Impact of Public Debt on Economic Growth in Nigeria: The Threshold Effect

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Abstract: The study examine the impact of Public debt on Economic growth in Nigeria with a focus on establishing a threshold level where Public debt becomes detrimental to economic growth. Using annual time series from 1981 to 2022 and secondary data from CBN statistical bulletin on various issues and IMF data, the study employed the ARDL estimation technique to establish the long and short-run relationships as well as the TAR threshold technique to estimate the point of inflexion between the linear and non-linear effect of the exogenous variables on economic growth. The results of the study reveals that in the short run, domestic debt has a negative relationship with RGDP with a coefficient of -0.55, while external debt has a positive relationship with RGDP with a coefficient of 0.25. The threshold results show that domestic debt threshold with economic growth is 7.06% of Nigeria's RGDP and is significant at 5% level. This is the turning point in the relationship between domestic debt and GDP is such that it becomes asymmetrical and reveals an inverted U-shape. The study also reveals that external debts has non-threshold effect on RGDP for the period under study. The implication of this finding is that debt accumulation in excess of the estimated threshold levels could hurt economic growth. The study therefore, recommends that the government should keep debt profile within the recommended limit that is consistent with the country's growth objectives and ensure effective and efficient utilization of borrowed funds to boost economic prosperity.

**Keywords:** Public Debt, Debt threshold, and Economic Growth.

1. INTRODUCTION

The national resources available in most instances are grossly inadequate for the huge infrastructural developmental requirements and aggregate public expenditure. This requires financing beyond national revenue sources to augment shortfall in revenue. Public debt can be seen as the total government borrowings (domestic and external) used to finance budget deficits in order to meet developmental needs. In developing countries like Nigeria, deficit financing is prominent due to the dominant role the public sector plays in economic growth and development. However, economists and policy makers are usually apprehensive when debt to GDP ratio is high. Some scholars argue that high tax rates is required to meet the debt interest burden and this may cause inflation, distorted exchange rate, devaluation and degradation of the gross domestic product. Recent research suggests that large increases in the debt-to-GDP ratio could lead to much higher taxes, lower future incomes and intergenerational inequity (Boskin 2020). In addition, the global economic crises have provided further impetus for countries especially developing countries to borrow in order to address the short run deficit of capital inflow. Following the 2007–2008 global financial crisis and subsequent sovereign debt

crisis in Europe, 2014 oil price decline and the COVID-19 pandemic there has been a renewed interest in exploring the relationship between government debt and economic growth. The existence of a linear and non –linear relationship between debt and economic growth has dominated the arguments around deficit financing in recent time. Also, aside from the neoclassical and Keynesian theoretical arguments on public debt, there exists another theory that corroborates the existence of a nonlinear relationship between public debt levels and economic growth, that is, the threshold or nonlinear effect theory. According to this theory, increases in government debt levels have positive growth effects when debt levels are low, but these effects becomes negative when debt levels increase beyond a certain threshold level (Reinhart and Rogoff 2010). At low debt levels, increases in the debt ratio provide positive economic stimulus in line with conventional Keynesian multipliers. Once the debt ratio reaches heightened levels (nonlinear threshold), further increases in the debt level as a percentage of GDP have a negative impact on economic growth (Baum et el 2013). The consensus amongst these authors is that there exists first a linear relationship between debt and economic growth beyond some thresholds which results in a significantly negative effects on economic growth evidenced by the crowding out effects on private investment thereby confirming the debt overhang theory.

Another school of thought have an opposing view and have argued that weak growth is actually the cause of high levels

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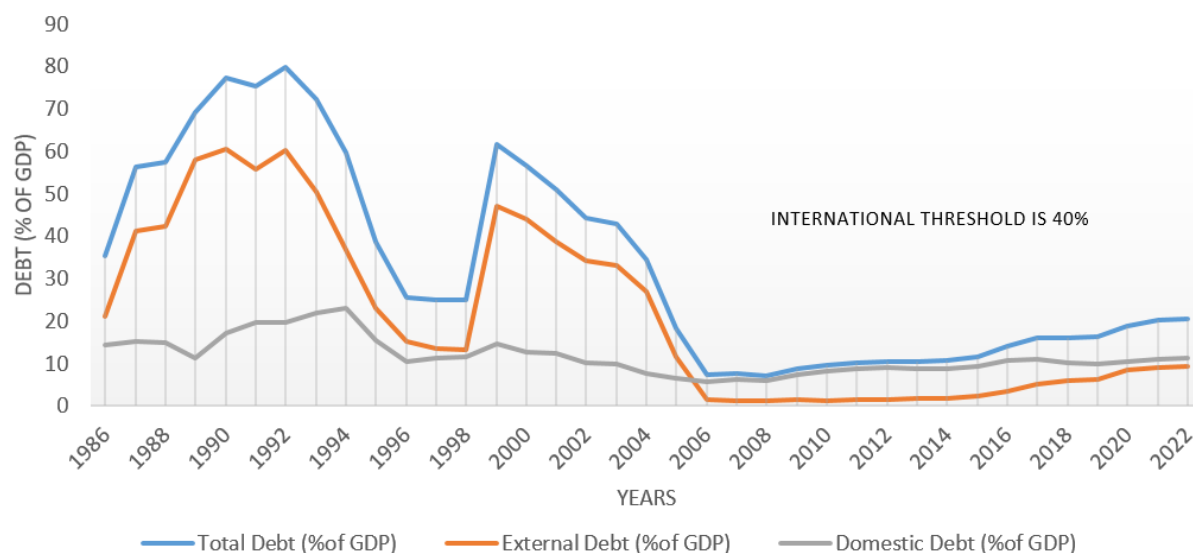
Fig. (1). A review of Nigeria's debt trajectory (Post SAP).

