EXTERNAL PUBLIC DEBT AND DEBT SERVICING IN NIGERIA: EVIDENCE FROM A NONLINEAR ARDL MODEL

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Abstract
This study examines the asymmetric effects of external public debt, inflation, exchange rate, and fiscal deficit, on Nigeria's debt servicing obligations using annual time-series data spanning 1982–2024 sourced from the World Development Indicators (WDI) and the Debt Management Office (DMO). The empirical analysis proceeds in several stages. The descriptive results indicate that debt servicing and external public debt are relatively stable, whereas inflation and exchange rate exhibit significant volatility. The BDS test confirms the presence of nonlinear dynamics in most variables, justifying the use of a nonlinear modeling framework. The unit root tests reveal a mixed order of integration with evidence of structural breaks, supporting the suitability of the NARDL approach. The bounds test confirms a long-run co-integration relationship among the variables. Empirical findings reveal significant asymmetric effects in both the short and long run. Positive shocks to external public debt, inflation, exchange rate depreciation, and fiscal deficits increase debt servicing obligations, while negative shocks generally have weaker or insignificant mitigating effects. Exchange rate and fiscal variables exert strong short-run impacts, highlighting the economy's sensitivity to macroeconomic instability. The dynamic multiplier analysis further confirms asymmetric adjustment paths, with positive shocks having more persistent effects than negative shocks. The study concludes that Nigeria's debt servicing challenges are driven by external debt accumulation, exchange rate volatility, inflationary pressures, and persistent fiscal deficits. It recommends strengthening fiscal discipline, improving exchange rate management, enhancing domestic revenue mobilization, and adopting prudent external borrowing strategies to ensure debt sustainability and macroeconomic stability.

Keywords: debt servicing, external public debt, NARDL, fiscal deficit, exchange Rate, Inflation.

1.0 Introduction

Public debt and debt servicing have become central macroeconomic worries across both developed and developing economies, particularly in the wake of recurrent global shocks such as the 2008 global financial crisis, the COVID-19 pandemic, and sustained commodity price volatility. Governments increasingly resort to borrowing to finance fiscal deficits, stabilize economic activity, and support development objectives. However, rising public debt has been accompanied by escalating debt servicing obligations,

which often crowd out critical public expenditure on infrastructure, health, education, and social protection. International financial institutions have consistently warned that excessive debt servicing burdens can undermine macroeconomic stability, erode fiscal space, and weaken long-term growth prospects (IMF, 2022). The challenge of debt servicing is especially acute in developing and resource-dependent economies where external public debt constitutes a substantial share of total public borrowing. External debt is largely denominated in foreign currencies, making its servicing highly sensitive to exchange rate movements, inflationary pressures, and global financial conditions. Exchange rate depreciation raises the domestic currency cost of servicing foreign liabilities, while persistent fiscal deficits and inflation further constrain governments' repayment capacity. Consequently, economies with narrow export bases and volatile foreign exchange earnings are particularly vulnerable to external debt-induced fiscal stress (Baldacci et al., 2015).

This vulnerability is evident across Sub-Saharan Africa, where many countries rely heavily on external borrowing to bridge financing gaps arising from weak domestic revenue mobilization, low savings, and large infrastructure deficits. According to the World Bank (2021), debt service payments in the region more than doubled between 2010 and 2020, driven largely by increased external borrowing and adverse exchange rate movements. Countries such as Ghana, Kenya, and Zambia have experienced severe fiscal stress linked to mounting external debt servicing obligations, culminating in debt distress and restructuring efforts. These developments highlight the importance of understanding how external public debt interacts with key macroeconomic variables to shape debt servicing dynamics in developing economies.

Nigeria represents a particularly important case in this discourse given its rising external debt exposure and high debt service-to-revenue ratio. Data from the Debt Management Office (DMO, 2023) show that Nigeria's total public debt exceeded ₦87 trillion in 2023, with external debt accounting for a growing share. More critically, debt servicing consumed over 90% of government revenue in 2022, highlighting severe fiscal pressure. Persistent fiscal deficits, exchange rate volatility, rising inflation, and sluggish economic growth have further increased the cost of servicing external obligations. While external borrowing is often used to finance development and bridge infrastructure gaps, the growing share of revenue devoted to debt servicing raises serious concerns about fiscal sustainability and development financing (World Bank, 2023).

A growing body of empirical literature has examined the determinants of debt servicing in Nigeria, emphasizing the roles of exchange rate depreciation, inflation, fiscal imbalance, and economic growth (Lawal et al., 2018; Okon & Effiong, 2019; Ogunyemi, 2020; Adeleke & Ajayi, 2021). However, most existing studies rely on linear econometric frameworks, implicitly assuming that positive and

negative changes in key macroeconomic variables exert symmetric effects on debt servicing. This assumption is particularly restrictive in the context of external public debt, where exchange rate depreciation may exacerbate debt servicing costs more sharply than appreciation reduces them, and inflationary shocks may have stronger adverse effects than disinflationary episodes.

