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# Public Debt Management and Capital Expenditure Performance in Nigeria

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## Abstract

This study examines whether the way Nigeria manages its public debt is related to the performance of its capital budget. Capital expenditure performance is measured by the capital budget implementation rate, the ratio of actual to budgeted capital expenditure, and debt management is represented by the debt service-to-revenue ratio, the domestic share of public debt, the average interest cost of debt and the long-term share of debt, with debt-to-GDP, real GDP growth and the oil revenue share as controls. Annual data for 1990 to 2024 are analysed with an autoregressive distributed lag model, after unit root tests show a mixture of stationary and first-difference stationary series. The bounds test ($F = 4.16$) indicates a long-run relationship, and the error correction coefficient of −0.90 implies that about 90 per cent of a deviation is corrected within a year. In the long run, a higher debt service-to-revenue ratio and a larger domestic debt share are associated with lower implementation, a larger long-term debt share is associated with higher implementation, and average interest cost has no statistically significant association. A sensitivity check that replaces the dependent variable with the capital share of total expenditure retains the negative effects of debt service and domestic share, while the long-term share is significant only at the 10 per cent level and the bounds test for that specification is inconclusive. The results point to debt service pressure and the domestic and maturity composition of borrowing as the channels through which debt management relates to capital budget execution.

*Keywords:* public debt management; capital expenditure; budget implementation; debt service

# Introduction

Capital expenditure is the part of the budget through which borrowing is expected to become roads, power plants, schools and other assets, so the conditions under which a government borrows and repays shape how much of its capital budget can actually be carried out. In Nigeria the connection appears in recent studies that tie external debt servicing to lower capital expenditure (Ogwuru et al., 2026) and report that debt servicing reduces funds for capital projects even where larger borrowing adds to project financing (Njoku et al., 2025). Evidence from road infrastructure points the same way, with external and internal borrowing raising expenditure on roads while debt servicing pulls it down (Ibrahim et al., 2025).

The annual series assembled for this study show why the question deserves attention. Between 1990 and 1999 the capital budget implementation rate averaged 43.1 per cent while debt service absorbed 40.8 per cent of revenue. In 2000 to 2009 implementation rose to 52.9 per cent as the debt service ratio fell to 23.7 per cent, and in 2020 to 2024 implementation dropped to 33.7 per cent while debt service climbed to 85.6 per cent of revenue. Movements of this size are unlikely to be explained by the stock of debt alone, because the stock says little about when repayments fall due, which lenders supply the money or what the borrowing costs.

A smaller group of studies moves closer to fiscal execution by examining public investment or public expenditure (Abu et al., 2022; Chukwu et al., 2021), and few treat budget implementation as the outcome, as Aremu (2026) does for selected states and Sunday and Akpan (2023) do for the relation between government consumption and annual capital expenditure. What remains unsettled is whether the management of the debt, meaning its service burden, its domestic or external composition, its cost and its maturity, explains the share of the approved capital budget that is actually spent at the national level. The objectives are to estimate the long-run and short-run effects of each debt management indicator on the implementation rate, to test whether the relationship is stable over the sample, and to draw out implications for debt strategy and capital budget execution. The estimates show a stable long-run relationship in which a heavier debt service burden and a larger domestic share of debt are linked to lower implementation, a larger long-term share is linked to higher implementation, and average interest cost shows no statistically significant association. The paper proceeds by reviewing the literature and deriving the hypotheses, describing the data and estimation strategy, reporting the results, discussing them against earlier studies, and closing with limitations and directions for further work.

# Literature Review

## Conceptual Clarifications

Public debt management is usually understood as the set of decisions that determine how a government raises money and how it arranges repayment, covering the choice between domestic and external lenders, the maturity profile, the cost of borrowing and the schedule of debt service. Seen this way, management is a property of the debt portfolio and of the institutions that handle it, not of the debt stock alone. Adegbie et al. (2022) link effective management in Nigeria to growth through the investment of borrowed funds in productive ventures and the timely servicing of loans, and Aremu (2026) reports that stronger domestic and external debt management systems are associated with better budget implementation in selected states. Institutional quality enters the same discussion, since Jibril and Naim (2024) find that stronger rule of law and anti-corruption measures in Nigeria are associated with lower public debt levels and better fiscal management.

Capital expenditure performance, as used here, refers to how fully the approved capital budget is carried out in a fiscal year, which differs from the level of capital spending relative to GDP or total expenditure. A government can devote a large share of its outlays to capital items and still implement only part of what was appropriated, and the reverse is also possible. The distinction matters because the factors that move the level of spending, such as revenue and political priorities, are not the same as those that govern the release and execution of appropriated funds. Sunday and Akpan (2023) report that changes in government consumption, particularly administrative consumption, are positively and significantly related to the annual performance of capital expenditure in Nigeria, which suggests that recurrent commitments and capital execution are tied together within the budget. Revenue sources matter as well. Ogungbade et al. (2022) review evidence that oil revenue and non-oil tax revenue influence the budget execution phase and call for work on oil price volatility, and Ajibola et al. (2026) find that company income tax is positively related to government capital expenditure whereas petroleum profit tax and foreign debt are not significantly related to it.