Source: DMO (2022).

of debt. The proponents of this view argue that foreign borrowing has a net positive effect on output and income as long as the net inflow of borrowed funds exceeds interest payments and the marginal productivity of investment is greater than the rate of interest on debt (Green and Kahn, 1990). In other words, foreign borrowing is at optimal, up to the point where the marginal productivity of capital or investment equals the rate of interest on external debt. Notwithstanding the two opposing views regarding the impact of debt accumulation on economic growth, economists and policy makers seem to have reached a consensus that excessive debt can cause negative growth effects and macroeconomic distortions through debt overhang and crowding out effects.

Statistical evidence has shown that Nigeria has consistently operated a budget deficit since 1961 after the civil war. The government borrowings in the early 70s were justified on the grounds for war reconstruction. Interestingly, Nigeria earned unprecedented amounts of foreign exchange during the oil boom of the early 1970s. Consequently, government spending and bureaucracy amplified. In the early 1980s during the oil glut, prices of oil began to fall. This led to a sharp fall in government revenue. Many governments began to borrow to cushion the effect of shortages in revenue. This led countries especially developing countries to adopt the IMF conditional borrowing. Nigeria adopted the Structural Adjustment Program (SAP) in 1986. The program allows member countries to secure loans from the International Monetary Fund and/or the World Bank in order to finance her budget deficit and realign its economy towards a long term economic growth trajectory. The SAP measures only succeeded in hiking Nigeria's debt profile with little result for economic prosperity. Prior to year 2005, the country's total debt stock consistently increased surpassing the international thresholds for debt sustainability (Fig. **1**). However, following the US$ 30 billion debts to creditors. The Paris Club cancelled US$ 18 billion and Nigeria repaid US$ 12 billion.

As shown on Fig. (**1**), external debt and domestic debt stock trended upwards during the 1980s while there was a steady decline during 1994 to 1998. But the external debt stock remained relatively high above 60% in the early 2000s, until the debt cancellation in 2005. Total Debt to GDP ratio also drop from 34.54% in 2004 to 18.26% in 2005 following the debt cancellation. The ratio remained relatively stable within 7%-10% from 2006 to 2014 after the debt cancellation period. Available data reveals that debt to GDP ratio is on the rise from 14.17% in 2016, to 16.07 in 2018 to 18.86% in 2020 and 20.52% in year 2022. Nigeria government must however take precautionary measures to keep its debt to GDP ratio within sustainable limits.

The Nigeria's public debt stock at the end of December 2022 stood at US$103.11 billion.

Debt Category	2022 Amount Outstanding (US$'M)	2022 Amount Outstanding (N'M)	% of Total
Total External Debt	41,694.91	18,702,251.88	40.44%
Total Domestic Debt	61,415.93	27,548,116.06	59.56%
Total Public Debt	103,110.84	46,250,367.94	100%

Fig. (2). Nigeria's public debt stock.

Source: DMO (2023)

The GDP growth rate is one of the key performance indicators used in accessing the health status of an economy.

Unfortunately, Nigeria's economic growth rate has been unstable over the past two decades. A review of the available statistics in Figure 3 below shows that for the period under review, the GDP growth rate was at its lowest in 1981 at -13.1% and hit its highest point in 2002 at 15.3%. (World bank, 2022). This point was made possible by the various expansionary fiscal policies and tightening of the monetary policies adopted. This figure fell significantly to 6.44 percent
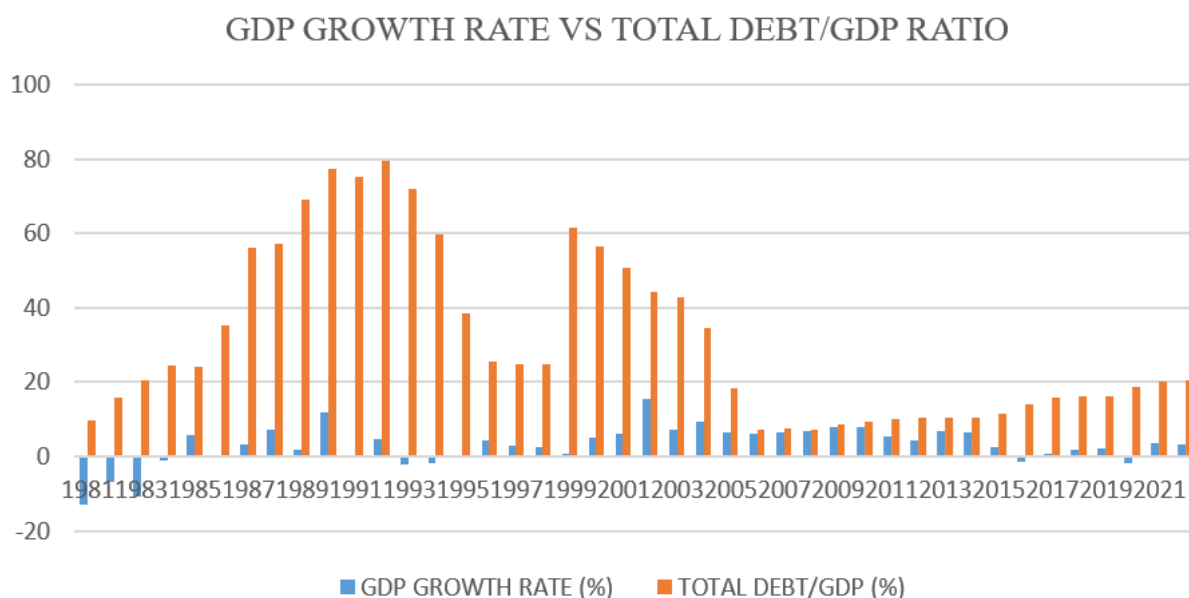
Fig. (3). GDP growth rate vs total debt/GDP ratio.