From a theoretical perspective, the debt overhang and crowding-out hypotheses suggest that excessive external debt servicing obligations can discourage private investment, weaken investor confidence, and constrain long-run growth (Iyoha, 1999; Sulaiman & Azeez, 2012). In contrast, Keynesian and endogenous growth theories argue that borrowing can enhance growth if efficiently allocated to productive and export-generating investments. In Nigeria, however, worries persist that a significant portion of borrowed funds is directed toward recurrent expenditure rather than growth-enhancing projects, thereby intensifying long-term debt servicing pressures (Onwuka & Ikpefan, 2020; Udoh & Udeaja, 2021).

Despite successive debt management initiatives, Nigeria continues to allocate a disproportionate share of its revenue to servicing external debt, leaving limited fiscal space for capital investment and social spending. This situation has intensified debates regarding the sustainability of Nigeria's debt trajectory and its implications for macroeconomic stability, poverty reduction, and economic development (Audu & Okumoko, 2018). Moreover, the inconclusive empirical evidence on the debt–growth–debt servicing nexus underscores the need for more robust analytical approaches capable of capturing nonlinear and asymmetric relationships among macroeconomic variables (Pesaran et al., 2001).

Against this backdrop, the persistent rise in Nigeria's external public debt, coupled with escalating debt servicing obligations and macroeconomic fragility, reveals a critical research gap. This study addresses this gap by employing a Nonlinear Autoregressive Distributed Lag (NARDL) framework to examine the asymmetric effects of external public debt, inflation, exchange rate, fiscal deficit, and economic growth on Nigeria's debt servicing dynamics over the period 1982–2024. The findings are expected to provide policy-relevant intuitions into external debt sustainability and macroeconomic management in Nigeria. The aim of this study is to examine how external public debt, inflation, exchange rate, and fiscal deficit affect Nigeria's debt servicing obligations, with a particular focus on capturing their asymmetric (nonlinear) short- and long-run effects using the NARDL approach.

2.0 Literature Review

A growing body of empirical studies have examined the determinants of debt servicing obligations in developing economies, with particular emphasis on external public debt, inflation, fiscal deficits, and exchange rate dynamics. These studies generally acknowledge that the burden of servicing external debt is shaped not only by the volume of

debt but also by macroeconomic instability, currency movements, and fiscal management practices.External public debt refers to borrowings by government from foreign sources, typically denominated in foreign currencies, and is often used to finance budget deficits and development projects (Krugman, 1988; Sachs, 1989). While such debt can support investment and growth, its sustainability depends on macroeconomic conditions, particularly inflation, exchange rate stability, and fiscal discipline. Inflation, defined as a persistent rise in the general price level, erodes purchasing power and increases nominal interest rates, thereby raising the cost of debt servicing (Egwaikhide, 1999). Fiscal deficits occurring when government expenditure exceeds revenue often necessitate borrowing, contributing to debt accumulation and future servicing obligations (Sulaiman & Azeez, 2012). Exchange rate dynamics are particularly critical in the context of external debt, as currency depreciation increases the domestic currency cost of servicing foreign-denominated debt, thereby worsening fiscal pressure (Aliyu & Usman, 2013). Debt servicing itself represents the repayment of principal and interest on accumulated debt and serves as a key indicator of fiscal sustainability; high servicing burdens can crowd out public investment and constrain economic growth (Adegbite et al., 2008). Collectively, these variables are interrelated, with macroeconomic instability amplifying the burden of external debt servicing, especially in developing economies like Nigeria.

This study is anchored on the Debt Overhang Hypothesis (Krugman, 1988; Sachs, 1989), which suggests that excessive external debt discourages investment and growth, especially when exchange rate depreciation and inflation increase servicing costs. It also draws on the Twin Deficit Hypothesis, linking fiscal deficits to external imbalances and rising debt burdens. The study incorporates asymmetry theory, recognizing that increases and decreases in external debt, exchange rate, and inflation may have unequal effects on debt servicing. This motivates the use of the Nonlinear Autoregressive Distributed Lag (NARDL) model (Shin et al., 2014).

Recent studies provide important intuitions into these dynamics. Ngbede and Philip (2025) examined the relationship between budget deficit financing and inflation in Nigeria using ECM, Johansen co-integration, and FMOLS techniques. Their findings indicate that budget deficit financing did not significantly induce inflation, although reductions in deficits were paradoxically associated with inflationary pressures largely attributed to oil price volatility and security challenges. While their study did not directly model debt servicing, it highlights the fiscal–inflation channel through which external debt servicing pressures may intensify. Similarly, Salisu, Alabbas, and Haladu (2024), employing a nonlinear ARDL framework for the period 1980–2022, found that external debt servicing and exchange rate movements exerted positive long-run effects on economic growth, whereas external debt stock negatively affected output. Their results underscore the asymmetric role of debt servicing and the importance of

allocating borrowed funds to productive investments.