## Theoretical Framework

The cost-risk trade-off in public debt management provides the main anchor for the analysis. A government can borrow cheaply at short maturities or from domestic markets and accept the refinancing and market risks that follow, or it can pay more for longer maturities and more stable terms, and the resulting mix determines both the level and the volatility of debt service. For a capital budget the consequence is direct, because debt service is a first charge on revenue and a portfolio that produces a high or erratic service burden leaves less cash available for releases to capital projects. The framework therefore points to four portfolio characteristics, namely the service

burden relative to revenue, the composition by lender, the cost and the maturity, and it predicts that portfolios that raise the service burden or shorten maturities will weaken capital execution.

Two strands of the debt literature supply mechanisms through which these characteristics can matter. Debt overhang arguments hold that a large inherited debt discourages investment because returns are expected to go to creditors, and evidence consistent with this has been reported for external debt in Asian developing economies (Dawood et al., 2024), for private investment in the European Union (Vanlaer et al., 2021) and, for Nigeria, in a study that finds public investment rising under overhang without a matching gain in growth because of inefficient allocation (Adewuyi et al., 2026). Crowding-out arguments focus on competition for resources, and the supporting evidence includes short- and long-run crowding out of public investment in Central and Eastern Europe (Konatar et al., 2025), lower fiscal multipliers when debt accumulates in expansions because long-term interest rates are expected to be high (Bentour, 2021), and larger multipliers when spending is financed by foreign rather than domestic investors, a difference attributed to the crowding out of private investment under domestic financing (Priftis & Zimic, 2020).

Competing views temper these predictions, and the best known of them, Ricardian equivalence, holds that under its assumptions the choice between taxes and debt does not change real outcomes (Busato, 2022), while some time-series work finds behaviour consistent with it, as households raise saving when government expenditure rises (İkiz, 2020). Keynesian and post-Keynesian arguments give borrowing a more favourable role, with fiscal expansion able to support growth and, in some circumstances, debt sustainability (Parui, 2023). Related studies indicate that expansion can lower debt ratios in OECD countries, with stronger reductions at high debt-to-GDP levels (Ciaffi et al., 2024), and that deficits can partly finance themselves in models with nominal rigidity and finite lives, with the effect strengthening when fiscal adjustment is delayed (Angeletos et al., 2023). These perspectives suggest that debt need not impair capital execution when it finances productive spending and the service burden stays manageable. The analysis therefore treats the sign and size of each debt management indicator as an empirical question within the cost-risk framework, and it carries the crowding-out and overhang channels into the hypotheses because they bear on the competition between debt service and capital releases.

## Empirical Review

Ogwuru et al. (2026) report that external debt servicing is negatively related to capital expenditure, and Njoku et al. (2025) find that external and domestic borrowing add to capital project financing while debt servicing reduces it. The same split appears for road infrastructure, where borrowing raises expenditure and servicing lowers it (Ibrahim et al., 2025). Studies that use growth as the outcome reach a similar view on service. Aiyedogbon et al. (2022), Aladejare and Musa (2024) and Yusuf and Mohd (2023) each report negative associations between debt

service or interest payments and growth, and Faizulayev et al. (2020) find that debt stocks and debt service affect growth in both the short and the long run, which they take to support optimal debt management. Not every result agrees. Ekperiware et al. (2023) report a positive association between debt servicing and output, Akpan (2023) finds that debt service is positively related to private domestic investment while the debt stock is negatively related, and Chukwu et al. (2021) find an insignificant effect of public debt on public investment for 1985 to 2018. These differences may reflect the choice of outcome, the period covered and the way service is scaled, although the studies do not allow this to be settled. Cost and maturity have received less direct attention than the stock of debt in the Nigerian studies reviewed here. Interest payments are linked to weaker growth in Nigeria (Aladejare & Musa, 2024), and the interest rate is among the negative influences on growth reported by Musa and Ewetan (2023), while Ehikioya and Omankhanlen (2021) include interest rates and oil prices among the factors shaping growth alongside a negative association with public debt. Maturity is rarely measured explicitly in the Nigerian studies reviewed here, and the closest evidence concerns the level at which debt begins to harm outcomes. Nzeh (2020) estimates an optimal threshold of 40.2 per cent of GDP beyond which growth declines, Anisiobi et al. (2023) place the optimal range at 30 to 40 per cent within an inverted U-shaped relationship, and Ofino et al. (2025) estimate 62.5 per cent as the threshold needed for adequate infrastructural development. Abu et al. (2022) find that public expenditure in Nigeria rises with debt at first and declines beyond a threshold. The spread of these estimates shows how sensitive threshold figures are to the sample and method, and it argues for including the debt-to-GDP ratio as a control without treating any single threshold as a policy target.

Work that treats budget implementation or capital outlays as the outcome is thin but informative. Aremu (2026) finds, for selected Nigerian states, that effective debt management systems enhance budget implementation performance, and the evidence on administrative consumption in Sunday and Akpan (2023) shows that execution depends on the structure of the wider budget. Shah et al. (2023) examine debt sustainability across African economies and find it generally high, with four countries holding unsustainable ratios, a result that cautions against relying on cross-country averages for a country with a heavy service burden. Evidence from outside Nigeria is mixed on whether debt displaces capital spending. Aryal (2026) finds for Nepal that government debt raises tax revenue without directly reducing or increasing capital expenditure, whereas Konatar et al. (2025) find crowding out of public investment in Central and Eastern Europe, and Barngetuny (2025) argues for Kenya that productive public investment has to be paired with sustainable debt practices.

