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# PUBLIC DEBT AND ECONOMIC GROWTH IN NIGERIA: INVESTIGATING THE OPTIMAL THRESHOLD LEVEL



 **Nzeh, Innocent**  
Chile

*Department of Economics, Renaissance University, Ugbozoka, Enugu State,  
Nigeria.*

*Email: [nzechile@yahoo.com](mailto:nzechile@yahoo.com) Tel: 08034222084*



## ABSTRACT

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The current worrisome high debt situation in Nigeria amid falling revenue motivated this study. Using annual data spanning a period of 1981-2018 and under the framework of Autoregressive Distributed Lag (ARDL) bounds technique, the results of findings revealed that public debt contributes to the growth of the economy both in the short-run and in the long-run. However, after a certain threshold level, public debt leads to declining growth in both time horizons. The study also found the optimal threshold level of debt to be 40.2% in both the long-run and short-run. Also finding revealed that while trade openness contributes to GDP positively, both inflation and fiscal deficit adversely affect GDP. I therefore recommend that beyond using the debt-GDP ratio to decide when to borrow, regulatory authorities should consider other indices used to measure debt sustainability. Also, while there is need for diversification of the economy, a synergy should exist between monetary and fiscal authorities in order to fight inflation.

**Contribution/ Originality:** This study investigated the optimal threshold level of debt using recent data that corresponds to period of immense rise in public debt in Nigeria. This is in addition to providing trend analyses of the various indexes used to assess debt sustainability. Thus the originality in the work is therefore authentic and credible and can be verified.

## 1. INTRODUCTION

Owing to the burgeoning needs of the government and the frequent inability to meet these needs in each fiscal year, governments rely on borrowing to argument the shortfall in revenues. Debts are incurred by government through fiscal deficit by borrowing in the domestic and international markets to finance domestic expenditure. For developing countries, deficit budgeting has become a major tool to finance government expenditure due to inability to mobilize sufficient domestic resources (Murwirapachena, Maredza, & Choga, 2013; Wakeel & Ullah, 2013). Nigeria is a typical case of countries whose expected revenue hardly matches her projected expenditure. Umeora (2013) observed that the bloating of government bureaucracy and cost of providing critical infrastructures, among others have over the decades resulted in persistent annual deficits. However, a major issue is over reliance on oil which adversely effects revenue projection of the country each time the oil price crashes. Lending credence to this contention, Wosowei (2013) observed that Nigeria was caught in the deficit trap since early 1980s when the world

oil market collapsed. From an historical angle, the growth of government deficits in Nigeria was more pronounced after the civil war in 1970 and this development is in line with Reinhart and Rogoff (2010) who observed that wars are among the genesis of rising debt in most countries.

Debt per se may not be bad. However, it depends on the utilisation of funds raised through borrowings. If the bulk of the revenue generated through borrowing is used for capital formation, it could contribute to the real income of future generation and thus can enable the government to offset the debt in future. On the contrary, the use of borrowings to finance only current expenditure as is mainly a case in Nigeria, poses the risk of debt rising to unsustainable levels. An unsustainable debt is what gives a debtor nation reasons to worry. An unsustainable debt will erode the confidence of creditors regarding the ability of the debtor country to repay the debts and this can lead to the suspension of further granting of credits. If creditors are willing to extend additional credit, this may come with some conditions such as demand for risk premiums, tax increase and even devaluation, which may end up leading to reduced domestic savings, capital flight and finally to a financial crisis or balance-of-payments.

Udoka and Ogege (2012) observed that public debt could lead to waste of productive efficiency (misdirection of production) for the economy as a whole or undesirable economic burdens imposed upon particular classes.

In attempting to investigate the impact of debt on a country's economy, several approaches have been adopted. However, the non-linear relationship between growth and debt has been a subject of wide interest and debate. In their paper, Reinhart and Rogoff (2010) argue that growth slows down sharply when the government debt to gross domestic product (GDP) ratio exceeds a threshold level of 90 per cent. Kaur and Mukherjee (2014) also observed that several economists argue that growth slows down sharply when the government debt to GDP ratio exceeds a certain threshold level. However, as observed by Chudik, Mohaddes, Pesaran, and Raissi (2017) there is no consensus regarding the threshold level of debt beyond which growth suffers as the threshold level vary widely across advanced and emerging market economies. In Nigeria, some empirical studies have identified the existence of a non-linear public debt ratio to GDP and this is confirmed by the trend analysis in Figure 1 below. However, what is contentious is that the threshold level differs across studies. These conflicting results do not argue well for Nigeria as policy makers in the country have been relying on the threshold level of debt-GDP to support the borrowing quest of the government; maintaining that the government still has enough leverage to borrow based on the low Debt-GDP level. This study contributes in the existing literature by considering current data that incorporate the period in which public debt rose very high. Another contribution is a trend analysis of different indexes used to assess debt sustainability and using such information to provide policy direction.

### *1.1. Debt and Expenditure Profile of Nigeria*

Over the years, Nigeria's rising public debt has always been a source of concern. For instance, Rafindadi and Musa (2019) observed that in 1987 there was an unprecedented rise in Nigerian public debt by 96.9% to N137.58 billion and up to N6.188 trillion in 2004. In 2005, the country was granted debt pardon by the Paris Club which reduces her total debt by 59% between 2004 and 2006 to N2.533 billion and N451.5 billion respectively. According to the Debt Management Office (DMO) as cited in Urama, Ekeocha, and Iloh (2018) Nigeria's debt stock profile (both domestic and foreign loan) stood at NGN22.7 trillion as at March 2017. Urama et al. (2018) also noted that the 2018 Fiscal Sustainability Analysis for the Federation (federal, states and FCT) as reported by the DMO show that the ratio of total public debt-to-gross domestic product remained below its threshold of 19.8% throughout 2017. The report had it that for the country to remain in the proposed country-specific threshold of 25% borrowing limit, the total domestic and external borrowing for the 2018 fiscal year should not go beyond USD6.25 billion or NGN1,906.37 billion. Current developments in the country may prove real, the fears of DMO as both state governments and the federal government are angling to procure more debts in the face of dwindling revenues.

Irrespective of the optimal threshold debt level being paraded by the DMO, various empirical studies have identified different threshold debt levels in Nigeria. The interesting thing in the studies is that they have been able

to reveal a debt turning point in the country. By implication, after a certain level of debt acquisition in Nigeria, further debt procurement negatively affects the growth of the economy. Figure 1 below shows that the ratio of public debt to GDP in Nigeria experiences a turning point (U-shaped) after some time as debt level rises. After this ratio attains a peak, it begins to experience a decline which shows that additional debt incurred will negatively affect growth level. What the figure does not reveal however, is the exact percentage point at which debt turns negative and this is the basis of studies devoted to investigating the threshold debt level. The trend analysis so far has shown that within 2015, public debt began to assume a turning point and this is the period when public debt rose very high as Figure 2 shows. The implication of this is that studies devoted to periods below 2015 could not capture this debt dynamics, thus suggesting investigation using recent data.