In a related study, Ndu (2024) established that both domestic and external debt servicing significantly affected GDP, concluding that debt servicing in Nigeria has largely been a burden rather than a catalyst for growth. This finding aligns with Yusuf and Mohd (2023), who applied a nonlinear ARDL model for 1980–2020 and reported that while external debt stock positively influenced growth, external debt servicing consistently retarded economic performance, supporting the debt overhang hypothesis. Onwuka and Okorie (2023) further examined the relationship between public debt and debt servicing using a linear ARDL framework and confirmed a significant association, though their approach did not account for possible asymmetric effects.

At the institutional level, the World Bank (2023) provides comprehensive evidence on Nigeria's rising interest-to-revenue ratio, emphasizing the growing vulnerability of public finances to both external and domestic shocks. Udoh and Udeaja (2021), using an asymmetric ARDL approach, show that fiscal deficits have nonlinear inflationary effects in Nigeria, implying that fiscal imbalances can indirectly amplify external debt servicing burdens through rising prices. Similarly, Sani and Nwite (2021) argue that Nigeria's external debt burden undermines growth unless accompanied by credible fiscal and structural reforms, reinforcing sustainability worries raised by multilateral institutions.

Several studies focus explicitly on the growth and servicing implications of external debt. Idris and Aliyara (2022) reported that foreign debt servicing exerted a negative and insignificant effect on GDP, concluding that Nigeria's external debt burden weakens growth performance. Otiko and Iheonkhan (2022) extended this analysis by introducing corruption as a moderating variable, finding that although foreign debt servicing significantly influenced growth, corruption weakened its potential benefits. Similarly, Akanbi, Uwaleke, and Ibrahim (2022) found that external debt servicing had a negative but insignificant effect on growth, suggesting a resource-depletion effect. Using Ethiopian data, Awol (2022) showed that while external debt reduced growth, debt servicing exerted a positive influence, highlighting the context-specific nature of debt outcomes.

Earlier Nigerian studies also emphasize the macroeconomic channels through which external debt servicing operates. Adegboyega (2021) found that debt servicing and exchange rate volatility negatively affected growth, recommending frameworks that compare returns on borrowed funds with servicing costs. Edeminam (2021) showed that debt servicing relative to GDP exerted a negative effect on growth in both the short and long run. Grace, Oluwayemisi, and Femi (2019) corroborated these findings, demonstrating that external debt and debt servicing undermined growth, although exchange rate depreciation occasionally played a mitigating role through export competitiveness.

Onwuka and Ikpefan (2020) linked public debt, exchange rate dynamics, and growth in Nigeria, finding that depreciation and weak growth jointly worsen the debt servicing ratio. Muhammad and Abdullahi (2020), using ARDL techniques, reported that external debt servicing depressed long-run growth and recommended channeling external loans to tradable and infrastructure sectors. Similarly, Audu and Okumoko (2018) showed that rising public debt, weak non-oil revenue, and high yields create a feedback loop that elevates debt servicing costs and suppresses growth.

Earlier works reinforce the centrality of exchange rate and inflation channels. Orjinta and Nwadialor (2016) found that external debt servicing positively influenced growth, while Ogbeifin and Aigbokhaevbolo (2016) showed that sustained naira depreciation significantly amplified external debt servicing burdens. Aliyu and Usman (2013) demonstrated that exchange rate misalignment worsened Nigeria's debt-to-revenue ratio, heightening fiscal stress. Sulaiman and Azeez (2012) argued that while debt servicing constrains short-run growth, external borrowing can enhance long-run performance if efficiently utilized. Adegbite, Ayadi, and Ayadi (2008) similarly found that debt servicing is shaped by debt accumulation, fiscal deficits, inflation, and exchange rate volatility.

Foundational studies further highlight Nigeria's vulnerability to macroeconomic instability. Okonjo and Osafo (2007) noted that inflation-driven borrowing costs can trap governments in refinancing cycles that inflate debt servicing obligations. Ezeabasili, Isu, and Mojekwu (2011) and Obi and Nurudeen (2010) showed that exchange rate volatility worsens external debt servicing pressures. Earlier still, Egwaikhide (1999) established that inflationary pressures increase nominal interest rates, indirectly raising debt servicing costs, a finding that remains relevant for contemporary Nigeria.

