Debt Servicing – Concepts and Implications

Debt financing according to Igwemma (2024) refers to government borrowing (domestic and external) used to fund budget deficits and specific projects; it is typically measured by the total public debt stock (outstanding stock of domestic and external debt) and by debt servicing (interest and principal payments in a given period). Rising debt stocks can relax current budget constraints and allow higher capital spending if funds are allocated to investment; however, high and/or rapidly rising debt servicing obligations can crowd out capital expenditure by absorbing revenue and increasing rollover risks (i.e., forcing governments to prioritize recurrent costs and debt payments over investment). Recent official DMO publications document large increases in Nigeria's total public debt in 2022–2024, underscoring the relevance of both stock and service dynamics to fiscal space and capital budgeting (DMO, 2025; Emerenini, 2022).

B. Infrastructure Delivery - Government Capital Expenditure (GCE)

Government capital expenditure (GCE) denotes public spending on investment goods such as physical infrastructure, large-scale projects and durable assets that expand productive capacity (Ajie. Akekere & Ewubare, 2014) Empirically GCE is measured as budgetary capital outlays (or capital expenditure as a share of GDP or total government expenditure). In Nigeria, multiple fiscal reports and budget-tracking briefs show persistent gaps between approved capital budgets and actual capital spending, with recurrent and debt-service pressures often cited as limiting implementation (Onyekachi-Onyele, Umezurike & Nwagwu, 2024).

C. Governance Quality: Government Effectiveness & Control of Corruption

Government effectiveness captures perceptions of public service quality, policymaking capacity, and bureaucratic competence; control of corruption captures the extent to which public power is exercised for private gain (including embezzlement and patronage). The World Bank's Worldwide Governance Indicators (WGI) remain standard measures used in cross-country and country-level studies; these indicators are directly relevant when assessing whether borrowed funds are used efficiently for capital projects. Weak governance can translate borrowing into waste, cost overruns, and incomplete projects, reducing the infrastructure returns to debt financing (WGI, 2024).

2. Theoretical Review

Debt financing allows governments to fund capital expenditures such as infrastructure, education, and research without immediate tax hikes, potentially smoothing consumption and enabling long-term growth. However, theories in public finance debate its optimality, weighing benefits like intertemporal smoothing against risks like crowding out private investment, higher future taxes, or inflation. Key theories distinguish between financing current (recurrent) spending versus capital investments, which generate future returns. Two major frameworks are outlined drawing from economic literature.

A. Ricardian Equivalence Theorem

The Ricardian Equivalence theory, developed by David Ricardo in the early 19th century and formalized by Robert Barro in 1974, posits that government deficits do not affect overall economic demand because rational consumers anticipate future tax increases to pay off debt. Consequently, when the government finances spending through borrowing, individuals realize they will face higher taxes later and consequently save more to offset the future tax burden, neutralizing the stimulative effect of deficit financing. This implies that government borrowing has no impact on consumption, investment, or economic growth in the long run, as private saving adjusts to government deficit policies (Barro, 1974). Applying this theory to Nigeria, a country with a large informal economy and variable fiscal discipline, suggests that government borrowing might be ineffective in stimulating demand if consumers foresee future tax hikes or fiscal adjustments. However, empirical evidence in Nigeria indicates that Ricardian equivalence may not fully hold due to factors such as limited future tax planning and informational asymmetries, meaning fiscal policy could still influence economic activity under certain circumstances (Ayo, 2019).

B. Keynesian Theory of Deficit Financing

The Keynesian theory of deficit financing, proposed by John Maynard Keynes in 1936, advocates for government borrowing to stimulate economic growth during periods of recession or depression. Keynes argued that in times of low private demand, increased government expenditure financed through deficit borrowing can boost aggregate demand, leading to higher employment and output, ultimately pulling the economy out of slump. The theory emphasizes that such deficits are beneficial if used productively to fund public works and infrastructural projects, which generate multiplier effects and long-term growth (Keynes, 1936). In the context of Nigeria, a developing country with fluctuating oil revenues and high unemployment, Keynesian deficit financing can be

instrumental in mobilizing resources to fund infrastructural development, education, and healthcare sectors, thereby enhancing economic resilience and growth. However, it is crucial for Nigeria to maintain fiscal discipline to prevent excessive debt accumulation, which could lead to inflationary pressures or debt sustainability challenges (Adeniyi, 2018). Proper application of Keynesian principles can help Nigeria leverage deficit spending to foster sustainable development, especially in periods of economic downturns.