in 2005 and remained within 6%-8% up till 2010. By 2015, the GDP growth rates declined to 2.65% majorly due to recession resulting from the fall in oil price, remarkably the total debt in that year, hit a record high of $10.94Billion. The decline in GDP rate continued in 2016 reaching a negative growth rate of -1.61%, and by 2020 it hit -1.79% this can be attributed to the negative impact of COVID-19 on the worlds' economy. GDP growth rate fell to 3.3% in 2022 from 3.6% in 2021, precipitated mainly by a decline in oil production. The most disturbing fact during these periods remain that the country's debt profile was also on the increase amidst the dwindling economic growth. It becomes imperative to establish an effective point beyond which such debt accumulation becomes injurious to economic growth.

Remarkably, during the seven-year period of 2009-2015, a total of N6 trillion deficits created an economic growth averaging 6.4%, while a five-year period of 2015 to 2019 over N12 trillion deficits delivered a diminutive economic growth of just 1.24%, also a four-year period of 2019 to 2022 a total deficit of N149 trillion delivered little average growth rate of 1.82%. The situation looks unhealthy as total debt stock accumulates amidst dwindling economic growth. The Nigeria government have adopted both fiscal and monetary policies to ameliorate this imbalance. The establishment of Debt Management Office (DMO) in 2000 was also a deliberate attempt, to establish an institutional based solely to manage the debt of the nation. The DMO conducts regular debt sustainability analysis (DSA) to assess the sustainability of the national debt and to identify potential risks and vulnerabilities. The Total Public Debt-to-GDP ratio benchmarks or peer-group threshold for emerging markets and developing countries like Nigeria under MAC-DSA is 70 percent while the Nigeria's self-imposed limit of Total Public Debt-to-GDP ratio was set at 40 percent in the Medium-Term Debt Management Strategy (MTDS), 2020-2023. In view of the threat to debt sustainability, due to high Debt Service-to-Revenue ratio. (DMO MAC-DAS, 2022). The DMO uses the results of the DSA to guide its debt management strategy and

to advise the government on its borrowing policy and strategy.

To the best of our knowledge, limited study exists on the determination of the threshold point beyond which the incurrence of additional debt becomes injurious to economic growth in Nigeria especially following the recent shock in oil prices 2007-2008, 2020 Russia-Saudi Arabia oil price war which led many countries (especially oil revenue earning countries) to seek for funding in order to cushion the effect of shortfall in national revenue.

Therefore, this study aims to determine the relationship that exist between Public debt and economic growth and to establish possible threshold point beyond which public debt begins to hamper Nigeria's economic growth prospects. The study covered the period of forty-one years from 1981 to 2022.

The paper is divided into five sections. The first part presents the introductory section. The rest of the paper is organized as follows: section 2 conducts a thorough examination of existing literature, section 3 outlines the methodology employed, section 4 presents the empirical findings, section 5 offers conclusions and policy recommendations.

2. LITERATURE REVIEW

2.1. Theoretical Foundation

2.1.1. Neoclassical Theory

Economic theory suggests that reasonable levels of borrowing by a developing country are likely to enhance its economic growth. The neo-classical theory postulates a self – regulated market force and thus asserts that expansionary fiscal policy increases aggregate consumption, but reduces savings. Their theory is anchored on full employment equilibrium where savings equals investment. From the neo-classical point of view, government investment expenditure

is considered less productive, than domestic private investment. Therefore, the output expansion resulting from deficit-induced consumption cannot fully offset the negative consequences of crowding out effects on private investment (Sen & Kaya, 2014). The neoclassical economists have noted how increase in taxation are been used to finance interest payment which impedes economic growth of the nation.

2.1.2. Keynesian Theory

Keynesian economists, advocates a countercyclical fiscal policy in which, during periods of economic recession, the government should undertake deficit spending to make up for the decline in investment and boost consumer spending to stabilize aggregate demand which in turn stimulates private investment, Income , output and employment. Keynesian theory gained greater acceptability during the great recession of 1933. The theory believes that active government intervention in the market place through deficit financing was the only method for ensuring growth and stability by ensuring efficiency in resources allocation, regulation of markets, stabilization of the economy and harmonization of social conflicts. Therefore, deficit financing will stimulate effective demand for goods and services leading to increase in private investment, employment and general level of output, in multiple folds, through the government expenditure multiplier. Keynesian economists further explained that the magnitude of the multiplier depends on the marginal propensity to consume (MPC).

2.1.3. Ricardian Equivalence Theory

Contrary to the neo-classical and Keynesian views, is the Ricardian equivalence approach developed by Barro (1989). He observed the present value of future tax and explained that a rational consumer will plan his consumption expenditure based on his net wealth position bearing in mind the impact of government current deficit spending on his future tax. Ricardian equivalence necessitates making the assumptions of long-term thinking that is, the present value of future taxes.