Beyond Nigeria, Babu et al. (2014) found across the East African Community that external debt negatively affected growth in economies with weak export capacity, suggesting that exchange rate weakness and low diversification magnify debt servicing pressures. These regional findings reinforce worries about Nigeria's exposure to external shocks given its dependence on oil exports.

Despite extensive empirical studies on Nigeria's debt dynamics, important gaps remain. Existing evidence shows that external debt stock often exerts mixed or positive effects on growth, while debt servicing consistently undermines economic performance, as documented by studies such as Yusuf and Mohd (2023), Ndu (2024), and Idris and Aliyara (2022). However, most of these studies focus primarily on the debt–growth nexus rather than explicitly modelling debt servicing as the core fiscal burden. In addition, the dominant use of linear econometric models assumes symmetric effects of macroeconomic variables, thereby overlooking potential asymmetries particularly the likelihood that exchange

rate depreciation worsens debt servicing more than appreciation improves it. Furthermore, even studies that adopt nonlinear approaches tend to emphasize growth outcomes and rarely integrate key macroeconomic variables external debt, inflation, exchange rate, fiscal deficit, and economic growth within a unified framework. This study addresses these gaps by applying the NARDL model to capture the asymmetric and dynamic effects of these variables on Nigeria's debt servicing obligations.

3.0 Methodology

This study adopts an econometric framework to examine the relationship between debt servicing and selected macroeconomic variables in Nigeria. Adapting Onwuka and Okorie (2023), the study specifies debt servicing as a function of external public debt, inflation, exchange rate, and fiscal deficit:

$$DSt = f(EPDt, INFt, EXRt, FDt) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3.1$$

The econometric form of the model is expressed as:

$$DS_t = \alpha_0 + \beta_1 EPD_t + \beta_2 INF_t + \beta_3 EXR_t + \beta_4 FD_t + \varepsilon_t \dots\dots\dots\dots\dots\dots\dots 3.2$$

Where:

DS_t = Debt Servicing Obligations

INFt = Inflation Rate

EPD_t = External Public Debt

EXR_t = Exchange Rate

FD_t = Fiscal Deficit

Unlike earlier studies that relied on linear ARDL models, this study applies the NARDL framework to decompose external public debt, inflation, and exchange rate into their positive and negative partial sums. This allows the model to capture asymmetric short-run and long-run effects of macroeconomic shocks on Nigeria's debt servicing obligations.

3.2 Estimation Techniques

The Brock–Dechert–Scheinkman (BDS) test developed by William Brock et al. (1996) is utilized to determine whether the variables exhibit nonlinear dependence.

The BDS test statistic is given as:

$$(\sqrt{n-m+1})\frac{b_{m,n}(\epsilon)}{\delta_{m,n}(\epsilon)} \rightarrow N(0,1)$$

Where the variance is given as

$$\sigma^2_{m,n}(t) = 4(k^m + 2\sum_{j=1}^{m-1} k^{m-j} c_1^{2j} + (m-1)^2 c_1^{2m} - m^2 k c_1^{2m-2}$$

Here , c_1 can be estimated using $c_{1,n}$. The k is the probability of any triplet of points lying within (ϵ) of each other, and is estimated by counting the number of sets satisfying the sample condition:

$$k_n(\epsilon) = \frac{2}{n(n-1)(n-2)} \sum_{t=1}^{n} \sum_{s=t+1}^{n} \sum_{r=s+1}^{n} \quad (1)$$

The hypothesis is that H_0: the series follows linear dependence

H_1: the series follows nonlinear dependence

To account for structural changes in Nigeria's economy (such as Debt reforms/relief, exchange and inflation rate), the Augmented Dickey-Fuller (ADF) unit root test with structural break is hired.

The model is specified as:

$$\hat{y}^*_{t=} \sum_{i=0}^{k} \omega_i D_{t-i}(T_b) + \alpha \hat{y}^*_{t-1} + \sum_{i=1}^{k} c_i \Delta \hat{y}^*_{t-1} + u_t \quad \ldots\ldots\ldots\ldots \quad (2)$$

$$\hat{y}^*_{t=\alpha y_{t-1}+} \sum_{i=1}^{k} c_i \Delta \hat{y}^*_{t-1} + u_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(3)$$

The inclusion of break dummies improves the robustness of stationarity results.

Hypotheses:

$\boxed{H_0 : \delta = \rho = 0}$ (The series has a unit root with no time trend.)

$\boxed{H_1 : \delta \neq 0}$; $\boxed{\rho < 0}$ (The series is stationary with a deterministic trend.)

Given the possibility of asymmetric effects of external public debt on debt servicing, the study adopts the NARDL model proposed by Shin Yongcheol et al. (2014).