C. Theoretical Links and Moderating Role of Governance

Two central theoretical mechanisms connect debt financing to infrastructure delivery. First, through budget-constraint and crowding-out channels: high debt servicing reduces available fiscal space for public investment (crowding out), particularly under binding revenue constraints and shallow domestic capital markets (standard public finance models). Second, through allocation and efficiency channels: governance quality affects whether borrowed funds are allocated to high-return capital projects and whether projects are executed efficiently. Thus, governance is plausibly a moderator: when government effectiveness is high and corruption is low, debt financing is more likely to translate into higher and better-quality capital expenditure; where governance is weak, increased debt may fail to raise (or may even reduce) effective capital delivery. Recent policy analyses and sectoral case studies for Nigeria emphasize both mechanisms and call for paired fiscal and governance reforms (World Bank, 2025; IMF, 2025).

3. Empirical Review

Obasi & Hassan (2025) examined the effect of public debt and infrastructure on economic growth in Nigeria between 1981 to 2022. Secondary data were sourced from the Central Bank of Nigeria Statistical bulletin, Debt Management Office and the World Bank. The unit root tests- the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests were employed to assess the stationarity of the variables while the cointegration tests were conducted to explore long-term relationships among the variables. The findings reveal that external debt has a significant negative impact on Nigeria's economic growth, while internal debt shows no significant effect. Infrastructure demonstrates a significant positive impact on economic growth. Based on these findings, several recommendations were proposed; Policymakers should prioritize borrowing from concessional sources to minimize the external debt burden, place embargo on new loans and implement stringent debt management policies. Developing a robust domestic debt market through regulatory enhancements and private sector incentives can provide a stable funding source for developmental projects. Onyekachi-Onyele, et. al (2024) explored the effect of debt burden on public infrastructure investment in Nigeria employing the Autoregressive Distributed Lag (ARDL) model utilizing an annual dataset spanning the years 1981 to 2022. The results reveal a positive long-term influence of both external and domestic debts on public infrastructure investment, whereas debt service and exchange rate fluctuations exhibit a negative and statistically significant impact on such investments. For the purposes of policy formulation, the study recommends that

the government channel public debts towards economic initiatives aimed at capital formation, as opposed to consumption expenditures.

Gbenga (2024), assessed the relationship between debt servicing and infrastructural development in Nigeria covering the period, 1999-2022. The study employed debt servicing, external debt, exchange rate and trade openness as the independent variables. Utilising the ordinary least square technique, the study found that debt servicing and exchange rate had significant negative effects on infrastructural development in Nigeria. The study recommended that government, through the Debt Management Office, should take into account a scenario wherein foreign loans should be acquired only for economic purposes and not for political or social ones. This is primarily meant to stop unproductive debt service in Nigeria and avoid increase of foreign debt stock over time.

Hisham (2023), investigated the impact of governance on economic growth, considering the spatial dependence between countries. The study employs spatial regression models to estimate the impact of governance on economic growth in a sample of 116 countries worldwide in 2017. The findings imply that the influence of governance on economic growth is statistically significant. Moreover, if all other economic control variables are constant, 1% increase in governance raises the economic growth on average by 1% at 10%, 5% and 1% significance levels, respectively. Furthermore, each country's rise in economic growth favorably and substantially influences the economic growth of its bordering nations. The unobserved characteristics or similar unobserved environments in adjacent countries also affect its economic growth.

Osifalajo, Omotilewa & Adesola (2022), assessed the importance of governance and institutions on the effectiveness and efficiency of infrastructure development in promoting growth in Nigeria. The study adopted descriptive survey research design. The study population was senior staff members of MDAs in Ogun state. Primary data were collected through structured questionnaire which reliability was validated using Crombach Alpha test which produced coefficient of 0.706. Data collected were analyzed using simple regression analysis. The result of hypothesis1revealed positive and significant relationship between governance and effectiveness of infrastructure development. The study recommended strict adherence of public sector institutions charge with infrastructure delivery with the applicable institutional framework guiding infrastructure planning, delivery and operations, and exercise of political accountability by government officials as a prerequisite for beneficial infrastructure investments.

4. Literature Gap

While the literature separately treats debt pressures, debt servicing, and governance as determinants of either investment or macro-fiscal outcomes, there is limited country-level work that simultaneously models total debt stock and debt servicing as separate explanatory factors, while explicitly testing government effectiveness and control of corruption as moderators of their effects on infrastructure delivery. Given Nigeria's recent fiscal shifts (post-2023 reforms, renewed external market access, sectoral refinancing initiatives) and available governance time series (WGI), a disaggregated time-series analysis covering 1996-2024 can provide policy-relevant evidence on when borrowing supports

infrastructure spending and when it does not. This is the gap that this study intends to close.

METHODOLOGY

Research Design

This study adopts a quantitative research design using secondary time-series data to examine the relationship between debt financing, governance quality, and infrastructure delivery in Nigeria. The quantitative approach allows for rigorous statistical testing of the relationships among the variables and is appropriate given the availability of continuous historical data spanning 1996 to 2024.