2.1.4. Debt Overhang Theory

A nonlinear threshold could suggest that increased government borrowing competes for funds in the nation's capital markets, which in turn raises interest rates and crowds out private investment, confirming the debt overhang theory.

2.2. Conceptual Framework

Public debt is simply the total amount of money that the Government of a country owes to its creditors, both domestic and external. Broadly speaking, public debt is the cumulative sum of all deficits. When government spending exceeds its revenue, public debt goes up and comes down when there is a surplus budget. If revenues and spending are equal, the government is running a balanced budget. In modern times, the various governments entities such as the Local, State and Federal government borrow by selling securities to investors such as Treasury bills (maturing with one year) while other securities are referred to as government bonds. These government entities even hold securities issued by other government entities. The sum of what has been borrowed by all these Central, State and Local administrations, often referred to as general government debt. Usually net of the debt held by components of the general government itself. In advanced economies, government securities are often regarded as the quintessential risk- free asset this is so because the government has the power to raise revenues through taxation. Therefore, the larger the size of public debt, the higher the tax revenues needed to service it. That is why, it is important to raise the amount of national resources that could potentially be taxed. A good proxy for these resources is given by a country's gross domestic product (GDP), or what a nation produces every year, as most government revenues come from the taxation of GDP or its components. That is why economists usually look at public debt as a percentage of GDP. Public Debt are usually paid by Borrowings or Printing more currencies.

The sustainability of a nation's debt is the ability of the country to meet its current and future debt obligations without compromising its economic growth, social development, and environmental protection. The sustainability of the national debt depends on various factors, such as the size. A low debt profile is easy to repay and builds confidence with the creditors, also a debt profile that is denominated majorly in foreign currencies have higher risk of repayment than debts denominated in domestic currencies, this is so because the government may decide to printing money as a measure to repay back its loan. The level and growth of a country's GDP is crucial in its debt sustainability index. This is important because the GDP measures what a country is able to produced within, of which revenue is generated through tax to offset interest on borrowed funds. More so, the exchange rate and inflation, the interest rate and debt service, the external and domestic shocks, and the institutional and policy environment are other important factor to be considered in debt sustainability.

2.3. Hypothesis Development

2.3.1. Link Between Debts and Economic Growth (Linear Relationship)

Investigating the relationship between debt and economic growth, Abubakar and Mamman (2020) employ a two-stage least squares regression to estimate a decomposed model examining the effects of public debt on economic growth in 37 OECD countries. The approach of this study is unique among the literature, in that the authors examine the permanent versus transitory effects of public debt on economic growth. The findings reveal that public debt exerts a significant negative permanent and positive transitory effect on economic growth. The magnitude of the negative permanent effect of debt was found to be larger than the positive transitory effect. In addition, while all country groups experienced negative permanent effects, not all country groups experienced positive transitory effects.

Asteriou *et al.* (2020) examined the relationship between public debt on both short- and long-run economic growth in 14 Asian countries for the period of 1980–2012. Using an ARDL model and a mean group (MG) estimator to allow for heterogeneity in the short-run and long-run relationship. The study revealed that a 1 percentage point increase in the gov-

ernment debt-to-GDP ratio will lower economic growth by 0.012 to 0.125 percentage points. In the long run, the magnitude of the two different regimes is somewhat higher in the region of ^0.091 to ^0.132 percentage points indicating that an increase in public debt will lead to a significant adverse effect on economic growth. Similarly, Pegkas el (2020) ran a time series analysis with a fully modified least squares approach on 12 eurozone countries for the period 1995 to 2016. The study found that there is a negative long-run effect of public debt on growth. Furthermore, the results indicated that there is long-run unidirectional causality running from investment, trade openness, and human capital to growth and bidirectional causality between public debt and growth. The authors recommend that eurozone countries should base their growth strategies on fiscal consolidation.

In Nigeria, Wosoweil (2013) investigated the impact of deficit financing on macroeconomic aggregates for the period 1980 – 2010. The study used OLS regressions and Engel Granger cointegration approach to estimate the models. The study showed an insignificant negative relationship between deficit financing and economic growth. The Engel Granger cointegration shows a bi-directional relationship between deficit financing and economic growth. The study did not incorporate the effect of deficit financing on inflation or the simultaneous effect of deficit financing on economic growth and inflation. In a related study, Nwanna (2019) examined the effect of deficit finance on Nigeria economic growth using secondary data from 1981-2016. Estimation by OLS revealed that deficit financing through external debt borrowing has a significant negative effect on Nigeria's economic growth. Also Domestic debt has a positive and significant effect on Nigeria's economic growth, while Debt service has no significant effect on Nigeria's economic growth. Furthermore, Calderon el (2013) set out to test whether public debt hinders growth in the Caribbean and South America. They utilized a large panel data of 136 countries for the period 1970 – 2010. Results from the analysis indicated negative and robust effect of public debt on economic growth. They also indicated that strong institutions, good economic policies and outward-oriented policies mitigate these adverse effects. The authors showed that a sharp reduction in public debts and an improvement in the policy environment induced an increase in the growth rate per capita of 1.7 percentage points for the Caribbean and 2 percentage points for South America. A more conservative scenario, however, yielded lower growth benefits for the 2 regions. Snieška el (2018) adopted an ordinary least squares (OLS) and autoregressive (AR) model with cross-section data to analyze the influence of changes in real public debt, real private debt, and deflated house prices on GDP in 24 European Union (EU) countries. Small euro zone countries were excluded from the analysis due to fluctuations of their small economies caused by the volatile influence of offshoring financial services on their growth dynamics. The results suggest that, in the 24 European Union countries observed, the negative influence of public debt growth on the economy is significant when evaluated using zero, one, and two year lags.

