Sustainability of Nigeria External Borrowing: An Empirical Investigation

Modestus .C. Nsonwu, PhD

mochid_n@yahoo.co.uk
Department of Economics
Veritas Univeristy, Abuja
Bwari, FCT – Nigeria

Abstract
This paper empirically investigated the sustainability of Nigeria external debt and its effect on Nigeria Economic Growth from 1980 to 2020 with secondary data sourced .from Central Bank of Nigeria, Debt Management Office statistical/annual bulletins of various years and International debt statistics of the International Monetary Fund (IMF). Linear and Dynamic Autoregressive Distributed Lag (ARDL) Method were employed to estimate the effect of External Debt, External debt service, external debt service-export ratio, external debt-gross national income ratio and Exchange Rate on Gross Domestic Product while the Toda-Yamato causality test was used to investigate the causal effect of the variables on the economy. Among the several findings of this paper is that external debt service-export ratio and external debt-gross national income ratio proxies for debt sustainability impacted negatively on economic growth in Nigeria both in the short and long run. The Toda-Yamamoto causality test equal showed negative impact of the duo on Nigeria's gross domestic product. The paper based on these findings recommended that the country should invest external debts in self-liquidating projects that promotes investment and growth. Loans should be applied on investment in infrastructures that promotes productivity and human capital development. A well-developed capital market that will attract enough foreign portfolio investment where government can raise funds to finance its budget deficits is highly recommended. Measures that will stabilize exchange rates in the country should be put in place to check its adverse effects on the economy.
Key words: *Debt Sustainability, Economic Growth, Dynamic ARDL, Toda-Yamamoto*

I.   Introduction

The sustainability of the Nigeria's External debt and its impact on economic growth had been a topical issue among economist, researchers and policy makers. While some are of the view that external debt leads to economic growth others are opposed to it. Since the global debt crisis in the early 1980s, the relationship between sustainable external debt and economic growth has received enormous attention. The current Nigeria's debt profile is of immense concern to all as in recent time the debt profile has continued to rise.

The debate is apparently fundamental because over-indebtedness can lead a country to the risk of slowing down its growth in the long term and this creates the inability to develop rapidly and effectively combat the various ills of poverty, which can undermine a nation. However, findings on external debt are mixed; some studies concluded that debt can reduce the resources available for investment and social spending, decrease the credibility of the country concerned with potential donors and investors while others holds that it avails resources for developmental purposes. (UNCTAD, 2016)

When the accumulation of debt is huge, it would lead to unsustainable buildup of debt which produces lot of problems to the economy, as it brings disincentive to new investors, higher cost on future borrowing and crowds out spending for essential services and leads to the problems of debt overhang which is a situation where debt burden is so large that the country cannot take additional borrowing even if it is for viable projects.

Historically, external debt in Nigeria can be traced back to 1958 when the Nigeria government borrowed US$28 million for railway constructions from the World Bank. This was followed by a loan of 12 million pounds in 1960. In 1964 it took its first loan from the Paris Club of Creditors Countries. Similar to other developing economies, Nigeria depends substantially on external loans for financing its deficit infrastructure– iron and steel mills, roads, electricity generation plants etc. (AC-Ogbonna & Okosu, 2019)

Nigeria borrowed moderately even though it experienced a devastating civil war from 1967 to 1970. After the war ended in 1970, Nigeria's external debt was less than US$1 billion. The situation however dramatically changed during and immediately after the oil boom despite the huge income from oil revenue. The Federal and State Governments borrowed unsustainably to finance post war reconstruction and other state projects and infrastructure (Okonjo-Iweala, 2012)

As Omoruyi, 2010 opined, the Nigeria External debt from 1958 to 1977, were mainly concessionary debt from bilateral and multilateral sources. Such debts usually have longer repayment period and lower interest rates and it constitutes about 78.5% of the Nigerian total debt stock.