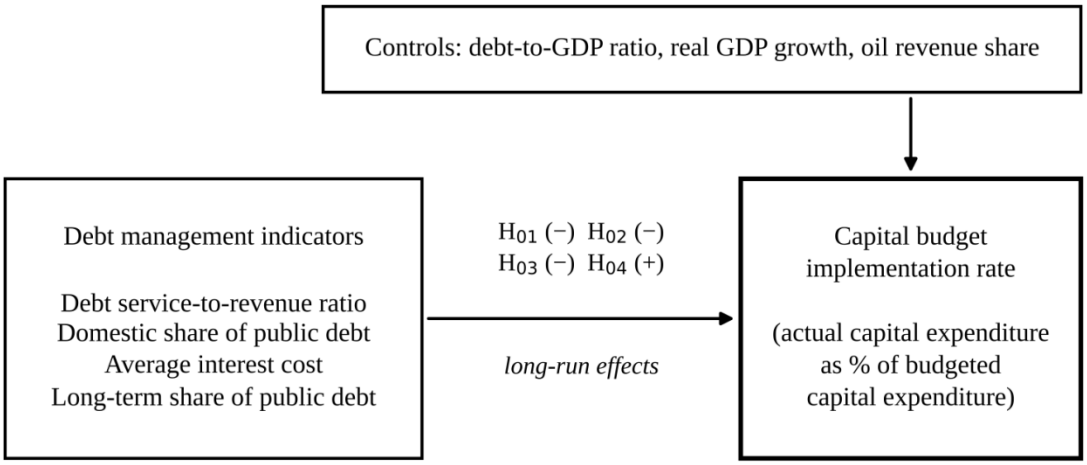
## Hypotheses Development

Four hypotheses follow from the framework and the evidence, each stated in null form with the expected direction of the alternative. The first ($H_{01}$) states that the debt service-to-revenue ratio has no significant effect on capital

budget implementation, and a negative alternative is expected because service is a prior claim on revenue and the Nigerian evidence reviewed above links servicing to lower capital outlays. The second ($H_{02}$) states that the domestic share of public debt has no significant effect on implementation, with a negative alternative expected under crowding out and in line with the unfavourable domestic debt results of Musa and Ewetan (2023) and Okeke et al. (2022), although the positive findings of Yusuf and Mohd (2021) leave the sign open. The third ($H_{03}$) states that the average interest cost of public debt has no significant effect on implementation, with a negative alternative expected because higher costs enlarge service obligations. The fourth ($H_{04}$) states that the share of long-term debt has no significant effect on implementation, with a positive alternative expected because longer maturities spread repayments and reduce refinancing pressure. Debt relative to GDP, real GDP growth and the oil revenue share enter as controls, the first because overhang and threshold arguments depend on the size of the debt, the second because faster growth widens the resource envelope, and the third because oil revenue has been tied to budget execution (Ogungbade et al., 2022). Figure 1 summarises the relationships to be tested.

**Figure 1**

*Conceptual Framework Linking Debt Management Indicators to Capital Budget Implementation*




*Note.* Signs in parentheses give the expected direction of each long-run effect.

# Methodology

The study adopts an ex post facto quantitative design based on annual national time series for 1990 to 2024. The period covers the years before the debt relief of the mid-2000s, the years of low debt service that followed and the recent rise in service, so the relationship is estimated across distinct debt regimes. The 35 annual observations yield 34 usable observations once the lagged dependent variable is included. Data on debt composition, debt service,

interest cost and maturity come from the Debt Management Office. Capital expenditure outturns, government revenue and the oil revenue share come from the Central Bank of Nigeria Statistical Bulletin, approved capital appropriations from the Budget Office of the Federation, and GDP series from the National Bureau of Statistics, with the World Bank World Development Indicators used to check real GDP growth. Table 1 defines the variables, their measurement and the expected signs.

**Table 1**

*Variables, Measurement, Expected Signs and Sources*

| Variable | Symbol | Measurement | Expected sign | Source |
|---|---|---|---|---|
| Capital budget implementation rate | CBIR | Actual capital expenditure as % of approved capital budget | Dependent | CBN; Budget Office |
| Debt service-to-revenue ratio | DSR | Total public debt service as % of government revenue | − | DMO; CBN |
| Domestic share of public debt | DOM | Domestic debt as % of total public debt | − | DMO |
| Average interest cost | AIC | Interest payments as % of average public debt stock | − | DMO; CBN |
| Long-term share of public debt | LTD | Debt with original maturity above one year as % of total public debt | + | DMO |
| Debt-to-GDP ratio | DGDP | Total public debt as % of GDP | − | DMO; NBS |
| Real GDP growth | GDPG | Annual percentage change in real GDP | + | NBS; WDI |
| Oil revenue share | OIL | Oil revenue as % of total government revenue | + | CBN |
| Capital expenditure share | CAPSH | Capital expenditure as % of total expenditure (sensitivity check) | Dependent | CBN |

*Note.* CBN = Central Bank of Nigeria; DMO = Debt Management Office; NBS = National Bureau of Statistics; WDI = World Development Indicators.

The choice of measures follows the cost-risk framework and the gaps identified in the earlier work. The debt service-to-revenue ratio is used instead of debt service in naira or as a share of exports because revenue determines how much cash is available to the budget once service has been paid. The domestic share and the long-term share describe the composition of the portfolio by lender and by maturity, and the average interest cost summarises the price paid on the debt outstanding, so that the four indicators correspond to the burden, composition, cost and maturity dimensions set out in the review. The debt-to-GDP ratio controls for the size of the debt, which the overhang and threshold literature treats as an independent influence (Anisiobi et al., 2023; Nzeh, 2020), real GDP growth controls for the resource envelope, and the oil revenue share controls for dependence on a volatile revenue source that has been tied to budget execution (Ogungbade et al., 2022). All series are used in levels and in per cent, without logarithmic transformation, because several are ratios that can approach zero and because the coefficients can then be read directly as percentage point effects.

