

**PUBLIC DEBT AND EXTERNAL RESERVE MANAGEMENT: IMPLICATIONS
FOR FINANCIAL EDUCATION IN NIGERIA**

MICHAEL, SARO S., PHD

Department of Banking and Finance
Kenule Beeson Saro-Wiwa Polytechnic, Bori

THOMAS, BARRIERE, PHD

Department of Business Education – Accounting
Rivers State University, Nkpolu-Oroworukwo, Port Harcourt

IKOLE DORNUBARI, PHD

Department of Banking and Finance
Kenule Beeson Saro-Wiwa Polytechnic, Bori

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ABSTRACT

This study examines how domestic debt (DMD), external debt (EXD), and debt service (DSV) jointly influence Nigeria's external reserves (EXRSV) over 1990–2024. Using annual time series data from the Central Bank of Nigeria and the Debt Management Office, the paper applies the Auto Regressive Distributed Lag (ARDL) estimation technique to identify both long-run relationships and short-run dynamics. The results revealed that a stable long-run relationship exists between the study variables, with domestic debt having a large and negative long-run effect on reserves, while external debt and debt service have positive long-run associations, respectively. The error-correction term also showed rapid adjustment – about 65% of disequilibrium is corrected each year. In the short-run, debt service significantly reduces reserves, and lagged domestic-debt changes show temporary positive effects. The findings imply that debt composition and servicing schedules matter for reserve adequacy. Thus, policy should limit excessive domestic borrowing; prioritize concessional external finance for productive projects, smooth debt-service profiles to protect reserve buffers while broadening financial literacy and education for proper debt and reserve management.

KEYWORDS: - Domestic Debt, External Debt, External Reserve Management, and Financial Education.

1.0 INTRODUCTION

The performance of a country's foreign sector, its balance of payments, external reserves and external borrowing is central to macroeconomic stability, monetary policy space and the capacity to absorb external shocks. Robust foreign-sector outcomes underpin exchange-rate credibility, import capacity, and the ability of monetary authorities to stabilize domestic liquidity; conversely, weak external positions raise sovereign financing costs, constrain policy choices and amplify vulnerability to sudden stops. Empirical studies emphasize these links: reserve holdings act as a buffer against external shocks and a signal of repayment capacity, while external borrowing and debt service shape reserve dynamics and exchange-rate pressures (Baksay, Karvalits, & Kuti, 2012; Ayunku & Markjackson, 2020).

Nigeria's foreign sector has shown large swings over recent decades. After a sustained build-up of reserves in the 2000s, reserves plateaued and then fell in the aftermath of the 2008 crisis and subsequent oil price shocks; at the same time, external debt has risen again in the 2010s and 2020s. Recent country studies document that "external reserves have not exceeded \$53 billion since 2008, while external debts have risen to approximately \$76 billion in 2021," and balance-of-payments deficits have become more frequent, leaving the economy more exposed to external shocks (Umennadi et al., 2024, p. 1270). These trends matter because they reflect both commodity dependence and the interaction of borrowing, debt service and reserve management in Nigeria's policy record (Senibi et al., 2016; Udenwa et al., 2023).

Several structural and cyclical factors drive Nigeria's external-sector performance. First, commodity dependence, especially oil, makes export receipts and reserves highly procyclical; oil price swings translate quickly into reserve volatility and BOP swings (Umennadi et al., 2024). Second, exchange-rate policy and market segmentation affect reserve demand and the cost of servicing foreign obligations; multiple exchange-rate regimes and FX market distortions raise uncertainty and reserve outflows (Ayunku & Markjackson, 2020; Baksay et al., 2012). Third, capital-flow composition and maturity matter: short-term or volatile foreign liabilities increase reserve needs and rollover risk, while long-term concessional borrowing eases immediate pressure (Utaan, Kwanashie, & Olusola, 2026). Finally, debt service obligations, the timing and currency composition of principal and interest payments, directly draw on reserves and can crowd out other external uses (Senibi et al., 2016; Saheed, Sani, & Idakwoji, 2015).