Siddique el (2016) in their research observe if debt as a proportion of GDP affects growth in 40 indebted countries from 1970 to 2007, using an autoregressive distributed lag (ARDL) mode. The result of their study revealed that the debt variable has a negative and statistically significant influence on GDP in both the short run and long run, which is consistent with apriori expectations. The study also showed that a higher debt levels have a negative impact on economic growth for debt-ridden countries, because a large proportion of their output is used to repay debts to foreign lenders, which creates a disincentive to invest.

2.3.2. link Between Threshold Level and Economic Growth (Non-Linear Relationship)

One of the most cited studies that triggered an emergence of new literature on the debt- growth nexus was Carmen Reinhart and Kenneth Rogoff's "Growth in a Time of Debt" (2010), which became widely cited and influential among academics, policymakers and debaters in discussions surrounding fiscal policy in debt-burdened economies. Their study argued that, across both advanced and emerging economies, high debt-to-GDP levels (90 percent and greater) are associated with notably less growth. Countries with debt-to-GDP ratios greater than 90 percent have median growth roughly 1.5 percent lower than that of the less-debt burdened groups and mean growth almost 3 percent lower. To reaffirm the result of their study, in 2012 they conducted another study and identified 26 episodes of public debt overhang in advanced economies since 1800: that is, cases where the ratio of gross public debt to GDP exceeded 90 percent in a given country on a sustained basis. The study indicated that such public debt overhang episodes were associated with lower economic growth than during other periods. Reinhart and Rogoff (2012). These studies have undergone various debates which reveals some limitation in their studies. One of such limitation is the coding errors in the Reinhart and Rogoff study which Herndon et el (2013), attempted a more accurately representation of the relationship between public debt and growth. they found that the growth rate for countries carrying a debt-to-GDP ratio greater than 90 percent is actually 2.2 percent, not ^0.1 percent as reported by Reinhart and Rogoff. Also there is no common nonlinear threshold. Their results, nevertheless, still reveal that growth rates decline as debt ratios increase; but growth rates do not fall off a nonlinear cliff as suggested by Reinhart and Rogoff. Another notable argument to Reinhart and Rogoff study was Égert (2015). Putting a variant of the Reinhart and Rogoff dataset to a formal econometric testing to see whether public debt has a negative nonlinear effect on growth if public debt exceeds 90 percent of GDP. Using a multivariate growth framework and Bayesian model averaging, the study assesses a sample of 44 advanced countries from 1960 to 2010. The study revealed a positive relationship between debt and growth but at a low levels of debt. At a higher level of debt, a negative effects occurs. However, contrary to most studies that identify a threshold range around 60 to 100 percent of GDP, this study finds that the negative nonlinear effect kicks in at much lower levels of public debt (between 20 and 60 percent). The authors suggest that the findings may indicate that high-return public investment opportunities may exist at low levels of public infrastructure and debt. In another test of Reinhart and Rogoff studies, Baglan and Yoldas (2016) use Reinhart and Rogoff's historical multicounty dataset and adopt a flexible semiparametric model with standard fixed effects. The study sample includes 20 advanced countries

during the post war period (1954 to 2008). The results reveal that average annual GDP growth gradually declines by about 0.5 percentage point as the debt-to-GDP ratio climbs from about 75 to 100 percent, with most of the effect taking place over the 85 to 95 percent range. These findings are consistent with other studies that find that each 10 percentage point increase in the debt ratio results in a decline in GDP growth of 0.2 percentage point.

Reviewing some studies on the Nigeria's debt to GDP threshold, using two variant of optimization algorithms namely The Gauss, Berndt, Hall, Hausman, and Marquardt algorithms, respectively, Kidochukwu (2015) examined the effect of IMF recommended sustainability threshold of 45% for Nigeria and other low-middle income countries. The data covered a period of 48 years (1965-2013). From the findings, the study showed that IMF recommended sustainability threshold is not growth augmenting but will act as a hindrance to economic growth in Nigeria. the estimates showed that maintaining such threshold drives output to a negative growth of (-19.5%) and (-27.9%), respectively. The study thus established that the debt sustainability threshold of 45% for Nigeria is not growth supportive. Hence, sustainability should be definable within the country's growth objective in contrast with debt sustainability analysis which is traditionally based on solvency.

In another study, Babatunde *et al* (2016), used a quarterly time series data for the period 2005 – 2015 especially following Nigeria debt cancelation of 2005 and the rebasing of the country's GDP from 1990 base year to 2010. Relevant variables included total domestic debt, total external debt and the total public debt were proxy for the county's indebtedness. The study found empirical support for an inverted U-shape relationship between public debt types and economic growth. For total public debt as percentage of GDP, model results identified a threshold level of 73.70 per cent, while the estimated inflexion points for external and domestic debts were 49.4 and 30.9 per cent, respectively. The implication of their finding is that debt accumulation in excess of the estimated threshold levels could hurt economic growth. A retrospective examination of the country's total and external debts profile indicated that the estimated threshold levels were exceeded prior to the debt forgiveness negotiated in 2005 and largely within limits afterwards. A similar study on the Caribbean revealed that a debt/GDP ratio of 61 per cent for the sample countries as the threshold for debt/GDP ratio. The results showed marked divergence between actual debt/GDP ratios and their optimal ratios at the country levels. The study indicated that the negative debt-growth relationship reiterates the point that government borrowing must be done not only on terms that are consistent with entrenching debt sustainability, but also on terms that yields growth dividends in the long run. Wright and Grenade (2014).