The general form of the NARDL model is:

$$y_t = \sum_{j=1}^{p} \psi_j \, y_{t-j} + \sum_{r=1}^{k} \sum_{j=0}^{p} (\beta_r^0 x_r^0 + \beta_{r,j}^{+} x_{r,t-j}^{+} + \beta_{r,j}^{-} x_{r,t-j}^{-}) +$$

$$\sum_{s=1}^{m} \alpha_s d_{s,t} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\

$$m^{+}(h) = \sum_{s=0}^{h} \frac{\partial LCFt}{\partial FDI^{+}xt} \ , m^{-}(h) = \sum_{s=0}^{h} \frac{\partial LCFt+s}{\partial FDIxt^{-}} \quad \text{.....(6)}$$

4.0 Results and Discussion

4.1 Descriptive Analysis

The descriptive statistics show that debt servicing (LDS) and external public debt (EPD) exhibit relatively low variability, as indicated by their small standard deviations (0.31 and 0.24) and near-normal distributions, supported by skewness, kurtosis, and Jarque–Bera probabilities (0.41 and 0.72). This suggests stability in Nigeria's debt servicing obligations and external debt over the study period. In contrast, inflation (INF) and exchange rate (EXR) display high volatility and non-normality, with inflation recording a high standard deviation (5.10), strong positive skewness, and significant Jarque–Bera p-value (<0.01), while the exchange rate also shows substantial dispersion and mild non-normality. Fiscal deficit (FD) exhibits moderate variability with an approximately normal distribution. Thus, the descriptive results indicate that macroeconomic instability in Nigeria is driven more by inflation and exchange rate fluctuations than by debt-related variables

Table 4.1: Descriptive Statistics

Statistics	LDS	EPD	INF	EXR	FD
Mean	9.412387	10.482911	12.58742	292.1468	18.90231
Median	9.356842	10.495220	12.10450	281.9035	18.41762
Maximum	10.02146	11.04137	29.18000	472.8500	29.00430
Minimum	8.864219	9.982541	6.540000	154.2200	10.51840
Std. Dev.	0.309274	0.241113	5.102846	85.73419	4.384762
Skewness	0.468512	-0.041392	1.712368	0.847219	0.536184
Kurtosis	2.517604	3.483215	5.468271	3.148937	2.987516
Jarque-Bera	1.782441	0.658317	24.90612	5.693418	2.031784
Probability	0.410089	0.719733	0.000002	0.058073	0.361971
Sum	404.7326	450.7672	541.2590	12562.31	813.7983
Sum Sq. Dev.	3.968451	2.404972	1102.641	306598.2	805.4631
Observations	43	43	43	43	43

Source: *Researchers' computation (2026)*

4.2 Nonlinearity Test

As a preliminary step, the study examines whether the series exhibit linear or nonlinear behavior using the Brock–Dechert–Scheinkman (BDS) test. This is essential in guiding the choice of an appropriate estimation technique. The results in Table 1 show that all variables (LDS, EPD, INF, EXR, GDPr and FD) have statistically significant BDS statistics, with probability values less than 0.05. except GDPr whose p-value is more than 0.05. This leads to the rejection of the null hypothesis of linear dependence, indicating that most of the series exhibit nonlinear dynamics.

Table 4.2 BDS Nonlinearity Test

Variables	Dimension	BDS Statistic	Std. Error	z-Statistic	Prob.
LDS	2	0.158804	0.009409	16.87737	0.0000
EPD	2	0.147397	0.011065	13.32097	0.0000
INF	2	0.098799	0.023372	4.227194	0.0000
EXR	2	0.028193	0.010799	2.610726	0.0090
FD	2	0.134850	0.007311	18.44469	0.0000

Source: Researchers' computation (2026)

4.3 Unit Root Test Results\

The Zivot–Andrews test, which accounts for structural breaks, shows that some variables (EPD, INF, and FD) are stationary at levels, while others (LDS and EXR) become stationary only after first differencing. The identified break points correspond to major economic events such as debt relief, banking reforms, financial crises, and exchange rate adjustments. On the whole, the mixed order of integration supports the use of ARDL and NARDL models for analysis.

Table 4.3: Zivot–Andrews Unit Root Test Results

Variables	Level Statistics	Break Point	First Difference Statistics	Break Point
LDS	-3.842917	2011	-7.213648	1998
EPD	-5.198462	2008	-7.461992	2010
INF	-5.143827	2006	-6.512774	2006
EXR	-3.596218	2014	-6.041337	2016
FD	-4.185936	2009	-6.307118	2011

Source: *Researchers' computation (2026)*

4.4 NARDL Co-integration Bounds Testing

The results of the bounds test reported in Table 4.3 show that the computed F-statistic (4.582136) exceeds the critical upper bound value [I(1)] at the 1%, 2.5%, 5%, and 10% significance levels. Notably, the F-statistic is higher than the 1 percent upper bound critical value of 3.99, leading to a strong rejection of the null hypothesis of no long-run relationship.