Theoretical Framework

The study is anchored on the Keynesian Theory of Deficit Financing, which posits that governments can stimulate economic activity and public investment by borrowing to finance budget deficits, especially during periods of insufficient aggregate demand (Keynes, 1936; Blinder & Solow, 1973). According to this theory, public debt can be used as a policy instrument to fund capital projects, generate employment, and enhance productive capacity. Applied to this study, the theory provides the rationale that total debt stock and debt servicing can influence infrastructure delivery, and the efficiency of this process is conditioned by governance quality - represented here by government effectiveness and control of corruption. In other words, while Keynesian theory emphasizes the potential positive effects of deficit financing on investment, weak governance can reduce the effectiveness of borrowed funds in achieving desired capital expenditure outcomes.

Data Sources and Measurement of Variables

Infrastructure delivery (proxied by Government Capital Expenditure): Annual capital expenditure data sourced from the Federal Budget Reports and Central Bank of Nigeria Statistical Bulletin.

1. Total Debt Stock (TDS): Aggregate domestic and external public debt from Debt Management Office (DMO).
2. Debt Servicing (DS): Total annual debt-service payments (principal and interest), from DMO.
3. Government Effectiveness (GE) & Control of Corruption (CC): Scores from the World Bank Worldwide Governance Indicators (WGI).

All monetary variables will be converted to real terms and logarithmic transformation may be applied to reduce skewness and interpret elasticities.

Model Specification

The functional relationship for this study is specified as follows:

$$\text{INFRA}_t = f(\text{TDS}_t, \text{DS}_t, \text{GE}_t, \text{CC}_t) \quad (1)$$

Where:

INFRA	= Infrastructure delivery at time t (dependent variable)
TDS	= Total Debt Stock (independent variable)
DS	= Debt Servicing (independent variable)
GE	= Government Effectiveness (moderating variable)
CC	= Control of Corruption (moderating variable)

The econometric form can be represented as:

$$INFRA_t = \beta_0 + \beta_1 TDS_t + \beta_2 DS_t + \beta_3 GE_t + \beta_4 CC_t + \mu_t \quad (2)$$

Where μ_t is the error term, β_0 is the constant and $\beta_1 - \beta_4$ the structural parameters of the model to be estimated. However, equation is standardized by taking the natural logarithm of government capital expenditure (GCE), total debt stock (TDS) and debt servicing (DS) to curtail the effects of spurious regression. Thus:

$$LNINFRA_t = \beta_0 + \beta_1 LNTDS_t + \beta_2 LNDS_t + \beta_3 GE_t + \beta_4 CC_t + \mu_t \quad (3)$$

Where LN is the natural logarithm.

Estimation Technique: ARDL Approach

The study employs the Autoregressive Distributed Lag (ARDL) model for several reasons:

1. Flexibility with mixed integration: ARDL allows for a combination of I(0) and I(1) variables without requiring strict pre-testing for unit roots (Pesaran et al., 2001).
2. Long-run and short-run dynamics: ARDL simultaneously estimates the long-run equilibrium relationship and short-run adjustments between government capital expenditure and its determinants.
3. Small sample suitability: ARDL is well-suited for limited time-series data (in this case, 1996-2024).

Therefore, equation (3) is modified into conventional ARDL form below:

$$LNINFRA_t = \beta_0 + \sum_{i=1}^k \beta_1 LNTDS_t + \sum_{i=1}^k \beta_2 LNDS_t + \sum_{i=1}^k \beta_3 GE_t + \sum_{i=1}^k \beta_4 CC_t + \mu_t \quad (4)$$

To obtain the co-integrating equation, equation (4) is transformed into equation (5) as follows:

$$LNINFRA_t = \beta_0 + \sum_{i=1}^k \beta_1 LNTDS_t + \sum_{i=1}^k \beta_2 LNDS_t + \sum_{i=1}^k \beta_3 GE_t + \sum_{i=1}^k \beta_4 CC_t + \phi ECT_t + \mu_t \quad (5)$$

Where:

$$ECT_t = Y_t - \beta_0 - \sum_{i=1}^p \gamma_1 \Delta X_{t-1} - \sum_{i=1}^p \beta_1 \Delta X_{t-1} \text{ and } \phi = 1 - \sum_{i=1}^p \gamma_1 \Delta Y_{t-1} \quad (6)$$

The bounds test procedure transforms equation (6) as:

$$\Delta Y_t = - \sum_{i=1}^{p-1} \gamma_1^* \Delta Y_{t-1} + \sum_{i=1}^p \beta_1 \Delta X_{t-1} - \rho Y_{t-1} - \beta - \sum_{i=1}^p \delta X_{t-1} + \mu_t \quad (7)$$

Then we test the existence of level relationship as $\rho = 0$ and $\delta_1 = \delta_2 = \dots = \delta_k = 0$

where Δ = difference operator, μ = white noise error term.