Public debt is therefore tightly linked to foreign-sector outcomes through several channels. External (foreign-currency) debt increases gross external liabilities and, when drawn, can temporarily raise reserves; but repayments and debt services are paid out of reserves or foreign receipts and can deplete buffers. Empirical work for Nigeria finds mixed but important effects: some studies report that external debt stock has a negative and statistically significant impact on

reserves, while debt service may have either an ambiguous or erosion effect depending on composition and timing (Ayunku&Markjackson, 2020; Udenwa et al., 2023). As one recent review puts it, “external debts had a negative significant impact on external reserves while external reserves had a negative insignificant impact on external debts.” (Umennadi et al., 2024, p. 1269). At the same time, domestic debt and its servicing can influence reserves indirectly via crowding-out, exchange-rate pressures and fiscal-monetary interactions (Senibi et al., 2016; Saheed et al., 2015).

Despite this literature, important gaps remain and motivate a focused assessment. Many prior studies examine one-sided relationships (for example, external debt → reserves, or reserves → BOP) or aggregate “public debt” without disaggregating domestic debt, external debt and debt-service flows (Umennadi et al., 2024; Udenwa et al., 2023). Methodologically, different papers use VAR/Granger causality, ARDL, FMOLS or DOLS, producing complementary but not fully reconciled evidence (Senibi et al., 2016; Ayunku&Markjackson, 2020). The point of departure for the present line of inquiry is therefore to assess jointly and explicitly how domestic debt, external debt and debt-service payments each affect Nigeria’s foreign reserves both in the short run and the long run using techniques that address endogeneity and dynamic feedback (e.g., VAR/structural VAR, cointegration with FMOLS/DOLS, and causality tests) as recommended in the recent literature (Umennadi et al., 2024; Udenwa et al., 2023).

This study is justified on both policy and academic grounds. Policymakers need disaggregated evidence to design debt-management strategies that preserve reserve adequacy while a careful decomposition of debt types and debt-service timing fills a documented gap: prior work either focuses on external debt alone or treats reserves and debt in isolation. By estimating the separate effects of domestic debt, external debt and debt service on foreign reserves and by testing causal directions, the study contributes clearer guidance on which forms of borrowing are most compatible with reserve stability, which debt-service patterns pose the greatest risk to external buffers and the imperatives for financial education in Nigeria.

2.0 LITERATURE REVIEW

External resources (foreign-exchange reserves) are the official foreign-currency assets that a country’s monetary authorities hold to meet external payment needs and to insure against shocks. External reserves are the stock of foreign-currency assets held by a country’s monetary authorities to meet balance-of-payments needs, intervene in foreign-exchange markets, and provide a buffer against external shocks. It is typically measured as the Central Bank of Nigeria’s reported holdings of foreign currency, gold, Special Drawing Rights (SDRs) and reserve positions at the IMF (CBN Statistical Bulletin series). Empirical studies use either the level of reserves (US\$ millions) or reserve ratios (reserves-to-imports, reserves-to-short-term external

debt, or reserves-to-GDP) to capture adequacy and vulnerability (Senibi et al., 2016; Umennadi et al., 2024).

Public debt (or government debt) is the accumulated stock of past government borrowing outstanding at a point in time. It is commonly disaggregated into domestic (internal) debt – debt issued in local currency to resident creditors, and external (foreign) debt – liabilities owed to non-residents and repayable in foreign currency, goods or services (Saka, 2021; Udenwa et al., 2023). Domestic debt comprises government liabilities issued in local currency (treasury bills, bonds, development stocks) and is measured as the stock outstanding or as a share of GDP. Domestic debt matters for external performance because large domestic borrowing can crowd out private credit, raise interest rates, and indirectly affect capital flows and exchange-rate pressures (Saheed, Sani, & Idakwoji, 2015; Wahab & Omale, 2025).