However, from 1978 until 2005 before she obtained debt relief from Paris Club of Creditors, Nigeria continued to increase its external borrowing at high commercial cost. In 1978 Nigeria obtained the first major jumbo loan of one billion dollar from the International Capital Market (ICM), this increased the total debt of the country to $2.2 billion. Borrowing increased with the entrance of sub-national (state) governments into external loan contractual obligations. As the share of loans from bilateral and multilateral sources declined significantly, borrowing from private sources also increased greatly. Thus, by 1982, the total external debt stock was $13.1 billion (Adepoju et al, 2007)

The external debts increased further to $33.1 billion in 1990 but declined to $27.5 billion in 1991 and increased steadily to $32.6 billion at the end of December 1995. In 1999, the total debt outstanding was $28.0 billion, with debt from Paris Club of Creditors constituting the highest share of 73.2%. As at December, 2000, Nigeria's debt stock was amounted to about 180% of export earnings and about 75% of GDP. Debt service outstanding in 2000 was about $3.0 billion or 14.5% of export earnings. As at December, 2010, the external debt of Nigeria stood at $4,58 billion (Ijeoma, 2013)

In December 2015 the total external debt stock was $10.72 billion, it increase to $18.91 billion in December 2017 signifying a 76%% increase. The major component of this increase was from Eurobond, a commercial and high interest category. As at December 2019, total external debt stock was $27.68 billion, which indicates an increase by 46% in external debt (DMO, 2019)

II.   External Debt Sustainability In Nigeria.

Debt sustainability could be defined as is the ability of a nation to meet its debt obligations without demanding for debt relief, debt re-scheduling, accumulating arrears or debt cancellation. Deb sustainability should place emphasis on the steadiness of a set of macroeconomic and policy variables with debt stabilization, in a situation where there is no need of default, debt restructuring or implausibly large adjustment measures. (UNCTAD, 2018)

As noted by Obadan (2003) for a sustainable debt management, to be achieved, it is expedient to devise a sound debt management framework that ensures a functional and early warning signal of debt crisis and an suitable currency composition of external debt and hedging to ultimately minimize exchange rate and interest rate losses from possible shifts in the terms of trade and balance of payment

It is a point of interest to note that after the debt relief in 2006, Nigeria government aimed at ensuring that the country does not relapse into debt unsustainability. This initiative led to the commencement of the conduct of annual National Debt Sustainability Analysis (DSA), using the debt sustainability framework developed by the IMF. The purpose of this exercise is to assess or analyse the Nigeria's ability/capacity to meet its current and future debt obligation, its policy goals, and service the ensuing debt without unduly large adjustments, which could otherwise compromise growth and development (DMO 2013, Nwankwo 2014).

In Nigeria, the Debt Management Office is saddle with the responsibility of coordinating the management of Nigeria's debt and it thus reviews the Debt Sustainability Analysis whose   objectives is to measure the nation's capacity and capability to finance its policy objective and service its current and future debt obligations, without unduly large adjustments, which may compromise its macroeconomic stability, growth and development. (DMO, 2017)

From external debt sustainability perspective, the evolution of external debt stock of a country is generally assessed in relation to its capacity to discharge debt obligations. In this context, external debt to GDP ratio is a standard measure used to gauge a country's solvency and potential to shift its production to exports so as to enhance its debt repayment capacity. External debt may not necessarily be considered harmful for a country provided the size of its economy grows in tandem and/or there is a desired compositional shift in domestic production in favour of exports ((Muhanji and Ojah, 2011))