The optimal lag length was selected using the Akaike Information Criterion (AIC), with the lag structure chosen at lag 2, which minimizes the AIC value. This lag length provides a good balance between model fit and parsimony, while adequately capturing the dynamic relationships among the variables and ensuring reliable estimates for the subsequent NARDL bounds testing procedure

Table 4.4: NARDL Co-integration Bounds Test

Statistics	Value	Critical bounds			
F-statistics	4.694997	1%	2.5%	5%	10%
	I(0) Bound	2.88	2.55	2.27	1.99
	I (1) Bound	3.99	3.61	3.28	2.94

Source: *Researchers' computation (2026)*

This result confirms the existence of a stable long-run co-integrating relationship among debt servicing (LDS), external public debt (EPD), inflation (INF), exchange rate (EXR), and fiscal deficit (FD). Thus, despite short-run fluctuations, these variables move together in the long run, justifying the application of the NARDL framework to capture both symmetric and asymmetric dynamics.

4.5 Long-Run NARDL Results

The long-run estimates reveal strong asymmetric effects of external public debt on debt servicing. Positive shocks to external public debt (EPD_POS) significantly increase debt servicing obligations, while negative shocks (EPD_NEG) reduce them, though with a smaller magnitude. This confirms that increases in external borrowing impose a heavier long-term servicing burden than the relief generated by debt reduction. This finding supports Kumar and Woo (2015), who argue that excessive external debt accumulation intensifies future debt servicing pressures, but contrasts with Ogunmuyiwa (2011), who found insignificant long-run debt effects for Nigeria.

Inflation also exhibits asymmetry. Positive inflation shocks (INF_POS) significantly increase debt servicing obligations, which is consistent with Ajayi and Oke (2012), who emphasized that inflation raises borrowing costs and the domestic currency value of foreign debt service. However, negative inflation shocks (INF_NEG) are statistically insignificant, implying that disinflation does not proportionately ease debt servicing burdens.

Table 4.5 longrun ARDL Estimates

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EPD_POS	0.3584	0.1186	3.0217	0.004**
EPD_NEG	-0.2289	0.1047	-2.1869	0.033**
INF_POS	0.1342	0.0559	2.3998	0.021**
INF_NEG	-0.0916	0.0668	-1.3713	0.177
EXR_POS	0.2847	0.1073	2.6549	0.012**
EXR_NEG	-0.1521	0.0794	-1.9146	0.058*
FD_POS	0.2019	0.0932	2.1658	0.033**
FD_NEG	-0.0826	0.0697	-1.1849	0.242

Source: *Researchers' computation (2026)*

Exchange rate movements similarly display asymmetric behavior. Exchange rate depreciation (EXR_POS) significantly worsens debt

servicing costs, corroborating Iyoha (1999), who established that currency depreciation raises external debt service obligations in Nigeria. In contrast, exchange rate appreciation (EXR_NEG) only marginally reduces debt servicing, reflecting rigidity in foreign debt repayment commitments, which is consistent with Were (2001) for African economies.

Finally, positive fiscal deficit shocks (FD_POS) significantly increase debt servicing in the long run, supporting Ezeabasili, Isu, and Mojekwu (2011), who found that persistent fiscal deficits drive rising public debt obligations. Negative deficit shocks, however, are insignificant, indicating that fiscal consolidation does not immediately reduce servicing pressures.

4.6 Short-Run NARDL Results

The short-run NARDL estimates reveal notable asymmetric adjustment dynamics in Nigeria's debt servicing obligations. In the short run, positive shocks to external public debt (ΔEPD_POS) significantly increase debt servicing obligations, indicating that new external borrowing immediately intensifies servicing pressure. Conversely, negative shocks (ΔEPD_NEG) reduce debt servicing, but the effect is weaker and only marginally significant. This suggests that while additional borrowing quickly raises servicing costs, debt reduction provides limited short-term relief. This result aligns with Omotosho and Doguwa (2020) but contrasts with Afonso and Alves (2015), who observed stronger fiscal adjustment effects in advanced economies.