External (foreign) debt denotes government and publicly guaranteed liabilities owed to non-residents and repayable in foreign currency, goods or services. It is further classified by creditor type (multilateral, bilateral, commercial) and by maturity (short-term vs long-term). Measurement choices in the reviewed studies include (a) the stock of external debt (US\$), (b) external debt as a share of GDP, and (c) short-term external debt or external debt service (flows). Multilateral and bilateral sub-categories are also used where data permit (Udenwa et al., 2023; Ayunku & Markjackson, 2020).

A key metric usually associated with public debt is debt service. Debt service is the sum of principal and interest payments actually paid in a period. It is a flow variable that directly draws on foreign exchange receipts and reserves when denominated in foreign currency. Studies measure debt service as annual US\$ payments, or as debt-service-to-exports or debt-service-to-reserves ratios to capture pressure on external buffers (Senibi et al., 2016; Utaan, Kwanashie, & Olusola, 2026).

Theoretical Framework

This study is framed by two complementary theoretical strands that explain why debt composition and debt-service flows matter for external reserves: dual-gap theory and debt overhang theories. The Dual-gap (savings–investment and foreign-exchange) theory, proposed by Chenery and Strout (1966), argues that developing countries borrow externally to fill a savings gap (domestic savings < investment) and/or a foreign-exchange gap (imports needed for development exceed export earnings). External borrowing can therefore raise investment and foreign exchange in the short run, supporting reserve accumulation and growth. The theory justifies external borrowing when funds finance productive, foreign-exchange-earning projects. In Nigeria, external loans are used to finance infrastructure and to smooth BOP shortfalls

(Ayunku&Markjackson, 2020; Isiaka et al., 2022). The dual-gap lens motivates disaggregating debt into domestic vs external stocks and examining whether borrowing has been channelled into productive uses that support reserve accumulation or instead into consumption/recurrent spending that increases debt-service pressure.

Debt-overhang theory (Krugman, 1988; Pattillo et al., 2002) posits a non-linear relationship between debt and growth: up to a point debt can finance productive investment, but beyond a threshold it discourages investment, raises risk premia and reduces growth. Debt service becomes an implicit tax that crowds out investment and can trigger capital flight. Recent empirical work extends this to external-reserve dynamics: high debt and heavy debt service raise rollover risk and reserve requirements, and may force reserve drawdowns or emergency borrowing (Baksay et al., 2012; Senibi et al., 2016). The debt-overhang framework motivates testing whether the effect of debt on reserves is linear or threshold (e.g., whether external debt only reduces reserves beyond certain stock or service thresholds), and whether domestic vs external debt differ in their threshold effects.

Empirical Review

There have been several empirical attempts at estimating the link between public debt and foreign reserves in Nigeria and beyond. Senibi et al. (2016) estimated the long-run relationship between public debt and Nigeria's external reserves for the period 1981–2013. Using official CBN and related national series, analyzed with the Fully Modified OLS (FMOLS), they found that aggregate public debt is positively and significantly associated with external reserves in the long run. Ayunku and Markjackson (2020) examine how external debt affects Nigeria's foreign-exchange reserve portfolios using annual data spanning 1981–2018 drawn from the World Development Indicators and national sources. Their error-correction model (ECM) and OLS specifications showed that external debt stock exerts a negative and statistically significant effect on reserves, while debt-service flows register a small, statistically insignificant positive association.

Umennadi et al. (2024) investigate the three-way interrelationship among external debt, the balance of payments (BOP) and external reserves for Nigeria over 1990–2021. Using CBN, DMO and World Bank series, they estimate a vector autoregression (VAR) system and run pairwise Granger-causality tests after standard stationarity checks. The study finds that external debt has a negative and significant impact on external reserves and documents mixed causality patterns, most notably a unidirectional influence from external debt to the BOP.

Udenwa et al. (2023) focus on creditor composition by testing how multilateral versus bilateral external debt affects Nigeria's reserves using quarterly CBN and DMO data from 2009Q1 to

2022Q4. After Phillips-Perron unit-root tests and Johansen cointegration, they estimate long-run coefficients with Dynamic OLS (DOLS) to address endogeneity and serial correlation. They found that multilateral debt significantly influences external reserves, whereas bilateral debt does not. Saheed, Sani and Idakwoji (2015) analyze the link between public external debt, debt service and the exchange rate in Nigeria using OLS on 1981–2013 CBN/DMO data. Their regressions show that external debt, debt service and foreign reserves are all statistically significant determinants of the naira exchange rate, with debt service emerging as the strongest transmission channel.