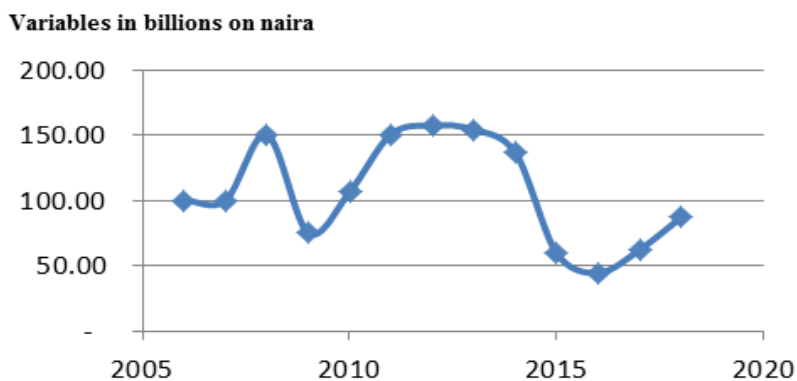


Figure-1. Non-linear public debt ratio to GDP in Nigeria.

Figure 2 shows the trend of public debt in Nigeria since 1999 when the country began the current democratic experiment. It can be observed from the figure that both foreign debt (FDEBT) and domestic debt (DDEBT) have been growing since 1999 with foreign debt rising very high, especially between 2003 and 2004. However, there is a falling trend of the debt from 2005 through 2009, especially foreign debt. The falling trend was owing to the debt relief granted Nigeria in 2005 which assisted the country to exit the debt trap. After 2009, however, Nigeria gradually returns to the debt debacle which has been rising very high till date. To worsen the situation in the country, crude oil price, which is the country’s main source of revenue, has been falling in recent times. As if that is not enough, the country has not been able to build up sustainable savings from oil revenue as a buffer. Past attempts at doing this through the establishment of excess crude account met a brick wall as political actors were hell-bent to ensure the savings arising from the excess crude was monetized to all the tiers of the government. So in the absence of savings to cater for the rainy day, the country is grappling with funds to execute her budgets whose source of funding was predicated on the price of crude oil.

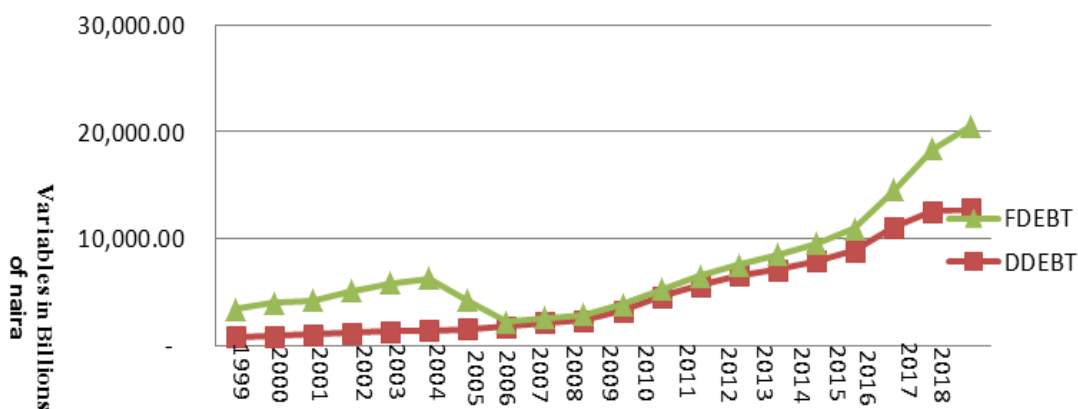


Figure-2. Trend in foreign debt (FDEBT) and domestic debt (DDEBT).

The reasons for the burgeoning debt profile of Nigeria can be appreciated if one considers the increasing roles of government in economic management. In recent times, the country has been saddled with so many fiscal responsibilities including payment of huge wages and salaries and the provision of some infrastructure. However, a more worrisome situation in the country is that a huge chunk of her revenue is mismanaged so much so that provision of critical infrastructure is lacking. From Figure 3 below, it can be observed that both capital expenditure (CAPEX) and recurrent expenditure (RECEX) exhibit continuous rising trend over the years. They got to a peak in 2012 and slightly fall thereafter only to continue to maintain rising trend till date. The cost of governance in the country is very high so much so that even some government functionaries are clamoring for its reduction. Each fiscal year, a large chunk of the budget is devoted to servicing political office holders to the detriment of the key sectors of the economy which are starved of needed resources to function. Perhaps, of more worrisome is a situation where capital budget performance is very low. In each fiscal year a, small percentage of the capital project is implemented and the balance is hardly rolled over to the following fiscal year. So the growing capital expenditure as portrayed in Figure 3 could be misleading as capital project implementation usually experiences a setback.

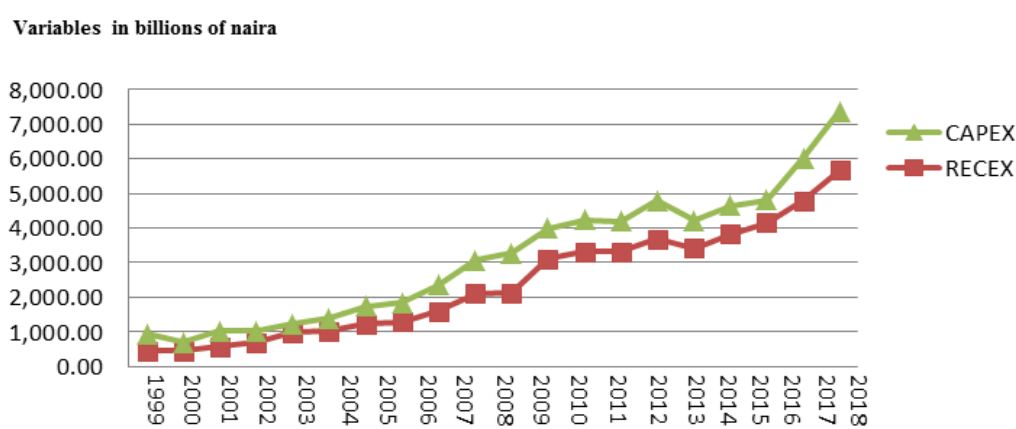


Figure-3. Trend in capital expenditure (CAPEX) and recurrent expenditure (RECEX).