Cecchetti *et al* (2012) using a sample of 18 OECD countries from 1980 to 2010 and adopting a bivariate least squares model for annual and five-years-ahead growth rates of per capita GDP, with country and time-period fixed effects, Cecchetti et el seek to find a nonlinear threshold effects of debt on growth for government debt, nonfinancial corporate debt, and household debt. The results revealed that, when the ratio of public debt to GDP reaches about 85 percent, a further 10

percentage point increase, reduces trend growth by more than 0.10 percentage point. In another study, the author employed a two-stage least squares regression model with control variables for fiscal indicators (e.g., average tax rate and fiscal balance) and long-term real interest rates, among other factors. The study investigates the average impact of government debt on per capita GDP growth in 12 Euro Area countries from 1970 to 2011. The authors find a nonlinear impact of debt on growth with a turning point—beyond which the government debt-to-GDP ratio has a deleterious impact on long-term growth— at about 90 to 100 percent of GDP. In addition, the negative growth effect of high debt may start already from levels of around 70 to 80 percent of GDP. Finally, Sichula (2012) investigated debt overhang in five Heavily Indebted Poor Countries (HIPC) of the Southern African Development Community (SADC), utilizing data for the period 1970 to 2011. The study showed a significant relationship between external debt and GDP. As external debt decreases, GDP increases. As those countries attain HIPC completion point, they witnessed increases in their real GDP occasioned by declines in debt service payments.

3. METHODOLOGY

3.1. Data and Source

The econometric analysis was conducted using annual time series data for the period 1981 – 2022. Data were sourced from various CBN statistical bulletin and IMF and World Bank website. The dependent variable includes real gross domestic product (rgdp) at 2010 constant price. While the focal independent variables are total domestic debt (DD) and total external debt(EXD). To obtain a fit model estimation, control variables such as total debt Servicing (DSER), total Government Revenue(TREV) and Foreign Direct Investment(FDI) were included in the model. In order to obtain proxies for the county's indebtedness, necessary ratios were computed. These include external debt to NGDP ratio (ed) and domestic debt to NGDP ratio (dd). The ratios were converted into their log forms in order to smoothen the time trend in the dataset and provide an improved fit (Khan and Senhadji, 2001).

3.2. Model Estimation

To unveil the relationship between public debt and economic growth, the study used the ARDL regression technique to determine the short and long-run characteristics of the relationship between public debt and economic growth. Also to rule out any spurious regression, Augmented Dickey Fuller (ADF) and Philip Perron test were conducted on each of the transformed variables. Breusch-Godfrey Serial Correlation was adopted to test for the presences of auto correlation in the residuals of the regression model. As a time series study, the study adopted the standard co-integration technique suggested by Johansen and Juselius (1992) and Engle and Granger (1987). The co-integration technique was to ensure that the variables have the same order of integration over the time series. The study also tested the bounds of the co-integration using the Autoregressive Distributed Lag model (ARDL) suggested by Pesaran *et al*. (2001). It has been argued that one of the finesse of the ARDL is its ability to eliminate or reduce the endogeneity problem usually encoun-

tered. As suggested by Pesaran *et al.* (2001), two critical bounds, namely, the upper and lower critical bounds are used to test for the co-integration. The lower critical bounds are used where the variables are of 1(0) order while the upper critical bounds are for variables of I(1) order.

The discrete threshold estimation method was used to assess if there is a nonlinear relationship (debt threshold) beyond which additional public debt may impede economic growth.

3.3. Model Specification

The functional relationship of the model is expressed as follows

$$RGDP = f (DD, EXD, DS, TREV, FDI) \ (1)$$

Using linear regression model by introducing constant and error hence

$$RGDP_t = \beta_0 + \beta_1 DD_t + \beta_2 EXD_t + \beta_3 DS_t$$
$$+\beta_4 TREV_t + \beta_5 FDI_t + \mu_t \ (2)$$

Where:

RGDP is real gdp

DD is domestic debt

EXD is external debt

DS is debt service

TREV is total government revenue

FDI is foreign direct investment

U is error term

The data were normalized by using the log form due to positive skewness of the employed data.

Table 3.1a Variables measurement.

Variable	Symbol	Definition	Source
GDP growth (annual %)	RGDP	Annual percentage growth rate of GDP at market prices based on constant 2015 prices	World Development Indicators
Domestic Debt	DD	Federal Government's Domestic Debt Outstanding (₦' Billion)	2022 CBN Statistical Bulletin
External Debt	ED	Nigeria's Public External Debt Outstanding (₦' Billion)	2022 CBN Statistical Bulletin
Debt Servicing	DSER	Debt service on external debt, total (TDS, current US$)	World Development Indicators
Foreign Direct Investment	FDI	Foreign direct investment, net inflows (% of GDP)	World Development Indicators
Government Total Revenue	TREV	Total Federally Collected Revenue (oil and non-oil Revenue)	2022 CBN Statistical Bulletin

4. EMPIRICAL FINDINGS

4.1. Summary of Descriptive Statistics

The summary statistics presented in Table 4.1a showed that Domestic debt and external debt averaged 6.60 and 6.45 during the estimation period of 1981-2022. This implied that the country accumulated more domestic debt than external debt during the period. However, in terms of the maximum shares attained during the study period, domestic debt has 9.86 compared to a value of 9.67 for external debt. Of all the variables, domestic debt appeared most volatile with a standard deviation of 2.24 compared to 2.08 for external debt and 0.64 for Debt Servicing.