We observed that the stock of Nigeria's external debt increased tremendously from 2012 to 2019. The stock of external debt in December 2012 was US$ 6,527 billion and by December 2019 it was $27,676 indicating a 324% growth. The increase in external debt in the period was caused primarily driven various commercial loans and the   Eurobond loans which were aimed at refinancing maturing domestic debt which is more expensive than foreign debt. According to government officials rational was to prevent crowding out the private sector in the domestic debt market (DMO, 2019)
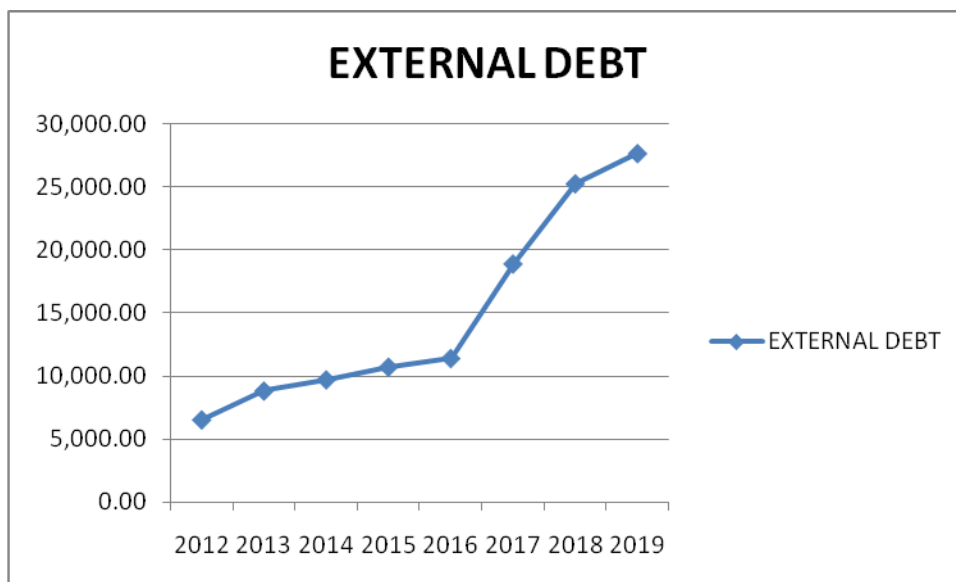
The Nigeria external debt is categorized into Multilateral, bilateral and Commercial. In reviewing the composition of Nigeria's external debt, we further observed that there is a change in the composition. In December 2006 after exit from the Paris Club debt, the Composition of the external debt was Multilateral 73. 59%, Bilateral 9.20%, and Commercial 17.21%. In 2010 September it was Multilateral 91.58%, Bilateral 3.60 %, and Commercial 4.82%. As at 2012 December it was Multilateral 80.70%, Bilateral 10.77%, and Commercial 7.53%. While at end December 2019 it was Multilateral 45.75 %, Bilateral 13.90 %, and Commercial 40.35 %

Below is a table showing external debt composition from 2014 to 2019
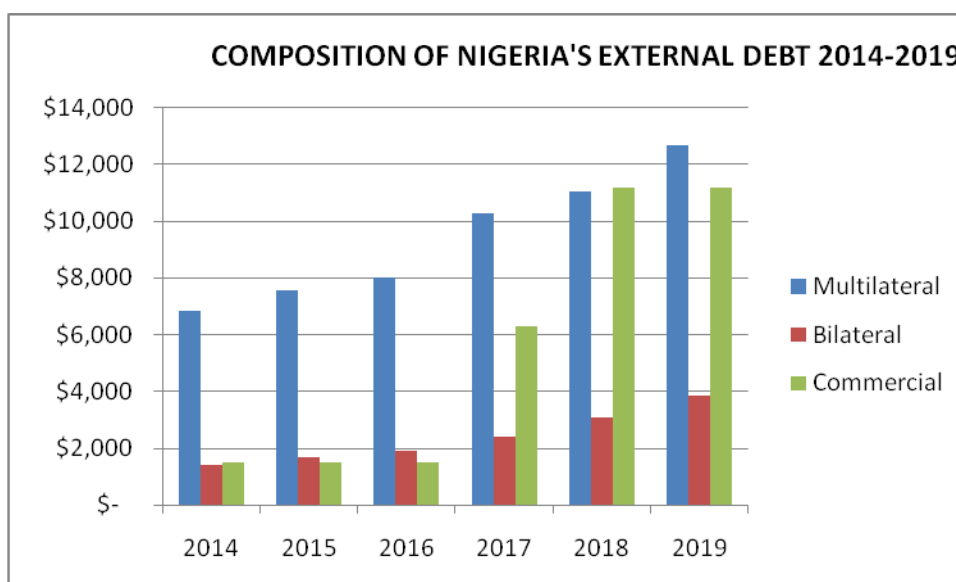
Apart from the high cost of commercial loans and the short duration of such loan, it is pertinent to state that these Eurobonds normally comes with less scrutiny at the application of the funds. This is in contrast with multilateral and bilateral loans that normally have long moratorium and low interest rates.