### 1.2. Public Debt Sustainability in Nigeria

The most important factor in any public debt is the sustainability of such debt. Kaur and Mukherjee (2014) noted that sustainable level of public debt varies across different countries depending on the country-specific circumstances. In this sub-section, I looked at public debt sustainability in the Nigerian context, based on different approaches identified in Kaur and Mukherjee (2014). I began the analysis from 2006 bearing in mind that in 2005, the country had a relief from her creditors. So within this period, the debt burden was reduced. The first approach I considered is that the rate of growth of public debt should be lower than the rate of growth of nominal GDP. Figure 4 below indicates that while the growth rate of GDP is sluggish over the years, the rate of growth of public debt keeps rising. Even with the rebasing of the economy around 2014 that placed the country as the largest economy in Africa, the growth rate of the economy still trail behind the country's growth rate of debt. It is unfortunate that policy makers in the country have been basing their argument to increase borrowing on the strength of the size of the economy imposed by the rebasing effort. However, evidence on ground as provided by Figure 4 shows that even with the acclaimed large size of the country's GDP, growth rate of public debt is way ahead of growth rate of GDP. Therefore, judging debt sustainability using this index shows that public debt is not sustainable in Nigeria.

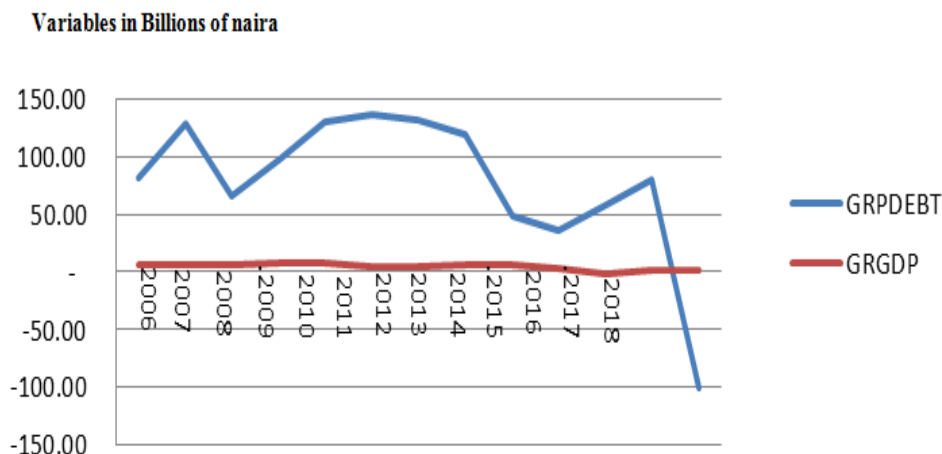


Figure-4. Trend of growth rate of public debt (GRPDEBT) and growth rate of GDP (GRGDP).

The next approach I looked into is the condition that the rate of growth of public debt should be lower than effective interest rate. This is necessary as growth rate of public debt which is higher than interest rate makes debt repayment impossible. Figure 5 below indicates that while effective interest rate is low within the years under review, the growth rate of public debt has been trending high with the exception of 2018 when the rate of growth of public debt was lower than the rate of interest rate. My worry is that with the current high inflation rate in the country, it will be difficult for interest rate to lower. Since there is no tendency for interest rate to decline owing to high inflation rate and for the fact that public debt is rising in the country, I expect the growth rate of public debt to continue to be higher than interest rate. Thus, with this situation on ground, one can infer that debt sustainability using this index is lacking.

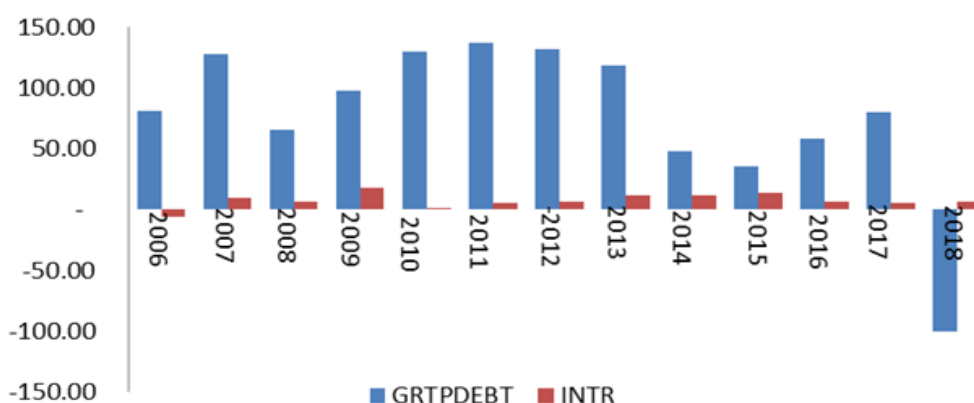


Figure-5. Trend of growth rate of public debt (GRTPEBT) and interest rate (INTR).

Another indicator I considered is the condition that revenue receipts as a per cent of GDP should increase over time. A closer look at Figure 6 below indicates that this ratio rose initially only to continue to observe a falling trend in recent times. It should be noted that even when the country's GDP is assumed to increase owing to the economy's rebasing, actual revenue receipts is on decline. The reason is because, while the rebasing was owing to the contributions of some emerging sectors such the telecom sector, actual revenue receipts to the economy is based mainly on income from the sale of crude oil which fluctuates frequently. So the improved economy as a consequence of the rebasing exercise lacks some fundamentals. As the country witnesses a fall in her revenue due to the current fall in the international price of crude oil, it is expected that this ratio may continue to experience further falling trend. Again, the implication of the decreasing trend of this index is that public debt in Nigeria is not sustainable.

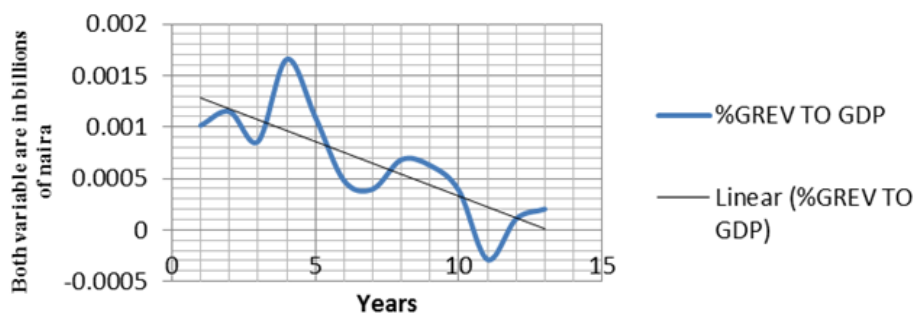


Figure-6. Trend of percentage of government revenue to GDP.