Capital budget implementation is specified as a function of the four debt management indicators and the three controls, as in equation (1). With 34 observations and seven regressors, the estimating equation retains one lag of the dependent variable and contemporaneous values of the regressors, as in equation (2), where $X_{jt}$ denotes the seven regressors. This ARDL(1,0,0,0,0,0,0,0) form had a lower Bayesian information criterion (126.1) than the alternative that adds one lag of every regressor (134.5), and it keeps the number of parameters at nine.

$$\mathrm{CBIR}_t = f(\mathrm{DSR}_t, \mathrm{DOM}_t, \mathrm{AIC}_t, \mathrm{LTD}_t, \mathrm{DGDP}_t, \mathrm{GDPG}_t, \mathrm{OIL}_t) \quad (1)$$

$$\mathrm{CBIR}_t = \alpha + \phi \mathrm{CBIR}_{t-1} + \Sigma \beta_j X_{jt} + \varepsilon_t \quad (2)$$

The error correction representation that follows from equation (2) is given in equation (3), in which the error correction term is the deviation of the implementation rate from its long-run level, the long-run coefficients are $\theta_j = \beta_j/(1 - \phi)$, and the coefficients on the differenced regressors are the short-run effects.

$$\Delta \mathrm{CBIR}_t = (\phi - 1)\mathrm{ECT}_{t-1} + \Sigma \beta_j \Delta X_{jt} + \varepsilon_t \quad (3)$$

Stationarity is examined with augmented Dickey-Fuller and Phillips-Perron tests that include an intercept, applied to levels and first differences, to confirm that no variable is integrated of order two. Cointegration is tested with the bounds procedure, which is valid when the regressors are a mixture of I(0) and I(1) variables and which has been used in earlier work on Nigerian public debt (Abu et al., 2022; Aimola & Odhiambo, 2021). The *F* statistic for the joint exclusion of the lagged levels in the unrestricted error correction form is compared with the lower and upper critical values for seven regressors and an unrestricted intercept. Long-run coefficients are computed as $\theta_j$,

with standard errors from the delta method. Residual diagnostics comprise the Breusch-Godfrey test with two lags, the Breusch-Pagan test, the Jarque-Bera test and the Ramsey RESET test, and parameter stability is assessed with the CUSUM and CUSUM of squares statistics at the 5 per cent level. Variance inflation factors are reported to gauge collinearity. Each null hypothesis is evaluated at the 5 per cent level using the long-run *t* statistics. As a check on the measurement of the outcome, the model is re-estimated with capital expenditure as a share of total expenditure. All computations were carried out in Python with the statsmodels and arch packages.

# Results

## Descriptive Statistics and Trends

The descriptive statistics in Table 2 show a capital budget implementation rate that averages 46.8 per cent over the 35 years, with a standard deviation of 7.7 and values between 31.45 and 59.41 per cent. Among the debt management indicators, the debt service-to-revenue ratio is the most dispersed, averaging 37.9 per cent with a range of 5.7 to 101.2 per cent, whereas the average interest cost has the smallest standard deviation (2.0) around a mean of 9.7 per cent. The domestic share averages 56.2 per cent and the long-term share 74.4 per cent. Skewness is mild for all series except the debt service-to-revenue ratio (0.93), and the Jarque-Bera probabilities exceed 0.05 for every series, including that ratio (.067).

**Table 2**

*Descriptive Statistics, 1990–2024 (N = 35)*

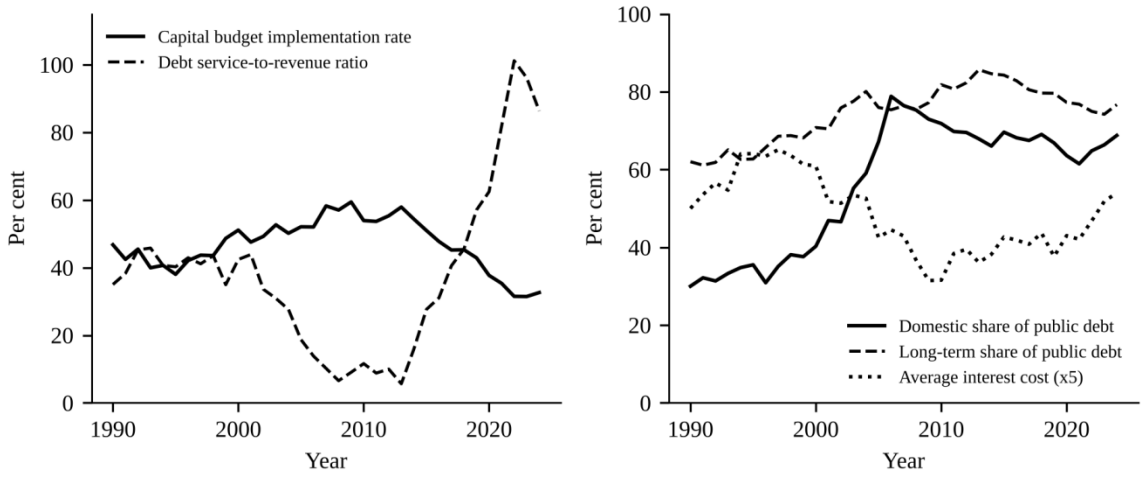
| Variable | Mean | SD | Minimum | Maximum | Skewness | JB *p* |
|---|---|---|---|---|---|---|
| Capital budget implementation rate (CBIR) | 46.76 | 7.71 | 31.45 | 59.41 | −0.34 | .505 |
| Debt service-to-revenue ratio (DSR) | 37.89 | 24.65 | 5.66 | 101.16 | 0.93 | .067 |
| Domestic share of public debt (DOM) | 56.24 | 16.42 | 30.00 | 78.82 | −0.44 | .125 |
| Average interest cost (AIC) | 9.67 | 1.99 | 6.29 | 13.02 | 0.19 | .391 |
| Long-term share of public debt (LTD) | 74.38 | 7.25 | 61.11 | 85.65 | −0.44 | .305 |
| Debt-to-GDP ratio (DGDP) | 53.15 | 35.04 | 11.90 | 120.15 | 0.41 | .193 |
| Real GDP growth (GDPG) | 3.40 | 3.09 | −2.29 | 9.21 | −0.22 | .608 |
| Oil revenue share (OIL) | 65.59 | 11.21 | 42.51 | 80.21 | −0.51 | .185 |