Table 4.1a. Descriptive statistics.

-	GDP	DMD	EXD	DSER	FDI	TREV
Mean	10.34	6.60	6.45	21.55	-0.08	6.67
Median	10.14	6.92	6.48	21.44	0.08	7.55
Maximum	11.18	9.86	9.67	22.92	1.45	9.31
Minimum	9.5	2.42	0.85	20.29	-1.98	2.35
Std Dev	0.60	2.24	2.08	0.64	0.88	2.18

4.2. Unit Root Tests

The study employed both the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests to ascertain the time series properties of the variables. Results from both tests presented in Table 2 indicated that GDPGR, DMD, EXD, DSER and TREV were found stationary at First difference while FDI was found stationary at Level. Thus, the study treated all the variables included in the model as I (1).

Table 4.2a. Unit Root Test.

-	Augmented Dicky Fuller Test		Philip Perron Test	
Variables	**t-statistics**	**P-Values**	**PP Statistics**	**P-value**
GDPGR	-3.437621	0.0153**	-3.31064	0.0210**
DMD	-4.757105	0.0004*	-4.75710	0.0004*
EXD	-4.928631	0.0002*	-4.928631	0.002*
FDI	-3.199305	0.0274**	-3.090740	0.0353**
TREV	-6.394284	0.0000*	-6.394284	0.0000*

Source: Author's Computation.
Note: ***, **,*Indicates critical values; 1%, 5%, and 10% respectively

4.3. Serial Correlation Test

The Breusch-Godfrey serial correlation test is used to detect presence of auto correlation in a higher order than the Durbin Watson serial correlation test. The decision rule is to reject the Null Hypothesis (Ho) which states that there is no serial correlation at a probability value of the F-statistics is less than 5%. From table 4.3a below, the probability value of the

F-statistics is 0.3047 which is greater than 0.05, therefore the study fail to reject the null hypothesis and conclude that there is no serial correlation in the residual. This implies that the estimates are efficient and the statistical inferences valid.

Table 4.3a. Breusch-Godfrey serial correlation lm test.

Null hypothesis: No serial correlation at up to 2 lags			
F-statistic	**1.341493**	**Prob. F(2,10)**	**0.3047**
Obs*R-squared	7.827057	Prob. Chi-Square (2)	0.0200

In statistics, a sequence of random variables is homoscedastic if all its random variables have the same finite variance; this is also known as homogeneity of variance. The complementary notion is called heteroscedasticity. This study adopted the ARCH heteroscedasticity test and the probability value of the F statistics show a result of 0.0830. which implies that there is no heteroscedasticity problem.

Table 4.3b. Heteroskedasticity test: ARCH.

F-statistic	**2.124222**	**Prob. F (9,18)**	**0.0830**
Obs*R-squared	14.42168	Prob. Chi-Square (9)	0.1081

4.4. Result of Short Run and Long Run ARDL

From the short run estimated results in Table 4.4a, the domestic debt with coefficient of -0.55 and debt servicing coefficient of -6.76 reveals a negative relationship with economic growth, while DMD is statistically significant, debt servicing is not statistically significant as shown in table 4.4a below. This implies that for every unit change in DMD, economic growth will reduce by approximately 0.55 units and for every unit change in debt servicing, economic growth will fall by 6.7 units. The result of the short run ARDL analysis also revealed that external Debt has a positive impact on economic growth of Nigeria and it is statistically significant. The OLS regression shows that the estimates are reliable and the goodness of fit is confirmed by the high explanatory power of the short-run dynamic estimates. Overall, the R-squared adjusted account for 99% of the variation in the dependent variable while the remaining 1% is accounted by variables not explicitly included in the model.

Table 4.4a. Short run result.

Dependent Variable: GDPGR				
Method: ARDL				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.***
GDPGR(-1)	1.062364	0.032880	32.31033	0.0000
DMD	-0.559331	0.138308	-4.044093	0.0003
EXD	0.259505	0.097403	2.664236	0.0117
DSER	-6.76E-08	8.48E-08	-0.797670	0.4306
FDI	96.25026	177.9906	0.540760	0.5922

TREV	0.360873	0.099727	3.618612	0.0010
C	-662.0995	696.0881	-0.951172	0.3482
R-squared	0.998615	Mean dependent var		37892.05
Adjusted R-squared	0.998371	S.D. dependent var		21757.08
S.E. of regression	878.2213	Akaike info criterion		16.54793
Sum squared resid	26223273	Schwarz criterion		16.84049
Log likelihood	-332.2325	Hannan-Quinn criter.		16.65446
F-statistic	4086.016	Durbin-Watson stat		1.856938
Prob(F-statistic)	0.000000	-	-	-

*Note: p-values and any subsequent tests do not account for model selection.

ADRL bound testing approach is capable of estimating both the short and long run co-integration among the time series variables. The estimated residual of the long run relationship and their established parameters, direction and magnitude are suggested by the error correction model. As seen below, given an F-statistics of 25.79 which is greater than the values in the lower and upper bound i.e. 1(0) and 1(1) at 10% level of significant, it connotes a long-run relationship among the variables in the model.

Table 4.4b. Long run/bound test ARDL.