The ratio of public debt to revenue is also another index used to evaluate the sustenance of public debt. The condition is that, public debt to revenue receipts ratio should decline over time for debt to be sustainable. Looking at Figure 7 below, one can observe that this index has been fluctuating over the years. It got to a peak around 2011 only to descend thereafter up till 2015 when it begins to exhibit signs of a rising trend. If the rise persists over the years, my verdict is that this index indicates that public debt in Nigeria is unsustainable. It is evident that the period in which the ratio experienced a falling trend coincides with when the country rebased her economy. The rebasing of the economy led to an increased GDP such that the ratio declined. The fear is that as the country indulges in further debt procurement amid falling revenue, chances are that this ratio may be rising which will end up eroding debt sustainability in the country.

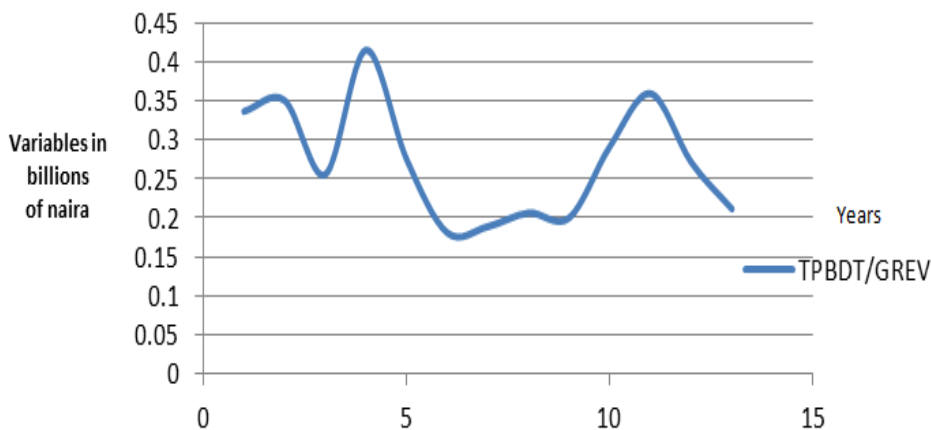


Figure-7. Trend of the ratio of total public debt to government revenue.

I also add debt service ratio to gross national income to the indexes and it is expect that this index to be declining over time. Their declining trend should show that a portion the country's resources used to service debt is small and as such debt servicing cannot erode the resources meant for other sectors. A look at Figure 8 below shows that from 2005 debt service as a ratio of GNI declined only to start a gradual rise from 2010. It declined in 2015 only to start rising thereafter. With this rising trend, the conclusion is that debt sustainability is lacking. This scenario is worsened by the current falling revenue facing the economy. The ongoing quest of the government to borrow further implies that there is need to service existing debts in order to pave way for such borrowing as creditor nations and institutions expect the country to be credit worthy.

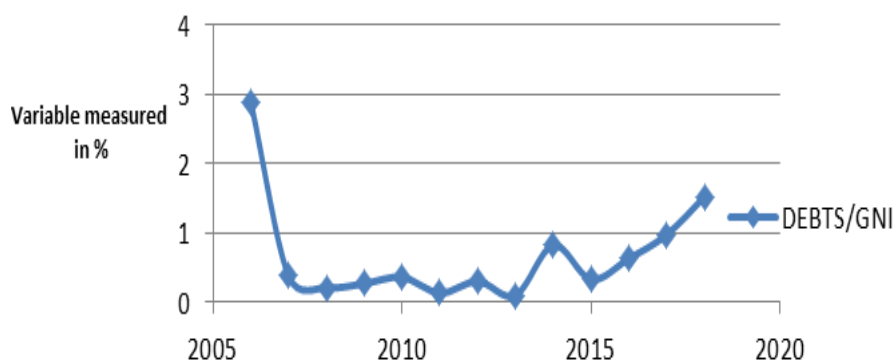


Figure-8. Trend of ratio of debt service (DEBTS) to gross national income (GNI).

### 1.3. Theoretical Issues

Even though public debt is essential for a country, mainly to cushion the shortfall in revenue; the conclusion of most of the theoretical literatures is that a negative relationship between public debt and economic growth exists. For instance, Miller and Modigliani (1961) in dividend policy, growth, and the valuation of shares, contended that external debt lowers the stock of private capital and as such reduces the flow of income; hence the lowering of growth. In another vein, Diamond (1965) borrowed a leaf from the neoclassical growth model to argue that national debt negatively affects growth. According to the study, this is possible as tax burden is increased which ends up moving interest rate away from the golden rule, leading to decreasing savings and then to lower capital stock. However, a growth rate that is higher than interest rate shows higher accumulation of capital and in this situation, a rise in national debt which leads to efficient allocation of resources can lead to economic growth.

From another perspective, Saint-Paul (1992) focusing on an endogenous growth model, analyzed the impact of fiscal policy on growth. The outcome of the study is that in an endogenous growth model, an increase in national debt reduces economic growth. In addition to all these studies, Aschauer (2000) proposed a growth model in which public debt has a non-linear (inverted U shape) relationship with economic growth. Finding reveals that high level of national debt adversely affects growth rate. Checherita and Rother (2010) noted that an important channel through which public debt accumulation can affect growth is that of long-term interest rates. Higher long-term interest rates, resulting from more debt-financed government budget deficits, can crowd-out private investment, thus dampening potential output growth.

## 2. EMPIRICAL LITERATURE REVIEW

### 2.1. Evidence from Nigeria

The sensitivity of public debt as a means of cushioning shortfall in revenue and the subsequent burden it throws up has led to many studies that centre on how it affects the economy. In Nigeria, most of the empirical studies have found significant positive impact of public debt on GDP. However, findings of most studies show a negative impact of public debt on GDP at the turning point and also threshold levels which differ in each study. Omotosho, Bawa, and Doguwa (2016) investigated the existence of threshold effects in the relationship between public debt and economic growth in Nigeria using quarterly data from 2005-2015. The study found empirical support for an inverted U-shape relationship between public debt types and economic growth with total public debt as percentage of GDP showing 73.70 per cent threshold level.

Eboreime and Sunday (2017) analysed the threshold effect of public debt on growth from 1981-2015. By adopting the framework of autoregressive distributed lag (ARDL), findings shows that the optimal total public debt-GDP threshold for Nigeria is 55.2%. The paper recommends the exercise of caution in the accumulation of domestic debts while encouraging more external borrowings at advantageous terms. Ebi and Imoke (2017) investigated the debt growth relationship in Nigeria for the period 1970-2014. By using the Error Correction Model (ECM) technique, result showed public debt to gross domestic product (GDP) ratio to be positive while the

squared of public debt to GDP was negative and statistically significant at 5% level in the different equations. The result supported the presence of non-linearity and the optimal debt carrying capacity of Nigeria is 29.7% debt GDP ratio. Under the framework of Dynamic Ordinary Least Square (DOLS), [Mary, Sunday, and Haruna \(2019\)](#) investigated the public debt ratio to GDP over a period of 1986 to 2017. Findings showed a significant relationship between government debt and Nigeria's economic performance. Government debt is growth-enhancing at low levels but growth-retarding at a high level with the optimal government debt estimated as 9.98% of the gross domestic product (GDP).