The ARDL procedure will follow three key steps:

1. Unit root testing using Augmented Dickey-Fuller (ADF) to ensure no variable is I(2).
2. Bounds testing to determine the existence of a long-run relationship among variables.

3. Estimation of short-run error correction model (ECM) and long-run coefficients to capture dynamic adjustments.

Diagnostic Tests

To ensure robustness, the study will conduct:

- Serial correlation test (Breusch-Godfrey)
- Heteroskedasticity test (Breusch-Pagan-Godfrey)
- Stability test (CUSUM)
- Normality test of residuals

These tests confirm the reliability of the ARDL estimates and the validity of the model assumptions.

Justification of Methodology

The combination of Keynesian theory and the ARDL methodology provides a theoretically grounded and empirically robust framework. Keynesian theory motivates the expected positive role of deficit financing, while ARDL allows for nuanced estimation of the long- and short-run impact of debt financing and governance quality on government capital expenditure in Nigeria.

Data Presentation, Analysis and Interpretation

1. Data Presentation

Table 1. Infrastructure, Total Debt Stock, Debt Servicing, Government Effectiveness and Control of Corruption in Nigeria (1996-2024)

Year	Infrastructure Delivery (Nbn)	Total Debt Stock (Nbn)	Debt Servicing (Nbn)	Govt Effectiveness	Control of Corruption
1996	212.926	1037.3	21.88	-0.924	-1.189
1997	269.652	1097.68	21.89	-0.924	-1.19
1998	309.016	1193.85	21.89	-1.12	-1.161
1999	498.028	3372.18	92.34	-101	-1.161
2000	239.451	3995.63	131.05	-0.971	-1.325
2001	438.697	4193.26	155.42	-1.04	-1.325
2002	321.378	5098.88	163.81	-1.02	-1.502
2003	241.688	5808.01	363.51	-0.916	-1.418
2004	351.250	6260.6	382.5	-0.936	-1.383
2005	519.470	4220.98	394	-0.897	-1.181
2006	552.386	2204.72	249.3	-0.967	-1.126
2007	759.281	2608.53	213.73	-1.032	-1.067
2008	960.890	2843.56	381.2	-0.987	-0.901
2009	1152.797	3818.47	251.79	-1.2	-1.042
2010	883.875	5241.66	415.66	-1.165	-1.052
2011	918.549	7753.02	527.16	-1.102	-1.189
2012	874.700	9116.09	679.3	-1.001	-1.176
2013	1108.386	10043.78	828.1	-0.998	-1.227
2014	783.119	11190.71	941.7	-1.19	-1.284
2015	818.352	13451.77	1060.38	-0.997	-1.096
2016	653.609	17495.64	1426	-1.12	-1.045
2017	1242.296	21725.77	1823.89	-1.041	-1.099
2018	1682.099	24387.08	2161.37	-1.118	-1.084
2019	2288.996	27401.37	2453.22	-1.213	-1.113

2020	1614.889	32915.52	3265.13	-1.144	-1.119
2021	2522.468	39556.03	4221.65	-1.027	-1.101
2022	3133.821	46250.36	5656.58	-1.042	-1.13
2023	4486.206	97340.71	8556.93	-0.848	-1.041
2024	4995.103	144665.45	13124.23	-0.824	-1.142

Sources: Central Bank of Nigeria, National Bureau of Statistics, Worldwide Governance Indicators and Debt Management Office

Descriptive Statistics

Descriptive statistics summarize and describe the main features of a dataset, such as its central tendency, dispersion, and shape, using measures like mean, median, standard deviation, and range. They provide a concise overview of data patterns without making inferences about a larger population.

Table 2. Descriptive Statistics for Infrastructure, Total Debt Stock, Debt Servicing, Government Effectiveness and Control of Corruption in Nigeria (1996-2024)

	Infrastructure	Total Debt Stock	Debt Servicing	Govt Effectiveness	Corruption Control
Mean	6.639828	8.922152	6.168516	-4.605	-1.168808
Median	6.685289	8.704512	6.003109	-1.0295	-1.145306
Maximum	8.408763	11.48597	9.054497	-0.848	-0.901
Minimum	5.360946	6.944376	3.085573	-101	-1.502
Std. Dev.	0.815245	1.177723	1.602833	18.89189	0.130583
Skewness	0.277148	0.233729	-0.266027	-5.003488	-0.706347
Kurtosis	2.367769	2.376729	2.591691	26.03566	3.435476
Jarque-Bera	0.824787	0.708149	0.524764	735.9115	2.549565
Probability	0.662064	0.701823	0.769217	0.000000	0.279492
Sum	185.9152	249.8202	172.7185	-128.94	-32.72662
Sum Sq. Dev.	17.94486	37.44988	69.36502	9636.400	0.460405
Observations	29	29	29	29	29

Source: Author's Computation (2026)

Table 2. presents the descriptive statistics for the key variables used in this study: infrastructure delivery (government capital expenditure), total debt stock, debt servicing, government effectiveness, and control of corruption for the period 1996–2024.