*Note.* All variables are in per cent except GDPG, which is the annual percentage change. JB *p* is the probability of the Jarque-Bera statistic.

Figure 2 displays the paths of the series over the sample period, and it shows that the implementation rate averaged 43.1 per cent in 1990 to 1999, 52.9 per cent in 2000 to 2009, 50.7 per cent in 2010 to 2019 and 33.7 per cent in 2020 to 2024, while the debt service-to-revenue ratio averaged 40.8, 23.7, 25.4 and 85.6 per cent over the same periods. The ratio reached its minimum of 5.7 per cent in 2013 and its maximum of 101.2 per cent in 2022, whereas the implementation rate peaked at 59.41 per cent in 2009 and reached its lowest value of 31.45 per cent in 2023. The domestic share rose from 30.0 per cent in 1990 to a high of 78.8 per cent in 2006 and has stayed between 61.5 and 71.8 per cent since 2010, the long-term share peaked at 85.7 per cent in 2013, and the average interest cost fell from 13.0 per cent in 1997 to 6.3 per cent in 2009 before rising to 10.8 per cent in 2024.

**Figure 2**

*Capital Budget Implementation Rate and Debt Management Indicators, 1990–2024*




The pairwise correlations in Table 3 show that the implementation rate has a correlation of −0.93 with the debt service-to-revenue ratio and correlations of 0.34, −0.47 and 0.40 with the domestic share, the average interest cost and the long-term share, and several explanatory variables are highly correlated with one another. The domestic share has correlations of −0.96 with the debt-to-GDP ratio, 0.86 with the long-term share and −0.83 with the average interest cost, and the average interest cost has a correlation of 0.90 with the debt-to-GDP ratio. Real GDP growth has correlations below 0.22 in absolute value with every other variable.

**Table 3**

*Correlation Matrix*

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| 1. CBIR | 1.00 | | | | | | | |
| 2. DSR | −0.93 | 1.00 | | | | | | |
| 3. DOM | 0.34 | −0.19 | 1.00 | | | | | |
| 4. AIC | −0.47 | 0.36 | −0.83 | 1.00 | | | | |
| 5. LTD | 0.40 | −0.25 | 0.86 | −0.76 | 1.00 | | | |
| 6. DGDP | −0.48 | 0.31 | −0.96 | 0.90 | −0.88 | 1.00 | | |
| 7. GDPG | 0.21 | 0.05 | 0.15 | −0.07 | 0.10 | −0.16 | 1.00 | |
| 8. OIL | 0.34 | −0.41 | −0.59 | 0.55 | −0.58 | 0.56 | 0.04 | 1.00 |

*Note.* Pearson correlations, N = 35. Variables are numbered in the order listed in the first column.

## Unit Root and Cointegration Tests

The unit root tests in Table 4 show that, in levels, none of the augmented Dickey-Fuller or Phillips-Perron statistics for the implementation rate, the debt service-to-revenue ratio, the domestic share, the average interest cost, the long-term share, the debt-to-GDP ratio or the oil revenue share rejects the unit root, with probabilities between 0.41 and 0.91. In first differences all of these series reject the unit root at the 5 per cent level, whereas real GDP growth rejects it in levels (ADF −6.78, PP −7.22, both $p < .001$). The variables are therefore a mixture of I(0) and I(1) series and none is I(2).

**Table 4**

*Unit Root Tests*

| Variable | ADF level | ADF first difference | PP level | PP first difference | Order |
|---|---|---|---|---|---|
| CBIR | −0.46 (.900) | −6.03 (< .001) | −1.05 (.736) | −6.20 (< .001) | I(1) |
| DSR | −0.98 (.760) | −3.45 (.009) | −0.74 (.835) | −3.62 (.005) | I(1) |
| DOM | −1.37 (.596) | −4.35 (< .001) | −1.44 (.564) | −4.44 (< .001) | I(1) |
| AIC | −1.16 (.690) | −5.62 (< .001) | −1.46 (.552) | −5.67 (< .001) | I(1) |
| LTD | −1.73 (.416) | −5.31 (< .001) | −1.75 (.406) | −5.31 (< .001) | I(1) |
| DGDP | −1.58 (.493) | −3.32 (.014) | −1.29 (.634) | −3.41 (.011) | I(1) |
| GDPG | −6.78 (< .001) | −6.52 (< .001) | −7.22 (< .001) | −21.66 (< .001) | I(0) |
| OIL | −0.43 (.904) | −6.05 (< .001) | −0.43 (.905) | −6.04 (< .001) | I(1) |

*Note.* Each cell shows the test statistic with its *p* value in parentheses. All tests include an intercept. ADF lag length chosen by the Akaike information criterion (maximum 2).