ARDL Long Run Form and Bounds Test				
Dependent Variable: D(GDPGR)				
EC = GDPGR - (8.9688*DMD -4.1611*EXD + 0.0000*DSER - 1543.3530*FDI				
-5.7865*TREV + 10616.6289)				
F-Bounds Test		**Null Hypothesis: No levels relationship**		
Test Statistic	**Value**	**Signif.**	**I(0)**	**I(1)**
-	-	-	**Asymptotic: n=1000**	-
F-statistic	25.79139	10%	2.08	3
K	5	5%	2.39	3.38
-		2.5%	2.7	3.73
-		1%	3.06	4.15

4.5. Stability test

As suggested by Pesaran et al. (2001), the study estimated the stability of resultant coefficients of the error correction model by a graphical method using the Cumulative Sum (CUSUM) of the Recursive Residual which shows that the coefficient is stable over the sample period.

The result of the threshold regression investigation is shown in Table 4.4d. The domestic borrowing threshold with economic growth is 7.06% of Nigeria's RGDP and is significant at 5% level. 7.06% of RGDP is the turning point in the relationship between DMD and RGDP such that it becomes
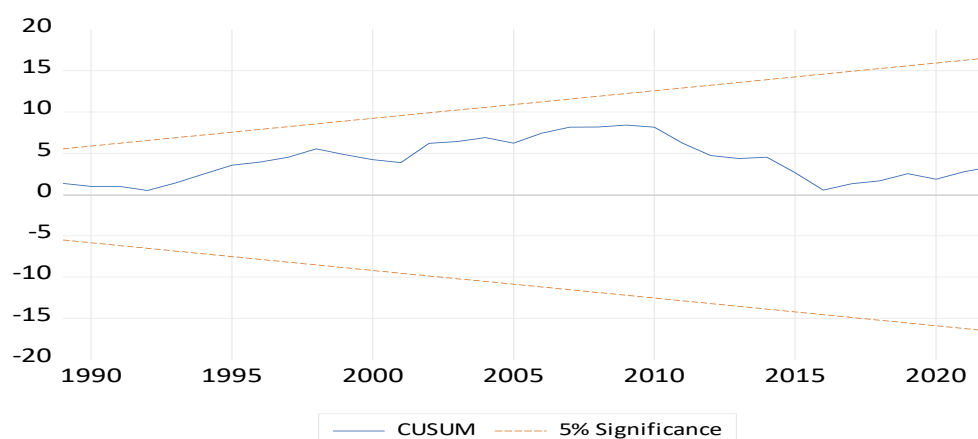
Fig. (4c). Cusum test for stability.

Table 4.4d. Threshold regression result.

Dependent Variable: RGDP				
Threshold variable: DMD				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
DMD < 7.061334 -- 21 obs				
DMD	0.162060	0.018609	8.708659	0.0000
C	9.497862	0.399182	23.79331	0.0000
7.061334 <= DMD -- 11 obs				
DMD	-0.326103	0.016132	20.21462	0.0000
C	8.648616	0.339760	25.45508	0.0000
Non-Threshold Variables				
EXD	-0.034349	0.011982	-2.866791	0.0069
DSER	-0.012874	0.017878	-0.720099	0.4761

Author's Computation.

asymmetrical. The upper part of Table 4.4d shows that the coefficient of domestic borrowing is positive (0.162060) before the threshold of 7.06% of RGDP. On the other hand, the coefficient of domestic borrowing is negative (-0.326103) after the threshold of 7.06%. The exact threshold occurs at 21 annual points into the data indicating the year 2002. The positive trend following the negative direction of the domestic borrowing curve before and after the threshold point shows an inverted U-shape curve in the relationship between domestic borrowing and economic growth. It means that for values of domestic borrowing before the threshold of 7.06% of RGDP, economic growth is positive and favourable to the country. However, there is a negative effect on the country's economic growth as the nation sustains domestic borrowing beyond the threshold of 7.06% of RGDP. The regression results of the non-varying variables show that the effect of external debt has been negative and significant on economic growth, while debt servicing have had a negative and insignificant impact on economic growth. However, the impact of domestic borrowing has been both positive and negative on economic growth.

5. CONCLUSIONS AND POLICY RECOMMENDATIONS

Public Debt is essential for growth in any economy, but the level of deficit financing can be detrimental to economy if not been checked and controlled. Scholars have argued on the various impact and possible threshold for debt on future economic growth. This study contributes to the empirical literature on the nexus of debt-growth relationship by investigating the existence of threshold effects in the relationship between public debt and economic growth in Nigeria. The study applied annual series data from 1981 to 2022. Our objective was to determine the point of inflexion, below which public debt contributes to growth and beyond which Public debt hurts growth, a point usually referred to as the optimal debt threshold level. This was motivated by the need to reassess Nigeria's debt profile. The Regression results confirmed the existence of a non-linear relationship between domestic debt and economic growth in Nigeria. Depicting an inverted U-shape curve in the relationship between domestic borrowing and economic growth. However, the threshold

results revealed that external debt has a negative impact on growth, however, it has no inflexion point, that is, no-threshold point depicting the existence of any asymmetrical effect. This implies that, there is no turning point in its relationship with RGDP. The result of the empirical search suggests that the accumulation of domestic debt in excess of the estimated threshold of 7.06% of RGDP exerts negative effects on economic growth in Nigeria. The findings of this study contributes to the economic discourse on debt accumulation and its growth implications in Nigeria. It also provided policymakers with quantifiable estimates of the growth impacts of high indebtedness. It is recommended that deliberate policies should be put in place to ensure that the accumulation of debt in Nigeria is consistent with the country's growth objectives and ensure effective and efficient utilization of borrowed funds to boost economic prosperity.

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