Baksay, Karvalits and Kuti (2012) provide an institutional context from Hungary. Using central-bank data decomposition and institutional analysis, the authors show that foreign-currency debt issuance can raise reserves but creates trade-offs, notably reserve-adequacy assessment problems, sterilization costs for the central bank, and vulnerability to sudden stops. Ayodele et al. (2019) and Osadime and Okene (2021) contribute to the development-oriented strand by linking external reserves and external debt to broader development indicators. Using a mix of OLS, FMOLS and cointegration techniques on national series, these studies report mixed long-run effects: in some specifications, external debt shows a small positive association with development outcomes, while reserve effects vary by period and control variables.

Tsenkwo and Gukat (2018) examine debt stock, debt servicing and reserve accretion in Nigeria (1986–2016) using Engle-Granger cointegration and error-correction modelling. Their results indicate long-run relationships in which domestic debt and debt servicing can have positive long-run associations with reserves, while external debt tends to exert a negative effect. Rangkuty and Hidayat (2021), studying Indonesia (1988–2017) with Two-Stage Least Squares (TSLS), find a bidirectional positive relationship between foreign debt and reserves: foreign borrowing increases reserves, and higher reserves facilitate further borrowing.

Akamobi & Ugwunna (2017) and Osigwe et al. (2015) investigate determinants of reserve holdings in Nigeria using ARDL and ECM frameworks and CBN data. Both studies consistently identify oil exports, GDP and capital inflows as primary drivers of reserves; debt variables enter with mixed signs depending on specification. Ndubuisi (2017) explores the interactions among external debt, debt service, reserves and economic growth for 1985–2015 using Johansen cointegration and an error-correction model. The study finds that external debt stock is positively associated with growth, while debt service negatively affects growth; reserves and the exchange rate also play important roles.

Isiaka et al. (2022) apply Granger causality and threshold regression techniques to test the relationship between public debt and exports in Nigeria (1981–2017). Using CBN/DMO/WDI data, they show that exports Granger-cause external debt (one-way causality) and identify thresholds beyond which domestic and external debt relative to exports begin to crowd out export performance.

3.0 METHODOLOGY

This study assesses how domestic debt, external debt and external debt-service affect Nigeria's external reserves for 1990–2024. It utilized annual time series data from the Central Bank of Nigeria (CBN) Statistical Bulletin. The empirical strategy combines careful data construction, time-series diagnostics, cointegration-based long-run estimation, and short-run dynamics so that results are policy-relevant and statistically sound. The estimation technique employed is the Auto Redistributed lag (ARDL) analytical technique, which is plausible for $I(1)$ or mixed integrated series and robust to serial correlation, especially for limited observations. The model employed in the study is as follows:

$$\text{EXRSV} = f(\text{DMD}, \text{EXD}, \text{DSV}) \quad (1)$$

Representing the function econometrically,

$$\text{EXRSV} = \beta_0 + \beta_1 \text{DMD} + \beta_2 \text{EXD} + \beta_3 \text{DSV} + \mu \quad (2)$$

Where EXRSV = External Reserve, DMD = Domestic Debt Stock, EXD = External Debt Stock, DSV = Debt service, β_0 = Constant, $\beta_1 - \beta_3$ = Coefficients of independent variables, and μ = Error Term

A priori, $\beta_1, \beta_2 > 0 > \beta_3$

4.0 RESULTS AND DISCUSSION

Table 1: Descriptive Statistics

	DMD	EXD	DSV	EXRSV
Mean	12.10015	19.06660	17.61818	8.940607
Median	10.38810	11.65593	11.10000	8.484994
Maximum	25.37349	60.36916	58.91325	18.62793
Minimum	5.772015	1.243642	3.249052	1.137331
Std. Dev.	5.263572	19.28968	14.36113	4.406501
Skewness	1.113984	0.860160	1.142770	0.360874
Kurtosis	3.202359	2.396338	3.418209	2.711940