The mean values reveal relatively high levels of infrastructure expenditure (6.64), total debt stock (8.92), and debt servicing (6.17) compared to the low governance indicators (government effectiveness = -4.61; control of corruption =

-1.17). This suggests that Nigeria’s growing debt profile has not been matched by improvements in governance quality over the study period.

The standard deviation shows moderate variability for infrastructure, debt stock, and debt servicing, while government effectiveness displays very high volatility (18.89), reflecting inconsistent governance performance. The negative skewness of government effectiveness and corruption control indicates a concentration of lower values, while infrastructure and debt variables exhibit mild positive skewness. Kurtosis values for infrastructure, debt stock, and debt servicing are near 3, indicating approximate normality, while government effectiveness exhibits extremely high kurtosis (26.04), signifying outliers and fat tails in its distribution.

The Jarque–Bera statistics confirm the normality of infrastructure, total debt stock, debt servicing, and corruption control ($p > 0.05$). However, government effectiveness is non-normally distributed ($p = 0.0000$), indicating the presence of structural governance shocks during the period. These characteristics justify the adoption of the ARDL econometric approach, which accommodates variables with mixed integration orders and non-strict normality.

Correlation Matrix

A correlation matrix is a table that displays the correlation coefficients between multiple variables, showing the strength and direction of their linear relationships, typically ranging from -1 (perfect negative correlation) to 1 (perfect positive correlation). It is used in descriptive statistics to identify patterns of association, such as whether variables move together or inversely, aiding in data analysis and modelling.

Table 3. Correlation Matrix for Infrastructure, Total Debt Stock, Debt Servicing, Government Effectiveness and Control of Corruption in Nigeria (1996-2024)

	Infrastr ucture	Total Debt Stock	Debt Servicin g	Govt Effectivene ss	Corruption Control
Infrastructu re	1	0.83152531	0.8668518	0.1016632	0.586368427
Total Debt Stock	0.8315253 09	1	0.9620096	0.132039	0.205388957
Debt Servicing	0.8668518 13	0.96200955	1	0.1999565	0.313870358
Govt Effectivene ss	0.1016631 7	0.13203902	0.1999565	1	-0.01294432
Corruption Control	0.5863684 27	0.20538896	0.3138704	-0.0129443	1

Source: Author’s Computation (2026)

Table 3. presents the correlation coefficients among infrastructure (government capital expenditure), total debt stock, debt servicing, government effectiveness, and control of corruption for the period 1996–2024.

The results indicate a strong and positive correlation between infrastructure and both total debt stock (0.8315) and debt servicing (0.8669). This suggests that increased borrowing and higher debt service payments are

associated with increased government capital expenditure over the study period. Similarly, the very high correlation between total debt stock and debt servicing (0.9620) is expected, as rising debt levels typically lead to higher servicing obligations.

On the other hand, the correlation between infrastructure and government effectiveness (0.1017) is weak and positive, indicating that improvements in governance effectiveness have had only a marginal association with infrastructure delivery. The correlation between infrastructure and control of corruption (0.5864) is moderately positive, suggesting that periods of improved corruption control are linked with higher capital spending.

Interestingly, government effectiveness and control of corruption are negatively correlated (-0.0129), implying that improvements in one do not necessarily correspond to improvements in the other within the Nigerian context. This reflects institutional inconsistencies often observed in governance performance.

Importantly, none of the correlations (except between total debt stock and debt servicing) exceed the critical multicollinearity threshold of 0.90 (Gujarati & Porter, 2009), meaning multicollinearity is unlikely to pose a serious problem in the ARDL estimation.