The bounds test in Table 5 gives an *F* statistic of 4.16 for seven regressors. The statistic lies above the upper critical value at the 10, 5 and 1 per cent levels (3.06, 3.40 and 4.09), and the probability attached to the upper bound is .009, so the null of no long-run relationship is rejected.

**Table 5**

*ARDL Bounds Test for Cointegration*

| Significance level | Lower bound I(0) | Upper bound I(1) | *F* statistic | Outcome |
|---|---|---|---|---|
| 10% | 1.95 | 3.06 | 4.16 | Above upper bound |
| 5% | 2.22 | 3.40 | 4.16 | Above upper bound |
| 1% | 2.80 | 4.09 | 4.16 | Above upper bound |

*Note.* Case with unrestricted intercept and no trend; $k = 7$ regressors; $N = 34$. Critical values are asymptotic.

## Long-Run and Short-Run Estimates

The long-run and short-run estimates in Table 6 give a long-run coefficient on the debt service-to-revenue ratio is −0.204 ($p < .001$), on the domestic share −0.210 ($p < .001$) and on the long-term share 0.212 ($p = .007$), while the coefficient on the average interest cost is −0.061 with a standard error of 0.363 ($p = .868$). Among the controls, the debt-to-GDP ratio has a coefficient of −0.143 ($p < .001$), real GDP growth 0.483 ($p < .001$) and the oil revenue share 0.212 ($p < .001$). The short-run coefficients have the same signs as the long-run coefficients and are close in magnitude, which follows from a coefficient of 0.096 on the lagged implementation rate ($p = .355$). The error correction coefficient is −0.904 with a standard error of 0.102 ($p < .001$). Figure 3 compares the fitted and actual values of the implementation rate, with an $R^2$ of .984 (adjusted .979).

**Table 6**

*ARDL Estimates: Long-Run and Short-Run Coefficients (Dependent Variable: CBIR)*

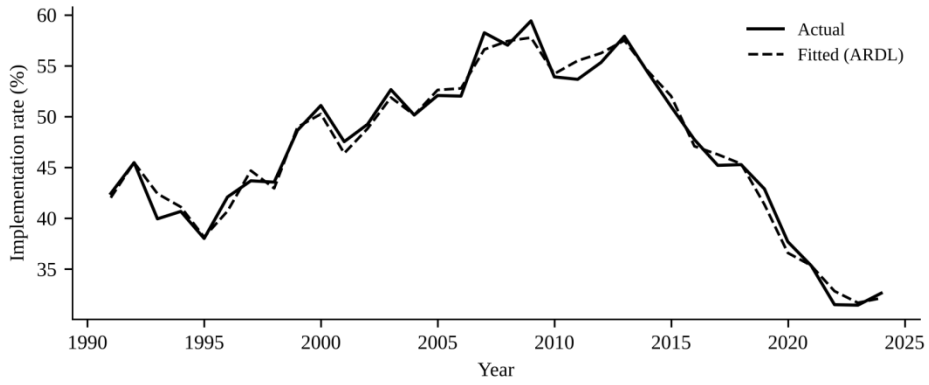
| Variable | Long-run coef. | SE | *p* | Short-run coef. | SE | *p* |
|---|---|---|---|---|---|---|
| DSR | −0.204 | 0.019 | < .001 | −0.184 | 0.021 | < .001 |
| DOM | −0.210 | 0.054 | < .001 | −0.190 | 0.053 | .001 |
| AIC | −0.061 | 0.363 | .868 | −0.055 | 0.332 | .869 |
| LTD | 0.212 | 0.071 | .007 | 0.191 | 0.072 | .013 |
| DGDP | −0.143 | 0.035 | < .001 | −0.129 | 0.032 | < .001 |
| GDPG | 0.483 | 0.103 | < .001 | 0.436 | 0.071 | < .001 |
| OIL | 0.212 | 0.043 | < .001 | 0.192 | 0.046 | < .001 |
| Constant | 43.147 | 7.687 | < .001 | 39.008 | 8.350 | < .001 |
| $CBIR_{t-1}$ | | | | 0.096 | 0.102 | .355 |
| $ECT_{t-1}$ ($\phi - 1$) | | | | −0.904 | 0.102 | < .001 |

*Note.* $N = 34$ (1991–2024). Short-run coefficients are the coefficients of the ARDL(1,0,0,0,0,0,0,0) specification on the contemporaneous regressors; the short-run constant is the ARDL intercept. Long-run coefficients equal $\beta_j/(1 - \phi)$, with delta-method standard errors. $F(8, 25) = 194.66$, $p < .001$.

Scaling the long-run coefficients by the sample standard deviations of the regressors gives a comparison of magnitudes. A one standard deviation change in the debt service-to-revenue ratio corresponds to 5.03 percentage points of the implementation rate, compared with 5.01 for the debt-to-GDP ratio, 3.45 for the domestic share, 2.38 for the oil revenue share, 1.53 for the long-term share, 1.49 for real GDP growth and 0.12 for the average interest cost.