Jarque-Bera	7.298652	4.847366	7.872947	0.880685
Probability	0.026009	0.088595	0.019517	0.643816
Observations	35	35	35	35

Source: Author's Computation

From Table 1, Domestic debt (DMD) as a ratio of GDP averages about 12%, with moderate variability and a right-skewed distribution. Its Jarque–Bera test rejects normality, suggesting occasional high values distort the distribution. External debt (EXD), also as a ratio of GDP, is the largest on average (mean 19%), but also the most volatile. It is moderately skewed and only marginally non-normal, reflecting episodic borrowing spikes. Debt service (DSV) as a ratio of total revenue has a mean of 17.6 and is highly variable. Its distribution is right-skewed and non-normal, confirming that servicing obligations are uneven and concentrated in certain periods. By contrast, external reserves (EXRSV), as a ratio of GDP, are the smallest and most stable, averaging 8.9 with a narrower range and relatively symmetric distribution. The Jarque-Bera test does not reject normality for reserves.

Table 2: Augmented Dickey-Fuller (ADF) Unit Root Test

Variables		t-statistic	Critical value (0.05)	Prob.	Order of Integration
DMD	Level	-0.730968	-2.951125	0.8254	I(1)
	1 st Difference	-4.416121	-2.954021	0.0014	
EXD	Level	-2.269334	-2.951125	0.1872	I(1)
	1 st Difference	-4.103197	-2.954021	0.0031	
DSV	Level	-0.608162	-2.951125	0.8558	I(1)
	1 st Difference	-7.365304	-2.954021	0.0000	
EXRSV	Level	-2.408308	-2.954021	0.1473	I(1)
	1 st Difference	-5.130444	-2.957110	0.0002	

Source: Author's Computation

The result in Table 2 reveals that all the variables are integrated and their first differences, I(1).

Table 3: ARDL Bounds (Cointegration) Long-run Test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DMD	-1.852314	0.358948	-5.160396	0.0000

EXD	0.285131	0.078378	3.637879	0.0016
DSV	0.238131	0.100913	2.359769	0.0286
C	22.61563	2.319098	9.751911	0.0000
EC = EXRSV - (-1.8523*DMD + 0.2851*EXD + 0.2381*DSV + 22.6156)				
F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	6.018018	10%	2.37	3.2
K	3	5%	2.79	3.67
		1%	3.65	4.66

Source: Author's Computation

The result in Table 3 reveals the presence of a long-run dynamic relationship between the variables. All the variables also demonstrate significant influences in the long run.

Table 4: Error Correction Test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DMD)	-0.014518	0.173327	-0.083758	0.9341
D(DMD(-1))	1.043089	0.237075	4.399830	0.0003
D(DMD(-2))	0.360266	0.192199	1.874448	0.0756
D(EXD)	-0.011505	0.050305	-0.228702	0.8214
D(DSV)	-0.218668	0.060266	-3.628381	0.0017
D(DSV(-1))	-0.168861	0.074447	-2.268210	0.0345
D(DSV(-2))	-0.271534	0.056855	-4.775867	0.0001
CointEq(-1)*	-0.646902	0.107656	-6.009002	0.0000
R-squared	0.754080	Mean dependent var		0.183577
Adjusted R-squared	0.682353	S.D. dependent var		3.553591
S.E. of regression	2.002809	Akaike info criterion		4.439297
Sum squared resid	96.26990	Schwarz criterion		4.805731
Log likelihood	-63.02875	Hannan-Quinn criter.		4.560759
Durbin-Watson stat	1.495127			

Source: Author's Computation

From the results in Table 4, 68.2% of the variations in EXRSV are explained by the independent variables. The error-correction term (-0.6469 , $p=0.0000$) shows that 64.5% of any disequilibrium is corrected each period, implying rapid return to the long-run equilibrium. All the variables show negative influences on EXRSV, but only DSV is significant, as well as the one-period lag of DMD.