It should be noted that the existence of non-linearity has been established in each study; however each study differs in their threshold levels. Even though the studies were carried out almost in the same period, the wide difference among their threshold levels is curious. More curious is the high threshold level reported by [Omotosho et al. \(2016\)](#) and a very low level reported by [Mary et al. \(2019\)](#) and also different results reported by [Eboime and Sunday \(2017\)](#) and [Ebi and Imoke \(2017\)](#) whose studies were carried out in the same year. These results therefore indicate that the question of what constitutes a proper threshold level in Nigeria is still unsettled.

## 2.2. Evidence from Other Countries

The results from other countries have also shown various threshold levels of debts which supports the popular view that there is no universal threshold level of debt. [Kaur and Mukherjee \(2014\)](#) investigated the threshold level of debt and public debt sustainability in India over the period 1980-81 to 2012-13. By applying the technique of OLS, finding indicates that the debt position in India is sustainable in the long run. The empirical results also reveal that there is a statistically significant non-linear relationship between public debt and growth in India, implying a negative impact of public debt on economic growth at higher levels. The threshold level of debt was found to be 61 per cent, beyond which an inverse relationship is observed between debt and growth. The study observed that the threshold level is lower than the actual level of debt at 66.0 per cent of GDP in end March 2013 and it thus recommends credible fiscal consolidation.

However, a panel data analysis of 25 sovereign member states of the European Union (EU) by [Mencinger, Aristovnik, and Verbič \(2014\)](#) indicates a statistically significant non-linear impact of public debt ratios on annual GDP per capita growth rates. Further, the calculated debt-to-GDP turning point, where the positive effect of accumulated public debt inverts into a negative effect, is roughly between 80% and 94% for the 'old' member states. Yet for the 'new' member states the debt-to-GDP turning point is lower, namely between 53% and 54%. [Mupunga and Le Roux \(2015\)](#) estimated an optimal growth-maximising public debt threshold for Zimbabwe. Using a bivariate quadratic growth equation, the analysis confirms the existence of an inverted U-shaped relationship between public debt and economic growth in Zimbabwe. The optimal growth-maximising public debt threshold was estimated at a public debt-to-GDP ratio of between 45% and 50%. In a study for South Africa, [Baaziz, Guesmi, Heller, and Lahiani \(2015\)](#) investigated the dynamic relationship between accumulated public debt ratio and RealGDP growth in the South African economy over the period 1980-2014. Using nonlinear Smooth transition Regression (STR), result of findings revealed that public debt in South Africa becomes an impediment to economic growth if it crosses the limit of 31.37% of GDP.

[Chudik et al. \(2017\)](#) study the relationship between public debt expansion and economic growth and investigate whether the debt-growth relation varies with the level of indebtedness. The study contributed theoretically by developing tests for threshold effects in the context of dynamic heterogeneous panel data models with cross-sectionally dependent errors. In the empirical application, using data on a sample of forty countries over the period 1965-2010, finding shows that there was no evidence for a universally applicable threshold effect in the relationship between public debt and economic growth. Regardless of the threshold, however, the study found significant negative effects of public debt build-up on output growth. [Javier, Pérez, and Rojas \(2017\)](#) examined the optimal threshold level for Spain using the Vector Auto Regressions (VARs). The estimated models were used to compute



the probability that the public debt ratio exceeds a given threshold, by means of MonteCarlo simulations. The aim of the exercise was to gauge the implicit debt threshold or “prudent debt level” that is most consistent with market expectations as measured by the sovereign yield spread. Finding of the study revealed a debt-to-GDP ratio anchor of 60% of GDP.

Sadiku, Bexheti, and Sadiku (2018) analyzed the impact of national debt on the economic growth of Republic of Macedonia using quarterly data for the time period 1999Q1-2016Q4. The study employs the econometric techniques of the Vector Error Correction Method (VECM) and Johansen co-integration test, in order to analyze both, the short term and long term effects. In addition, a Granger causality test was performed to investigate the causal relationship between the aforementioned indicators. The empirical results reveal negative relationship between initial debt and subsequent growth in the long run. On average, a 10 percentage point increase in the initial debt-to-GDP ratio is associated with a slowdown in real GDP growth of around 1.3 percentage points. While in the short term there was no evidence of any robust evidence. Also, the results reveal that the coefficients of government expenditures, trade openness and gross investments are positively connected with real GDP and are statistically significant in the long run. It shows that these variables are important long run determinants of economic growth. In a cross-country study involving 152 countries, Butkus and Seputiene (2018) investigated whether debt threshold level depends on government effectiveness. Under the framework of Generalized Moments Method (GMM) and over the period of 1996–2016, results of the study confirms the existence of inverted U-shaped debt-growth relationship with clear debt turning point dependence on government effectiveness.

Khanfir (2019) examine the non-linear relationship between public debt and economic growth, using panel data for 4 North African countries (Tunisia, Algeria, Morocco and Egypt) from 2003 to 2012. By applying a Panel Threshold Regression (PTR) model, finding of the study indicates a debt threshold level of 42.8% which is necessary for public debt to impact positively on economic growth.. However, beyond this threshold of public debt, this relationship becomes negative, which implies that public debt seems to reduce economic growth. The study recommended fiscal consolidation and reduction in public debt so as to stimulate the economic growth of the 4 North African countries. In another cross country study involving European countries, Hu (2019) investigated the relationship between public debt and GDP growth for European countries. By using a large cross sectional panel data, empirical results suggest that the short run impact of debt on GDP growth is positive and statistically significant but decrease to negative and lose some significance at public debt and GDP ratio of 109%. The study contended that countries with higher credit rating have higher threshold value and more significant threshold effect.

Juergen (2019) using a panel time series autoregressive distributed lag (ARDL), examined the threshold level of debt for 25 European Union member states over the 1996-2017 period. Overall the results substantiate the findings of empirical literature that government debt hinders economic growth. The study establishes that debt negatively impacts economic growth both over the short- and the long-term. In fact, a 10% rise in government debt leads to an immediate negative effect on growth of 0.72% for the high debt countries. The study noted that this negative effect suggests that the relationship between debt and growth is not influenced by the initial level of debt-to-GDP ratio. Nduricimpa (2020) investigated the threshold effects of public debt on economic growth in Africa. This study applies panel smooth transition regression approach with findings showing a debt threshold in the range of 62–66% for the whole sample. For middle-income and resource-intensive countries, a debt threshold in the range of 58–63% is estimated.