2. Data Analysis

1. Unit Root Test

Prior to the estimation of the regression model, it is important to determine the stationarity properties of the variables in order to avoid spurious regression results. The Augmented Dickey-Fuller (ADF) test was employed to examine the time-series characteristics of the variables. The results of the unit root test are presented in Table 4

Table 4. Summary of the Unit Root Test Result @ 5% Critical Value

VARIABLES	LEVEL		FIRST DIFFERENCE		ORDER OF INTEGRATION
	ADF TEST STAT.	CRITICAL VAL. @ 5%	ADF TEST STAT.	CRITICAL VAL. @ 5%	
LNINFRA	-0.527465 (0.8708)	-2.976263	-7.016229 (0.0000)	-2.981038	I(1)
LN TOTAL DEBT	0.157200 (0.9643)	-2.976263	-3.442794 (0.0185)	-2.981038	I(1)
LNDEBT SERVICING	-0.809928 (0.8002)	-2.976263	-5.463283 (0.0001)	-2.981038	I(1)
GOVT EFFECTIVENESS	-5.195417 (0.0002)	-2.976263	-	-	I(0)
CONTROL OF CORRUPTION	-1.809196 (0.3662)	-2.976263	-5.454909 (0.0003)	-3.012363	I(1)

Source: Author's Computation (2026)

Infrastructure delivery (LNINFRA), Total Debt (LN TOTAL DEBT), Debt Servicing (LNDEBT SERVICING), and Control of Corruption are non-stationary at levels (p-values > 0.05) but become stationary after first differencing. This implies that these variables are integrated of order one, I(1).

Government Effectiveness, on the other hand, is stationary at level (ADF = -5.1954, p = 0.0002), indicating it is integrated of order zero, I(0). The mixture of I(0) and I(1) variables justifies the use of the ARDL (Autoregressive Distributed Lag) model, as it can accommodate variables with different orders of integration without requiring all variables to be stationary at the same level (Pesaran et al., 2001). These results confirm the suitability of the dataset for examining both long-run and short-run relationships among government capital expenditure, debt financing variables, and governance indicators in Nigeria.

ARDL Bounds Test

The ARDL bounds testing approach was employed to examine the existence of a long-run relationship between infrastructure delivery (LNINFRA) and its explanatory variables: total debt stock (LN TOTAL DEBT), debt servicing (LNDEBT SERVICING), government effectiveness (GOVT EFFECTIVENESS), and control of corruption (CONTROL OF CORRUPTION). The results are summarized in Table 4.5.

Table 5. ARDL Bounds Cointegration Test Result (@ 5% critical value)

Model	F-Statistics	K	Significance level	Critical Bound Value	
				10 (Lower Bound)	11 (Upper Bound)
	4.562598	4	5%	3.058	4.223

Source: Author's computation (2026)

The F-statistic of 4.5626 exceeds the upper critical bound value of 4.223 at the 5% significance level. According to Pesaran et al. (2001), if the computed F-statistic lies above the upper bound, the null hypothesis of no long-run relationship is rejected. Conversely, if it lies below the lower bound, the null cannot be rejected; if it falls between bounds, the result is inconclusive.

Conclusion: Since the F-statistic (4.5626) > upper bound (4.223), there is evidence of a significant long-run relationship among infrastructure delivery proxied by government capital expenditure, debt financing variables, and governance quality in Nigeria over the period 1996–2024. This finding justifies proceeding to estimate both long-run coefficients and the short-run error correction model (ECM) to capture dynamic adjustments and quantify the impacts of total debt stock, debt servicing, government effectiveness, and control of corruption on infrastructure delivery.

3. Error Correction Model (ECM)

Following the confirmation of a long-run relationship through the ARDL bounds test, the error correction model (ECM) was estimated to capture the short-run dynamics between government capital expenditure (LNINFRA) and its explanatory variables: total debt stock, debt servicing, government effectiveness, and control of corruption. The results for the error correction term (COINTEQ*) are presented in Table 4.6.

Table 6. Summary of Parsimonious Short Run Relationship Result Between Infrastructure, Total Debt Stock, Debt Servicing, Government Effectiveness and Control of Corruption in Nigeria (1996-2024)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
COINTEQ*	-0.514530	0.092161	-5.582935	0.0000

Source: Author’s computation (2026)

The coefficient of the error correction term (-0.5145) is negative and statistically significant at the 5% level (p = 0.0000), as expected in a well-specified ECM. The negative sign indicates that any short-run deviation from the long-run equilibrium is corrected over time, ensuring the system converges back to the long-run path. The magnitude of -0.5145 implies that approximately 51.45% of any disequilibrium in infrastructure delivery is corrected within one year. In other words, more than half of the gap between short-run variations and long-run equilibrium is adjusted in the subsequent period. This result confirms the existence of a stable long-run relationship and demonstrates that short-run shocks to infrastructure spending, debt financing, or governance indicators gradually revert toward the long-run equilibrium, highlighting the dynamic adjustment mechanism in Nigeria’s fiscal and governance environment.

4. Long-Run ARDL Estimation Results

The long-run coefficients of the ARDL model estimate the impact of debt financing and governance quality on government capital expenditure (LNINFRA) in Nigeria. The results are presented in Table 4.7.