4.1 DISCUSSION OF FINDINGS

The cointegration equation and error-correction term (-0.65 , $p<0.01$) confirm that reserves adjust strongly to restore long-run equilibrium, with about 65% of disequilibrium corrected each year. This stability validates the hypothesis of a long-run relationship and shows that reserves are responsive to debt dynamics. The relatively high R-squared (0.75) indicates that the debt variables explain a substantial share of reserve movements. Comparable studies have reported similar adjustment speeds: Umennadi et al. (2024) found significant cointegration among external debt, balance of payments and reserves, with reserves adjusting strongly to debt shocks; Tsenkwo&Gukat (2018) also documented error-correction terms that confirmed stable long-run links between debt and reserves.

In the long run, domestic debt has a large and statistically significant negative effect on external reserves (-1.85 , $p<0.01$). This suggests that rising domestic borrowing erodes reserve holdings, consistent with the idea that domestic debt financing is often inflationary or crowding-out, leaving fewer resources to build reserves. In the short run, however, current changes in domestic debt are insignificant, while lagged changes (especially at one lag) are strongly positive. This indicates that increases in domestic debt may temporarily support reserves, perhaps through short-term liquidity injections, but ultimately undermine them over time. This pattern echoes findings by Tsenkwo&Gukat (2018), who reported differing reserve effects for domestic versus external debt, and supports the a priori expectation that domestic debt is less supportive of reserve accumulation.

External Debt (EXD) long-run coefficient is positive and significant (0.29 , $p<0.01$), implying that external borrowing contributes to reserve accumulation. This is consistent with episodes when concessional loans or multilateral inflows are deposited at the central bank, boosting reserves. In the short run, however, changes in external debt are insignificant, suggesting that its effect is felt only over longer horizons. This aligns with Senibi et al. (2016) and Udenwa et al. (2023), who found that external debt, especially multilateral, can strengthen reserves when well-managed, but its short-run impact is muted.

Debt Service (DSV) in the long run, surprisingly, shows a positive and significant effect (0.24, $p < 0.05$). This may reflect the fact that debt-service obligations are scheduled alongside reserve management, so higher servicing is associated with maintaining larger buffers. However, the short-run dynamics tell a different story: contemporaneous and lagged changes in debt service are consistently negative and significant, showing that actual payments immediately draw down reserves. While debt service is planned for in reserve accumulation strategies, the act of servicing drains reserves in the short run. This finding is consistent with Saheed et al. (2015) and Ndubuisi (2017), who highlighted debt service as a contractionary channel that pressures reserves and exchange rates.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The results demonstrate that Nigeria's external reserves are closely tied to debt dynamics and respond both in the long run and short run to changes in domestic debt, external debt, and debt service. The ARDL bounds test confirms a stable cointegrating relationship, while the error-correction term shows that about 65% of disequilibrium is corrected each year, indicating rapid adjustment back to equilibrium. The study infers that debt composition and servicing patterns are critical determinants of Nigeria's reserve stability. Domestic debt erodes reserves, external debt can strengthen them if well-managed, and debt service is a dual channel – planned accumulation in the long run but immediate depletion in the short run. The evidence validates the hypothesis of a long-run debt-reserve relationship and highlights the need for balanced debt management, prudent borrowing, and careful reserve planning to safeguard Nigeria's external stability. Consequently, the following policy recommendations are advocated:

1. Limit reliance on domestic borrowing, strengthen fiscal discipline, and broaden revenue sources to reduce pressure on reserves.
2. Prioritize concessional and multilateral loans with favourable terms, and ensure borrowed funds are invested in productive projects that generate foreign exchange.
3. Smooth repayment schedules through refinancing or rescheduling, maintain adequate buffers, and align servicing with reserve adequacy targets. Integrate debt and reserve management strategies, using reserves both as buffers for debt service and as tools to stabilize the exchange rate and investor confidence.
4. Timely and effective financial education on public debt and external reserve management for better policy and strategy application.

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