**Figure 3**

*Actual and Fitted Capital Budget Implementation Rate, 1991–2024*




## Diagnostic and Stability Tests

The diagnostic tests in Table 7 do not reject their null hypotheses, since the Breusch-Godfrey ($p$ = .777), Breusch-Pagan ($p$ = .869), Jarque-Bera ($p$ = .783) and RESET ($p$ = .967) probabilities all exceed .05, and the Durbin-Watson statistic is 1.99. The CUSUM and CUSUM of squares statistics in Figure 4 remain inside the 5 per cent bands throughout 2000 to 2024. The variance inflation factors are 30.7 for the debt-to-GDP ratio and 15.6 for the domestic share, and between 1.2 and 7.5 for the remaining regressors.

**Table 7**

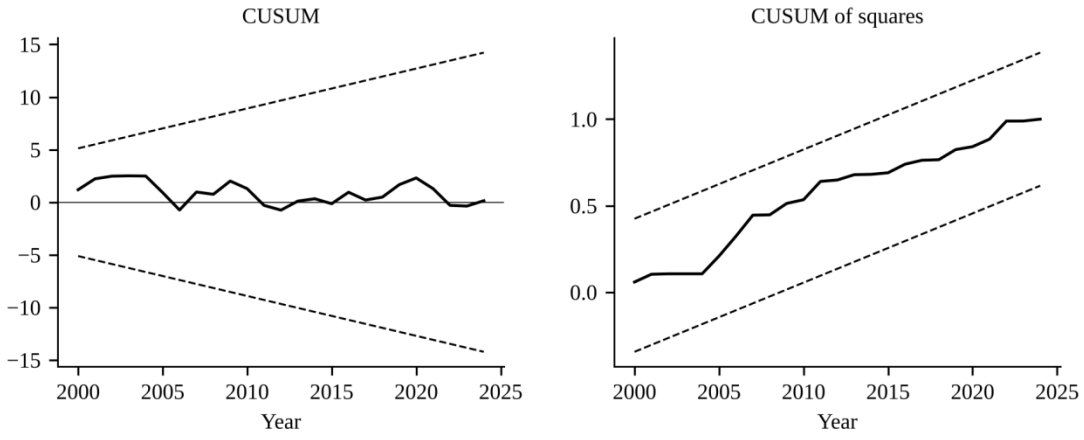
*Residual Diagnostics and Stability Tests*

| Test | Null hypothesis | *p* value | Outcome |
|---|---|---|---|
| Breusch-Godfrey LM (2 lags) | No serial correlation | .777 | Not rejected |
| Breusch-Pagan | Homoskedastic residuals | .869 | Not rejected |
| Jarque-Bera | Normally distributed residuals | .783 | Not rejected |
| Ramsey RESET (squared fitted values) | Correct functional form | .967 | Not rejected |
| CUSUM | Stable parameters | Within 5% bands | Stable |
| CUSUM of squares | Stable variance | Within 5% bands | Stable |

*Note.* Durbin-Watson = 1.99; standard error of regression = 1.13; maximum variance inflation factor = 30.7 (DGDP).

**Figure 4**

*CUSUM and CUSUM of Squares Tests of Parameter Stability*




*Note.* Dashed lines mark the 5% significance bands.

### Sensitivity Check with an Alternative Dependent Variable

In the re-estimation with capital expenditure as a share of total expenditure (mean 21.8 per cent, standard deviation 2.3, range 17.0 to 25.1 per cent), Table 8 shows long-run coefficients of −0.064 for the debt service-to-revenue ratio ($p < .001$), −0.071 for the domestic share ($p = .014$) and 0.062 for the long-term share ($p = .095$), while the average interest cost has a coefficient of 0.190 ($p = .327$). The error correction coefficient is −0.725 (standard error 0.121). The bounds statistic is 2.80, which lies between the lower and upper critical values at the 10 and 5 per cent levels. The Breusch-Godfrey, Breusch-Pagan, Jarque-Bera and RESET probabilities are .403, .870, .386 and .723.

## Discussion

### Findings in Relation to the Hypotheses

The long-run estimates reject three of the four null hypotheses (Table 9). The coefficient on the debt service-to-revenue ratio is −0.204, so a ten percentage point increase in the ratio is associated with a fall of about 2.0 percentage points in the implementation rate when the other variables are held constant. Across the observed range of the ratio, from 5.7 to 101.2 per cent, the implied difference is about 19.5 points, roughly 70 per cent of the 28.0-point range of implementation in the sample. The domestic share carries a coefficient of −0.210 and the long-term share +0.212, which imply that a domestic share ten points larger is associated with a 2.1 point lower rate and a long-term share ten points larger with a 2.1 point higher rate. The average interest cost has a coefficient of −0.061 with a standard error of 0.363, and its null is not rejected. The error correction coefficient of −0.904 indicates that about 90 per cent of a departure from the long-run relationship is removed within a year, which is rapid adjustment and close to the point at which correction would overshoot.

Two features of the estimates call for care in reading them. The simple correlation between the domestic share and the implementation rate is positive (0.34), so the negative long-run coefficient arises only after the debt service burden and the debt-to-GDP ratio are held constant. The domestic share is also highly correlated with the debt-to-GDP ratio (−0.96), and its variance inflation factor of 15.6, like the 30.7 for the debt-to-GDP ratio, indicates that the separate effects of these two variables are estimated less sharply than the standard errors alone suggest. The second feature concerns interest cost, which is strongly correlated in this sample with the debt-to-GDP ratio (0.90), the domestic share (−0.83) and the long-term share (−0.76). The absence of a statistically significant effect therefore does not show that borrowing costs are irrelevant, only that the sample does not separate their influence from that of the size and composition of debt.