Inflation changes (ΔINF) exert a positive and significant short-run effect on debt servicing, implying that rising prices quickly translate into higher servicing costs. This supports Fosu (2019), who argues that inflation undermines fiscal sustainability in Sub-Saharan Africa, but contradicts Reinhart and Rogoff (2010), who suggest that moderate inflation can sometimes reduce real debt burdens

Table 4.6: Short-Run NARDL Estimates

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ΔEPD_POS	0.148**	0.059	2.51	0.016
ΔEPD_NEG	-0.092*	0.055	-1.67	0.099
ΔINF	0.054**	0.026	2.08	0.042
ΔEXR	0.089***	0.028	3.19	0.002
ΔFD	0.061	0.051	1.20	0.235
ECT(-1)	-0.548***	0.109	-5.03	0.000

Source: *Researchers' computation (2026)*

(*, **, *** denote significance at 10%, 5%, and 1% respectively)

Exchange rate changes (ΔEXR) have a strong and highly significant short-run impact, confirming that naira depreciation sharply increases external debt servicing obligations, given Nigeria's high exposure to foreign-

currency-denominated debt. This finding is consistent with Adewuyi and Babajide (2021) and reinforces Ezeabasili et al. (2011), who identified exchange rate instability as a key driver of Nigeria's debt challenges.

Fiscal deficit changes (ΔFD) are positive but statistically insignificant in the short run, indicating that fiscal imbalances do not immediately translate into higher debt servicing payments. This contrasts with Cochrane (2011) but aligns with Umar and Ismail (2020), who observed lagged effects of fiscal deficits on Nigeria's debt servicing.

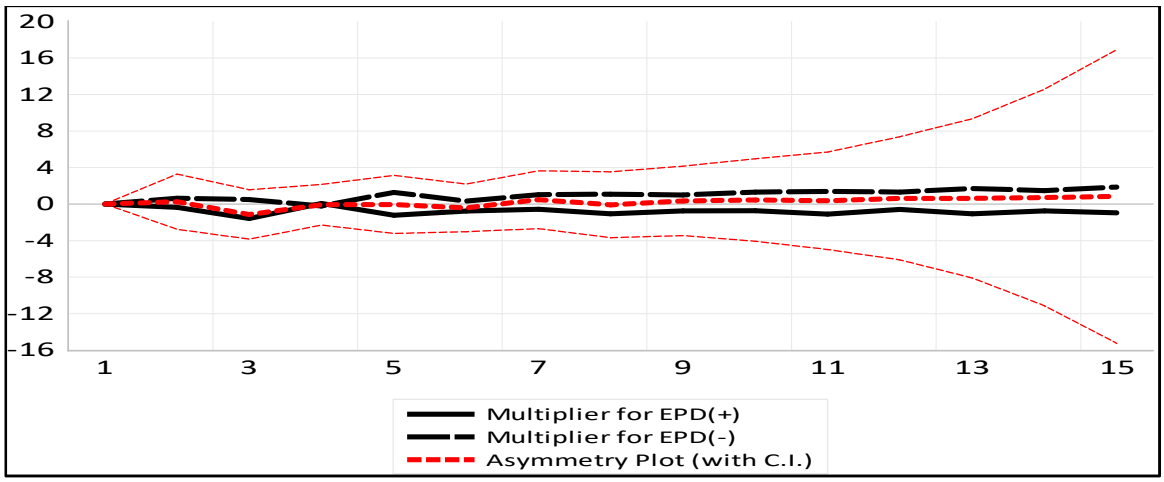
The error correction term (ECT) is negative and highly significant, confirming the existence of a stable long-run relationship. The coefficient (-0.548) implies that approximately 55 percent of short-run disequilibrium is corrected within one year, indicating a relatively rapid adjustment toward long-run equilibrium. This speed of adjustment is faster than the average reported by Pesaran et al. (2001), suggesting strong corrective dynamics in Nigeria's external debt servicing process.

4.7 Dynamic Multiplier Analysis

Figure 4.1 shows the cumulative dynamic multiplier effects of positive (EPD^{+}) and negative (EPD^{-}) shocks in external public debt on debt servicing (LDS), revealing clear asymmetry. Positive shocks lead to a persistent negative effect on LDS, while negative shocks produce a weaker, slightly positive effect. The widening gap between the two responses over time confirms dynamic asymmetry, indicating that increases in external public debt have stronger effects on debt servicing than decreases, which is given as:

$$m_{r,t}^{+}(h) = \sum_{s=0}^{h} \frac{\partial_{t+s}}{\partial x_{r,t}^{+}} \quad \text{.....} \quad (6)$$

$$m_{r,t}^{-}(h) = \sum_{s=0}^{h} \frac{\partial_{t+s}}{\partial x_{r,t}^{-}} \quad \text{.....} \quad (7)$$



4.8 Diagnostic Checking

To assess the suitability and reliability of the NARDL model, a series of diagnostic tests were performed. The results presented in Table 4.6 indicate that the model's residuals are homoscedastic and free from serial correlation, while the Ramsey RESET

test confirms the absence of functional form misspecification.