From the foregoing empirical review both at country-specific and country-wide, I can conclude that threshold levels for developing countries on the average, usually hover around 50% and below, while for developed countries, their threshold level is high. This by implication means that countries with high GDP have the leverage to borrow more than countries with a weak GDP base.

### 3. RESEARCH METHODOLOGY

Modified from [Kaur and Mukherjee \(2014\)](#) the model in equation one below guided the study:

$$y_t - y_{t-1} = \alpha D_t + \beta_1 D_t^2 + \beta_2 (i_t - i_{t-1}) + \beta_3 \pi_t + \beta_4 (T_t - T_{t-1}) + \beta_5 GFD_t + \varepsilon_t \quad (1)$$

Where

y is the real GDP.

D is public debt to GDP ratio.

D<sup>2</sup> is the square of public debt to GDP ratio.

i is real investment.

$\pi$  is inflation rate.

T is international trade in real terms.

GFD is the ratio of gross fiscal deficit to GDP.

The positive sign of  $D_t$  indicates that accumulation of public debt leads to higher growth in real GDP up to a certain level. The negative sign of  $D_t^2$  shows that the association of public debt and real GDP turns negative beyond a certain threshold.

The Auto Regressive Distributed Lags (ARDL) bounds approach developed by [Pesaran, Shin, and Smith \(2001\)](#) was used for estimation. The procedure for the ARDL bounds testing approach has two steps. The first step is testing for long-run relationship and the next step is the estimation of long and short-run parameters by using the Error Correction Model (ECM). A dynamic unrestricted Error Correction Model (UECM) can be derived from the ARDL bounds testing by way of a simple linear transformation. The UECM integrates the short-run dynamics with the long-run equilibrium without losing any long-run information. The UECM is expressed in equation two as follows:

$$\begin{aligned} LRGDP_t = & \alpha_0 + \phi_1 LRGDP_{t-1} + \phi_2 TPDEBT / RGDP_{t-1} + \phi_3 TPDEBT / RGDP_{t-1}^2 + \phi_4 LGFCF_{t-1} + \phi_5 INFR_{t-1} \\ & + \phi_6 OPEN_{t-1} + \phi_7 GFD / RGDP_{t-1} + \sum_{j=1}^k \lambda_{1j} \Delta LRGDP_{t-j} + \sum_{j=1}^k \lambda_{2j} \Delta TPDEBT / RGDP_{t-j} + \sum_{j=1}^k \lambda_{3j} \Delta TPDEBT / RGDP_{t-j}^2 \\ & + \sum_{j=1}^k \lambda_{4j} \Delta LGFCF_{t-j} + \sum_{j=1}^k \lambda_{5j} \Delta INFR_{t-j} + \sum_{j=1}^k \lambda_{6j} \Delta OPEN_{t-j} + \sum_{j=1}^k \lambda_{7j} \Delta GFD / RGDP_{t-j} + e_{1t} \end{aligned} \quad (2)$$

where

$\Delta LRGDP$  = Change in the log of Real GDP.

$TPDEBT / RGDP$  = Ratio of total public debt to RGDP.

$TPDEBT / RGDP^2$  = Square of ratio of total public debt to RGDP.

LGFCF = Log of Gross fixed capital formation (a proxy for investment).

INFR = Inflation rate.

OPEN = Trade openness (a proxy for international trade).

GFD/RGDP = Ratio of gross fiscal deficit to RGDP.

$\Phi_1$  to  $\Phi_7$  are long run parameters.

$\lambda_1$  to  $\lambda_7$  are short run parameters.

$e_t$  = error term.

I logged the variables in ratio before computing their ratio with an excel package.

Following [Checherita and Rother \(2010\)](#) the optimal threshold debt level was estimated. In achieving this I obtained the coefficients of both linear and non-linear variables and then find their ratio which we multiplied by a scalar (-1/2). The formula for the optimal threshold debt level is thus:

$$OTLD = \beta_1 / \beta_2 (-1/2)$$

where,

OTLD = Optimal threshold level of debt.

$\beta_1$  = the coefficient of the linear term (coefficient of debt/GDP).

$\beta_2$  = the coefficient of the quadratic (nonlinear) term. That is, the coefficient of debt/GDP<sup>2</sup>.

### 3.1. Estimation Technique, Model Justification and Data Sources

The justifications for the use of ARDL are as follows: unlike some other co-integration techniques, the bounds testing approach can be applied to the model irrespective of whether the variables are purely  $I(0)$  or purely  $I(1)$ . Secondly, the Monte Carlo analysis exhibits that the ARDL co-integration approach has superior properties in small sample (Pesaran & Shin, 1999). Third, even though some of the model's regressors are endogenous, the bounds testing approach provides unbiased long-run estimates simultaneity method of assessing the short and long-run effects of one variable on the other (Bentzen & Engsted, 2001). The study made use of annual data that spans a period of 1981-2018 and the data were sourced as follows: public debt, real GDP and fiscal deficit were sourced from the CBN Statistical Bulletin (2018) gross fixed capital formation was sourced from the World Bank Development Indicators (2019).

## 4. RESULTS PRESENTATION AND ANALYSES

To ensure the series maintain stationarity and also serve as a guide on the appropriate econometrics framework to adopt, the study carried out stationarity test using the Augmented Dickey Fuller (ADF) and Phillip Perron (PP) tests. The null hypothesis of no stationarity was tested against the alternative at the 5% level. Tables 1 and 2 below show the results of findings both at level and at first difference respectively. The results from both the ADF and the PP show that none of the variables achieved stationarity at level. However, when differenced, all the series became stationary. That is, they become  $I(1)$  after first differencing. With stationarity test showing that series are  $I(1)$ , it is convenient to apply the ARDL to estimate both the long-run and short-run coefficients.

Table-1. Result of Stationarity at levels.

Variables	ADF t-stat.	PP t-stat.	Critical value at 5% ADF	Critical value at 5% PP	Order of integration
GCFC	-2.595127	-4.242003	-2.948404	-2.943427	Nil
GFD	-2.542205	-2.650393	-2.943427	-2.943427	"
INFLR	-2.884731	-2.756360	-2.943427	-2.943427	"
PDEBT	1.183396	1.183396	-2.945842	-2.945842	"
RGDP	-0.029104	0.683755	-2.945842	-2.943427	"
EXPORT	1.730837	1.420159	-2.954021	-2.943427	"
IMPORT	-0.974770	-0.974770	-3.536601	-3.536601	"

Table-2. Result of stationarity at first difference.