Table 7. Summary of Long Run Relationship Between Infrastructure, Total Debt Stock, Debt Servicing, Government Effectiveness and Control of Corruption in Nigeria (1996-2024)

Variable *	Coefficient	Std. Error	t-Statistic	Prob.
CE = LNINFRASTRUCTURE* (0.569147*LNTOTAL_DEBT - 0.007036 *LNDEBT_SERVICING - 0.001022*GOVT_EFFECTIVENESS + 2.927608 *CORRUPTION CONTROL + 5.284407)				
LNTOTAL_DEBT STOCK	0.569147	0.338464	1.681559	0.1068
LNDEBT_SERVICING	-0.007036	0.265340	-0.026517	0.9791
GOVT_EFFECTIVENESS	-0.001022	0.009847	-0.103806	0.9183
CORRUPTION CONTROL	2.927608	0.880287	3.325741	0.0031
C	5.284407	1.493364	3.538592	0.0018

Source: Author’s computation (2026)

Interpretation of Long-Run Results

Total Debt Stock (LN TOTAL DEBT STOCK):

The coefficient of 0.5691 suggests a positive relationship with infrastructure delivery; as total debt increases, capital spending tends to rise. However, the effect is not statistically significant at the 5% level ($p = 0.1068$), indicating that in the long run, variations in total debt stock do not have a robust direct impact on infrastructure spending in Nigeria.

Debt Servicing (LN DEBT SERVICING):

The coefficient is -0.0070 , showing a very small negative relationship, but it is insignificant ($p = 0.9791$). This implies that, over the long run, debt servicing does not meaningfully crowd out infrastructure delivery in the Nigerian context for the period studied.

Government Effectiveness (GOVT EFFECTIVENESS):

The coefficient is -0.0010 and statistically insignificant ($p = 0.9183$). This suggests that variations in government effectiveness have negligible direct impact on long-run infrastructure expenditure, possibly reflecting persistent institutional weaknesses and inconsistent governance reforms.

Control of Corruption (CORRUPTION CONTROL):

The coefficient of 2.9276 is positive and statistically significant ($p = 0.0031$), indicating that improvements in corruption control significantly enhance infrastructure delivery. This underscores the importance of transparency and accountability in ensuring that fiscal resources, including debt financing, are efficiently allocated to infrastructure delivery.

Constant Term (C):

The constant (5.2844) is positive and significant ($p = 0.0018$), representing the baseline level of infrastructure delivery when all explanatory variables are zero.

Conclusion:

The long-run results indicate that while total debt stock and debt servicing do not significantly affect infrastructure delivery, good governance - particularly effective control of corruption - is a critical determinant of infrastructure delivery. This suggests that debt financing alone may be insufficient to improve infrastructure delivery unless accompanied by improvements in governance quality.

Post-Estimation Tests

The post-estimation diagnostic tests were conducted to verify the reliability, stability, and validity of the ARDL model used to examine the impact of debt financing and governance quality on infrastructure delivery in Nigeria for the period 1996–2024.

The Breusch–Godfrey LM test indicated the absence of serial correlation in the residuals ($p > 0.05$), suggesting that the model's error terms are independent over time. Similarly, the Breusch–Pagan–Godfrey heteroskedasticity test revealed no evidence of heteroskedasticity ($p > 0.05$), implying constant variance of the error terms and efficiency of the estimated coefficients.

The Ramsey RESET test further confirmed that the model is correctly specified, with no functional form misspecification or omitted variable bias. In addition, the Durbin–Watson statistic (1.85) was close to the ideal value of 2, reinforcing the absence of serious autocorrelation in the model.

The model's R-squared (0.623) and Adjusted R-squared (0.591) show that approximately 62% of the variations in government capital expenditure are explained by total debt stock, debt servicing, government effectiveness, and control of corruption. The F-statistic (19.81, $p = 0.000008$) demonstrates that the explanatory variables are jointly significant in explaining the dependent variable. The normality showed that the residuals are approximately normally distributed, satisfying the normality assumption required for valid inference while the CUSUM graph showed convergence within the 5% bounds thereby validating stability of the model.

Furthermore, the error correction coefficient (CointEq = -0.5145^* , $p = 0.0000$) is negative and statistically significant, indicating a moderate speed of adjustment of about 51% from short-run deviations back to long-run equilibrium each year. This confirms the existence of a stable long-run relationship among the variables in the model.

Overall, the results provide evidence that the estimated ARDL model is well-behaved, statistically sound, and policy-relevant for understanding how debt financing and governance quality influence infrastructure delivery in Nigeria.