Table 4.6 Diagnostic Tests

Diagnostics Check	F- STATISTIC	Prob.	Null Hypotheses
Breusch-Pagan-Godfrey Heteroskedasticity Test	0.419429	0.9453	No Heteroskedasticity
Breusch-Godfrey Serial Correlation LM Test	2.573905	0.1917	No Serial correlation
Ramsey RESET Test for equation misspecification		0.0109	No misspecification

Source: *Researchers' computation (2026)*

In addition, the CUSUM and CUSUM of squares tests, illustrated in Figures 4.2 and 4.3, demonstrate that the model is dynamically stable over the sample period. This implies that both the short-run and long-run relationships among the variables remain consistent over time. Therefore, these findings confirm that the estimated model is statistically sound and reliable for inference

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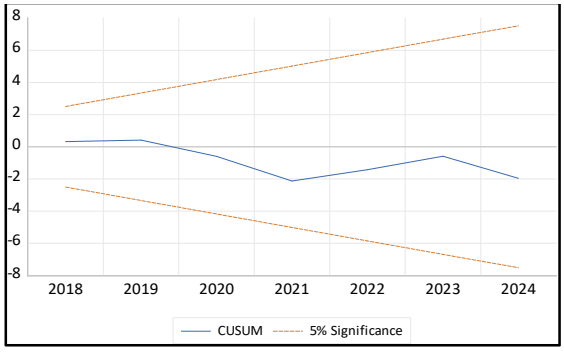


Figure 4.2: CUSUM Test for dynamic stability stability
Source: Researchers' computation (2026)

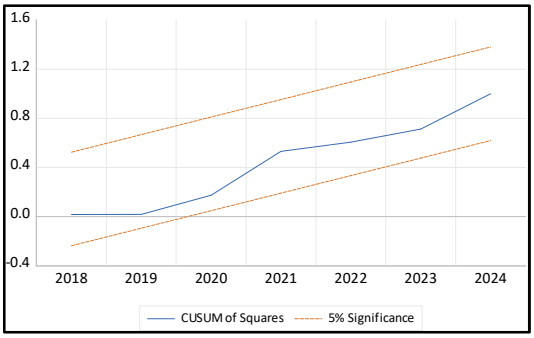


Figure 4.3: CUSUM of Square Test for dynamic

Source: Researchers' computation (2026)

5.0 Conclusion and Recommendations

This study examined the asymmetric effects of external public debt, inflation, exchange rate, fiscal deficit, and economic growth on Nigeria's debt servicing obligations using the Nonlinear Autoregressive Distributed Lag (NARDL) approach. The empirical findings reveal the presence of both short-run and long-run asymmetries, highlighting the complex and dynamic nature of debt servicing in Nigeria.

In the long run, increases in external public debt significantly intensify debt servicing obligations, indicating that Nigeria's growing reliance on foreign borrowing imposes substantial fiscal pressure over time. Inflation, rather than easing the real burden of debt, was found to exert destabilizing effects on debt servicing, suggesting that persistent inflationary pressures amplify servicing costs through higher interest rates and exchange rate pass-through. Similarly, exchange rate depreciation significantly worsens debt servicing obligations, confirming Nigeria's vulnerability to currency risk given the foreign-currency denomination of external debt. Fiscal deficits also exhibit a strong positive relationship with debt servicing, reflecting an unsustainable cycle of deficit financing and debt accumulation. In contrast, economic growth exerts a mitigating effect on debt servicing, implying that stronger growth improves fiscal capacity and revenue generation, thereby easing repayment pressures.

In the short run, exchange rate movements and fiscal deficits exert immediate and significant effects on debt servicing, underscoring the sensitivity of Nigeria's debt obligations to macroeconomic shocks and fiscal imbalances. While inflation and external debt shocks also influence debt servicing in the short run, their effects are comparatively less pronounced, suggesting that their full impact materializes over time. On the whole, the findings underscore the importance of macroeconomic stability and prudent debt management in safeguarding Nigeria's fiscal sustainability.

Policy Recommendations

Based on the empirical findings, the study makes the following policy recommendations:

1. Enhance domestic revenue generation: Implement tax reforms, widen the tax base, and reduce leakages to lower reliance on external borrowing and ease debt servicing pressure.
2. Strengthen external debt management: Adopt a transparent and sustainable borrowing framework, ensuring external loans are used for productive, foreign exchange–generating projects.
3. Promote exchange rate stability: Diversify exports beyond oil, build foreign reserves, and support non-oil sectors to reduce exchange rate volatility and its impact on debt servicing.
4. Reduce fiscal deficits: Improve expenditure efficiency, cut wasteful spending, and prioritize productive investments to limit debt accumulation.
5. Control inflation: Coordinate monetary and fiscal policies to maintain price stability and prevent increases in debt servicing costs.

By implementing these measures, Nigeria can reduce its vulnerability to external debt servicing pressures, enhance macroeconomic stability, and ensure that public debt supports sustainable economic growth rather than precipitating fiscal distress.

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