Variables	ADF t-stat.	PP t-stat.	Critical value at 5% ADF	Critical value at 5% PP	Order of integration
$\Delta$ GCFC	-4.879285	-5.317409*	-2.948404	-2.945842*	$I(1)$
$\Delta$ GFD	-5.896135	-6.663838*	-2.945842	-2.945842*	$I(1)$
$\Delta$ INFLR	-5.593821	-9.447165*	-2.945842	-2.945842*	$I(1)$
$\Delta$ PDEBT	-5.687803	-7.838440*	-2.951125	-2.948404*	$I(1)$
$\Delta$ RGDP	-3.394459	-3.242045*	-2.945842	-2.945842*	$I(1)$
$\Delta$ EXPORT	-5.047608	-2.753992*	-2.954021	-2.611531*	$I(1)$
$\Delta$ IMPORT	-6.039996	-5.324707*	-3.544284	-3.540328*	$I(1)$

Note: Figures with asterisks (\*) indicate the rejection of the null hypothesis at the 5% level.

The results of the short-run coefficients are displayed in Table 3 below. From the results, the ratio of public debt to GDP positively influences growth in the short run. Therefore, when public debt ratio to GDP is linear, growth is expected to improve and this result is in line with findings by previous studies in Nigeria cited in this

paper. What this result shows is that the government can still have the capacity to borrow without jeopardizing the economy. The result of the coefficient of the quadratic debt-to-GDP variable is however, negative. This indicates a non-linear (i.e. inverted U-shaped) relationship between economic growth and public debt in Nigeria. The result is in line with the general theoretical assumption and also empirical findings which show that beyond a certain debt turning point a negative effect on growth occurs. From the results of the coefficient of both linear and non linear ratio of public debt to GDP, the optimal threshold debt level is calculated to be 40.02%. However, the result of this study differs from the results of [Omotosho et al. \(2016\)](#); [Ebi and Imoke \(2017\)](#); [Eboreime and Sunday \(2017\)](#) that reported 73.70%, 52.2 and 29.7% respectively. The choice of methodology and the time period of these studies could account for the differences. Even though this study adopted the ARDL just like [Ebi and Imoke \(2017\)](#) the findings of the two studies differ. As shown in [Figure 2](#) above, starting from 2015, public debt rose very high in Nigeria and that could account for the low optimal threshold level in this study compared to [Ebi and Imoke \(2017\)](#). The implication of the result is that any debt level above 40.2% will be injurious to the economy.

In another vein, the gross fixed capital formation as a proxy for investment has a negative link with GDP even though it is not significant. The result is a departure from the works of [Kaur and Mukherjee \(2014\)](#) which found a positive link between gross fixed capital formation and GDP for India. This result is curious because it is expected that this variable exhibits a positive influence on GDP. The curiosity led me to do a trend analysis of the share of gross fixed capital formation to GDP in Nigeria which is displayed in [Appendix 2](#). The result shows that over the years, there has been a downward trend of this ratio, thus confirming the estimated result. I suspect that the reason could be owing to the high cost of doing business in Nigeria which has led to the folding up of most businesses and relocation of some to neighbouring countries. More so, the government has the penchant to devote a large share of the budget to current expenditure without much commitment to develop critical infrastructure that can improve the economy. Finding also shows that trade openness exhibited a positive relationship with GDP and it is significant. The result finds support in [Greenidge, Craigwell, Thomas, and Drakes \(2012\)](#) as well as in [Kaur and Mukherjee \(2014\)](#). This result shows that international trade contributes to economic growth in Nigeria. Thus by opening up the economy to the outside world, the country stands to gain and this goes contrary to the views of proponents of trade protection.

There is a significant and negative relationship between inflation rate and GDP which also finds support in [Greenidge et al. \(2012\)](#). The result is also in line with finding by [Baaziz et al. \(2015\)](#) for South Africa and the works of [Kaur and Mukherjee \(2014\)](#) for India. This result is in line with a priori expectation and the implication of the result is that rising prices which dislocates the macroeconomic environment has an adverse impact on the economy. Rising prices affects the ability of business people to plan as well as the consumption pattern of consumers. It may also impact the economy's balance of payments by making exports more expensive and this will end up leading to the deterioration of the trade balance and capital outflows ([Baaziz et al., 2015](#)). This justifies the reason why the key objective of the monetary authorities in Nigeria is to rein in inflation. Finally, finding indicates a significant and negative relationship between GDP and fiscal deficit. This is expected because over the years, the practice of the fiscal authorities in Nigeria is to engage in budget deficit. This is mainly owing to shortfall in revenue, especially when the international price of oil which is the country's mainstay, falls. Financing of fiscal deficit comes with many distorting factors such as crowding out domestic investors and mounting pressures on the fiscal authorities when repaying the debt occasioned by the deficit.

**Table-3. Results of short-run coefficients.**

ARDL Cointegrating and Long Run Form			
Dependent Variable: (LRGDP)			
Selected Model: ARDL(1, 0, 0, 0, 0, 1, 0)			
Sample: 1981 2018			
Included observations: 36			
Variable	Coefficient	t-Statistic	Prob.
D(PDEBT_RGDP)	0.045186	4.118747	0.0003
D(PDEBT_RGDP ^ 2)	-0.002248	-3.648725	0.0012
D(LGFCF)	-0.068140	-1.555729	0.1319
D(OPEN)	0.015410	2.542892	0.0173
D(INFLR)	-0.000983	-3.158679	0.0040
D(GFD_RGDP)	-0.002746	-2.616595	0.0146

From the result displayed in Table 4, the result of the coefficient of the error correction model (ECM) is negative and significant which is in line with the condition for the existence of a long-run relationship. The implication of the result is that about 89% percent of errors generated in each period is automatically corrected by the system in the subsequent period. The results of the long-run coefficients show that the coefficient of the ratio of public debt to GDP in linear form is significant and positive. This is in line with the short-run result. In the long-run also, the debt to GDP ratio exhibited a non-linear pattern as the coefficient turns negative and it is significant. The result finds support in Juergen (2019) that employed a panel ARDL with results showing a negative impact of debt to growth in both long-run and short-run. Coincidentally, the optimal threshold level of debt to GDP ratio is 40.2%. So in both time horizons, the optimal threshold level is the same. The implication of the result is that in the long-run, a threshold debt level beyond 40.2% will lead to declining economic growth.

Finding also revealed that the coefficient of gross fixed capital formation is negative and significant in the long-run. Thus, either in the short-run or long-run, gross fixed capital formation does not have any positive impact on GDP. Other variables exhibited the right sign as they are significant, thus exhibiting similar outcome with the short-run results.