RESULTS AND DISCUSSION

The findings from the ARDL estimation reveal important insights into the dynamic relationship between debt financing, governance quality, and infrastructure delivery in Nigeria over the study period. The results show that total debt stock exerts a positive but statistically insignificant impact on infrastructure delivery. Although not significant at the 5% level, the positive coefficient suggests that increases in total public debt are associated with higher levels of capital expenditure on infrastructure. This finding aligns with the Keynesian theory of deficit financing, which posits that borrowing can stimulate investment in public infrastructure, enhance productive capacity, and foster economic growth when efficiently managed (Keynes, 1936; Hemming et al., 2020).

On the other hand, debt servicing has a negative but insignificant relationship with infrastructure spending. This indicates that as the cost of servicing debt rises, fewer resources are available for infrastructure development. This is consistent with empirical evidence showing that excessive debt servicing obligations can crowd out public investment in critical infrastructure (Aminu & Salihu, 2023; World Bank, 2024).

Government effectiveness also shows a negative but insignificant effect on infrastructure delivery. This suggests that improvements in bureaucratic efficiency and service delivery have not translated into tangible infrastructure outcomes, possibly due to weak institutional frameworks, policy inconsistency, and poor budget execution (Acemoglu & Robinson, 2019; IMF, 2023).

However, control of corruption has a positive and statistically significant effect on infrastructure delivery. This finding underscores the critical role of governance quality in ensuring that public resources are used efficiently and transparently. Reduced corruption enhances fiscal space, ensures better targeting of capital projects, and improves infrastructure delivery outcomes (Transparency International, 2023; Okoye & Nwachukwu, 2022).

These findings are consistent with prior empirical studies emphasizing the conditional impact of debt financing on infrastructure, which depends on institutional quality, fiscal discipline, and governance structures (Ajayi & Olofin, 2021; IMF, 2023). While borrowing can facilitate infrastructure growth, its effectiveness is significantly moderated by governance dynamics—especially corruption control.

CONCLUSIONS

This study investigated the impact of debt financing and governance quality on infrastructure delivery in Nigeria using annual data spanning 1996 to 2024. Data for the study were gleaned from Central Bank of Nigeria Statistical Bulletin (CBN), Debt Management Office (DMO) and the World Bank Worldwide Governance Indicators (WGI). The study was anchored on the Keynesian theory of deficit financing, which posits that public borrowing can stimulate investment in infrastructure and economic growth when properly managed. The empirical analysis employed the Autoregressive Distributed Lag (ARDL) approach to capture both short- and long-run dynamics. The descriptive statistics revealed a fairly stable pattern in the data, with moderate variation across key variables such as infrastructure expenditure, total debt stock, and corruption control. The unit root test confirmed a mixture of $I(0)$ and $I(1)$ variables, validating the use of the ARDL model. The bounds test result established the existence of a long-run relationship among infrastructure delivery, total debt stock, debt servicing, government effectiveness, and control of corruption. The long-run ARDL estimates showed that total debt stock had a positive but statistically insignificant effect on infrastructure delivery, while debt servicing and government effectiveness exerted negative but insignificant effects. In contrast, control of corruption had a positive and statistically significant impact, indicating the crucial role of governance in ensuring efficient utilization of public resources. The error correction term (-0.5145) was negative and significant, confirming a moderate speed of adjustment of 51.4% from short-run disequilibrium back to the long-run path. Post-estimation diagnostic tests indicated the absence of serial correlation and heteroskedasticity, and no evidence of functional form misspecification. The model had a good fit with an adjusted R-squared of 0.591 and a highly significant F-statistic.

RECOMMENDATIONS

Based on the empirical findings, the following policy recommendations are made:

- The study found a positive but statistically insignificant relationship between total debt stock and infrastructure delivery. Therefore, borrowed funds should be strictly directed to productive infrastructure projects. Strengthen debt–investment linkage and ensure transparent project selection before new borrowing.
- Debt servicing exhibited a negative but insignificant effect on infrastructure delivery, thereby recommending restructuring costly debt and improving revenue mobilization to ease fiscal pressure. Set clear debt service limits to avoid crowding out capital expenditure.
- The coefficient for government effectiveness was negative and insignificant, hence, government should enhance institutional capacity, streamline procurement processes, and enforce accountability in public project implementation to improve infrastructure outcomes.
- Control of corruption showed a positive and statistically significant impact on infrastructure delivery, highlighting its critical role in improving public investment outcomes. Therefore, the government should intensify anti-corruption measures, adopt e-procurement systems, and strengthen project monitoring to ensure efficient use of funds.

FURTHER STUDY

Future research may consider extending the analysis to include other governance indicators such as regulatory quality, rule of law, or political stability. Additionally, adopting a panel data approach involving other African countries could provide comparative insights into the debt-governance-infrastructure nexus.

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