A simple decomposition shows how much of the fall in implementation between 2013 and 2022 the long-run coefficients attribute to each variable. The implementation rate fell from 57.9 to 31.5 per cent, a decline of 26.4 points, and the coefficients applied to the changes in the regressors imply a decline of 25.2 points. The rise in the debt service-to-revenue ratio from 5.7 to 101.2 per cent accounts for 19.5 points of this, the higher debt-to-GDP ratio for 3.3 points, the lower long-term share (from 85.7 to 75.0 per cent) for 2.3 points and the lower oil revenue share for 1.4 points, while the lower domestic share and faster growth work in the opposite direction by 0.7 and 0.8 points and the higher interest cost adds 0.1 points to the decline. On this accounting the service burden carries roughly three-quarters of the predicted decline, which is the main reason for the policy emphasis that follows.

The sensitivity check supports the main conclusions, with qualifications that concern the maturity effect and the bounds test, Replacing the implementation rate with the capital share of total expenditure leaves the negative signs on debt service and the domestic share intact at conventional levels, and the long-term share keeps its positive sign but is significant only at the 10 per cent level. The coefficients are smaller in absolute terms (−0.064, −0.071 and 0.062), as expected for an outcome with a mean of 21.8 per cent and a standard deviation of 2.3, in comparison with 46.8 and 7.7 for the implementation rate. The interest cost coefficient changes sign (0.190) and remains statistically insignificant, which is consistent with the reading that the sample does not identify an independent cost effect. Because the bounds statistic for this specification falls between the critical values, the check supports the signs and relative importance of the main estimates but does not by itself establish cointegration.

The positive coefficient on the long-term share provides evidence on an indicator that the Nigerian studies reviewed here rarely measure. Longer maturities spread repayments over time and reduce the amount that must be refinanced from current revenue, which is consistent with the cost-risk argument that shorter and cheaper borrowing exposes the budget to refinancing pressure. The result is less firmly established than the service effect, since it is significant at the 5 per cent level in the main model ($p$ = .007) but only at the 10 per cent level in the sensitivity check ($p$ = .095). The linear specification is a further limit, because threshold studies suggest that the effect of debt depends on its level (Abu et al., 2022; Anisiobi et al., 2023; Nzeh, 2020; Ofino et al., 2025), and nonlinear effects are not tested here.

In theoretical terms, the findings favour the cost-risk and crowding-out channels over Ricardian neutrality (Busato, 2022; İkiz, 2020), because the burden and composition of debt are associated with real differences in capital execution. They leave room for the more favourable Keynesian view only where debt finances productive spending and service remains manageable (Angeletos et al., 2023; Ciaffi et al., 2024; Parui, 2023). The estimates are compatible with the state-level finding that effective debt management systems improve budget implementation (Aremu, 2026), although management systems and institutional quality, which Jibril and Naim (2024) link with public debt outcomes, are not measured directly here. Unlike Nepal, where Aryal (2026) finds no direct effect of

debt on capital expenditure, the Nigerian estimates attach clear effects to service and composition, a contrast that may reflect differences in revenue structure and debt profile, and the emphasis of Barngetuny (2025) on pairing productive investment with sustainable debt practices is consistent with the importance of the service burden found here. The oil revenue share has a positive coefficient (0.212), in line with the role of oil revenue in budget execution discussed by Ogungbade et al. (2022), whereas Ajibola et al. (2026) find petroleum profit tax unrelated to capital expenditure, a difference that may arise from the revenue measure and the outcome used. The evidence of Shah et al. (2023) that debt sustainability is generally high across African economies also implies that conclusions drawn from a country with a heavy service burden need not carry over to the continent as a whole.

# Conclusion

This paper examined whether the management of public debt is related to capital expenditure performance in Nigeria, using annual data for 1990 to 2024 and an ARDL model in which performance is the ratio of actual to budgeted capital expenditure. The bounds test supports a long-run relationship, and the error correction coefficient indicates that about 90 per cent of any deviation is corrected within a year. A higher debt service-to-revenue ratio and a larger domestic share of public debt are associated with a lower implementation rate, a larger long-term share is associated with a higher rate, and average interest cost has no statistically significant association. The same signs appear for debt service and the domestic share when capital expenditure as a share of total expenditure replaces the implementation rate, and the long-term share is then significant only at the 10 per cent level. The findings point to the burden of debt service and the maturity and domestic composition of borrowing as the channels through which debt management relates to capital budget execution.

Several limitations qualify these findings, the first being that the sample contains 34 usable annual observations, which limits the degrees of freedom and means that the bounds test relies on asymptotic critical values. The debt-to-GDP ratio and the domestic share are highly collinear, which reduces the precision with which their separate effects can be read. Average interest cost and maturity are portfolio averages that do not capture changes in the terms of new issuance within a year, and the implementation rate combines delays in budget release with weak project execution, which the data do not allow to be separated. In the sensitivity check the bounds statistic (2.80) lies between the lower and upper critical values at the 5 per cent level, so the long-run relationship for that specification rests on the error correction coefficient (−0.725) and cannot be confirmed by the bounds test alone. Further work could use quarterly data, apply threshold or asymmetric ARDL specifications along the lines of Abu et al. (2022), separate external from domestic debt service, add measures of institutional quality in the spirit of Jibril and Naim (2024), and compare federal and state outcomes as Aremu (2026) does for selected states.

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