**Table-4. Results of long-run coefficients.**

Variable	Coefficient	t-Statistic	Prob.
Const.	6.327022	4.761733	0.0001
PDEBT_RGDP	0.050565	3.701888	0.0010
PDEBT_RGDP ^ 2	-0.002515	-3.354924	0.0024
LGFCF	-0.221153	-4.864771	0.0000
OPEN	0.017244	2.689752	0.0123
INFLR	-0.001100	-3.378225	0.0023
GFD_RGDP	-0.003073	4.761733	0.0001
ECM(-1)	-0.893620	-6.910822	0.0000

In Table 5, the results of diagnostic tests were displayed to ascertain the goodness of fit and adequacy the model. The result shows that there is no evidence of autocorrelation as the null of no serial correlation cannot be rejected. The model also passes the normality tests as the Jarque-Bera test indicates that the errors are normally distributed see Appendix 1. In addition, the model passes the Ramsey RESET test for the correct model specification as well as the test for heteroskedasticity.

**Table-5. Diagnostic results for ARDL model.**

Test	P-value	Null Hypothesis	Conclusion
Heteroskedasticity Test: Breusch-Pagan-Godfrey	0.1702	H <sub>0</sub> : No Homoskedasticity	Cannot reject H <sub>0</sub>
Serial Correlation: Breusch-Godfrey LM Test	0.1194	H <sub>0</sub> : No Serial Correlation	Cannot reject H <sub>0</sub>
Jarque-Bera (Normality Test)	0.9772	H <sub>0</sub> : Normally Distributed	Cannot reject H <sub>0</sub>
Model Specification (Ramsey RESET Test)	0.712	H <sub>0</sub> : Correctly Specified	Cannot reject H <sub>0</sub>

## 5. SUMMARY AND RECOMMENDATIONS

The results of this study so far have shown that public debt can lead to economic growth both in the long-run and in the short-run. However, after a certain threshold level, continuous incurring of debt leads to a negative growth. In summary, the debt to GDP ratio exhibits a non-linear pattern with an optimal threshold level of 40.2% both in the short-run and in the long-run. A non linear threshold pattern has been identified by various empirical studies in Nigeria and even outside the country. Finding also revealed that the gross fixed capital formation does not contribute to growth in Nigeria either in the short-run or in the long-run, while international trade as proxied by trade openness leads to growth in both time horizons. However, both inflation and fiscal deficit retard growth both in the times horizons.

The findings in this study has some policy implications for policy makers in Nigeria; especially now that the country has increased her quest to borrow at a time when there is falling revenue owing to the fall in international price of crude oil. Nigeria is an oil dependent country, so with the current bearish price of oil internationally owing majorly to the COVID 19 pandemic, further procurement of debt could be distortionary to the economy. Since the data utilized in this study is relatively current compared to other previous studies, it is my contention that the result of the threshold level will keep fiscal authorities in check regarding debt procurement. Empirical results so far have shown an optimal threshold debt to GDP ratio level which is beyond the stated 25% level by the Debt Management Office (DMO). Some government officials in Nigeria have been supporting the borrowing spree of the government by basing their argument on what they term low debt to GDP threshold level. I argue that such one-sided view could be misleading since there are other indexes that can guide the level of debt to target and the trend analysis of some of these indexes shows that debt sustainability in Nigeria is lacking. From the foregoing results, I recommend that caution should be exercised in using only the debt to GDP ratio as a basis for borrowing. Regulatory authorities should consider other indexes to guide them in optimal debt level projection. I also recommend genuine efforts to diversify the economic base away from the oil sector to deepen the revenue sources so as to reduce fiscal deficit which is inimical to the economy. Also, a synergy should be maintained between monetary and fiscal policies so that fight against inflation will be meaningful.

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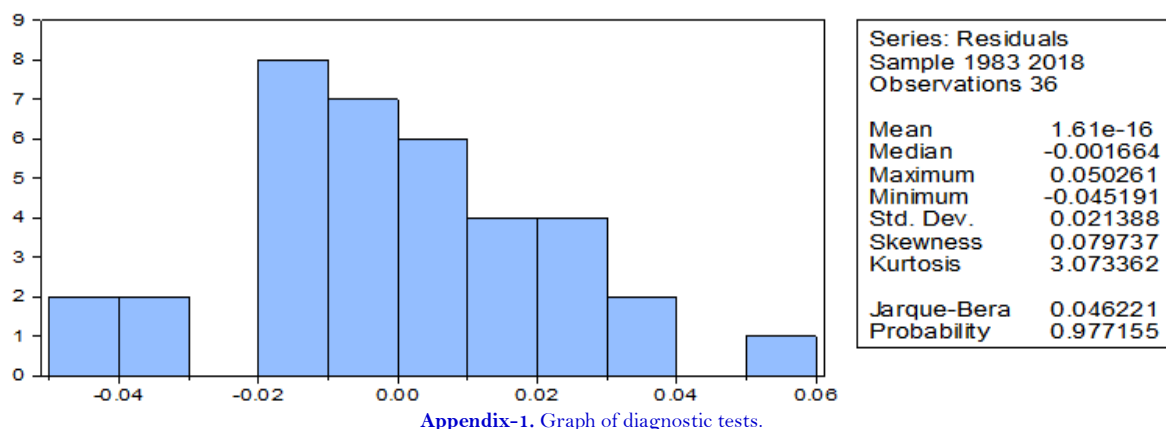
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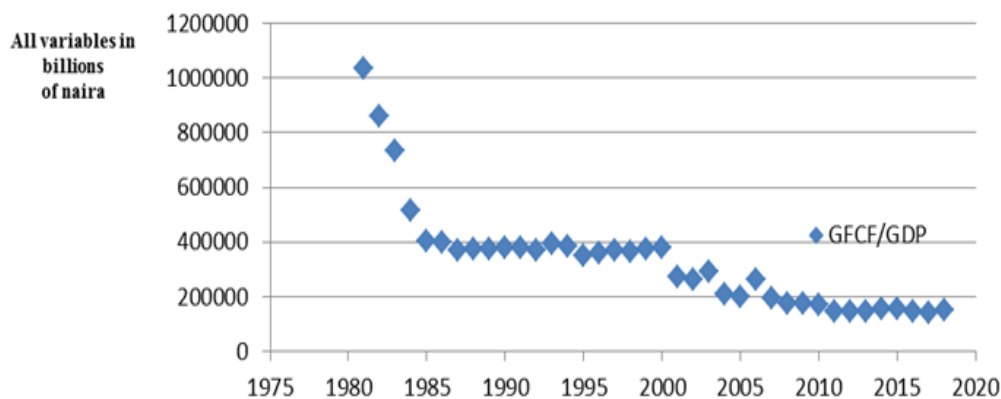
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APPENDIX



Appendix-1. Graph of diagnostic tests.



Appendix-2. Trend of the share of gross capital formation (GFCF) to GDP in Nigeria.

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