There are various indicators for determining a sustainable level of external debt. These indicators measure the country's solvency in that they consider the stock of debt at certain time in relation to the country's ability to generate resources to repay the outstanding balance. They include; Debt/GDP ratio, Debt/Export ratio and Debt/Government revenue ratio. Another set of indicators focuses of the short term liquidity requirements of the country with respect to its debt service obligation (Muhanji and Ojah, 2011)

2. 1 **Thresholds for sustainable debt**

The external debt situation of a nation is often measured by several macroeconomic aggregates and debt data. The ratios mainly offer measures of the cost of, or the capacity for, debt servicing. The commonly used ratios were external debt to GDP, debt service to exports, debt service to GDP and ratio of debt to export (Ajayi, 2003). As observed by UNCTAD 2017, the ratios include NPV debt-to-gross national income (GNI) ratio; debt service-to-GNI ratio; debt service-to-exports ratio; debt service-to-revenue ratio.

According to the IMF (2000), there are various indicators for determining a sustainable level of external debt. These indicators are primarily in the form of ratios and they aid policy makers in their external debt management duties. These indicators can be thought of as measures of the country's "solvency" in that they consider the stock of debt at a certain time in relation to the country's ability to generate resources to repay the outstanding balance. Examples of such indicators of debt management capacity include the debt to GDP ratio, foreign debt to exports ratio, government debt to current fiscal revenue ratio, share of foreign debt to total debt and short-term debt to total debt.

The IMF (2000) also notes that a second set of indicators focuses on the short-term liquidity requirements of the country with respect to its debt service obligations. These indicators are not only useful early-warning signs of debt service problems, but they also highlight the impact of the inter-temporal trade-offs arising from past borrowing decisions. Examples of liquidity monitoring indicators include the debt service to GDP ratio, external debt service to exports ratio and government debt service to current fiscal revenue ratio.

The next set of indicators are more forward looking as they point out how the debt burden will evolve over time, given the current stock of debt and average interest rate. These dynamic ratios show how the debt burden ratios would change in the absence of repayments or new disbursements, indicating the stability of the debt burden. A good parameter for measuring dynamic debt management ratio is the ratio of the average interest rate on outstanding debt to the growth rate of nominal GDP.

2.2 Nigeria External debt profile

The sustainability of the debt profile of Nigeria is becoming rather worrisome, even though debt to GDP ratio at 25.34% in 2017 and 27.26 in 2018 (Statista, 2019) seems favourable when compared to global benchmark of 56% for countries in Nigeria peer group however, other related ratios are very high especially the debt service to revenue ratio and external debt to export ratio.

As Okonjo-Iweala (2003), stated that prudent and effective sovereign debt management can contribute to the assurance of a country's financial stability and thereby help make it less susceptible to financial risk and contagion; this can help assure good macroeconomic management through its linkages to fiscal, monetary, and exchange rate policy; it can also help improve a country's credit rating and lower borrowing costs for the government by "reducing the credit risk premium in the term structure"; thus, help develop the country's domestic financial markets and encourage foreign investment in it.

The Nigerian External debt stock is broadly categorized into three, viz: Multilateral, Bilateral and Commercial. The Multilateral category is loans obtained from World Bank group, International Monetary Fund, African Development Bank, etc. While the Bilateral category is for other countries like the Japan International Cooperation Agency, Exim Bank of China, and Exim Bank of India. For the Commercial category we have Eurobonds, Diaspora Bond. It is pertinent to state that of all the three class, Commercial borrowing normally has the highest rate of interest, little or no moratorium and monitoring of usage of funds.

The external debt composition of Nigeria revealed that the Multilateral component has the highest share in 2013 with 71.13% followed by Commercial with 17.24% and then Bilateral by 11.63% and In 2015 the composition revealed that Multilateral component has the highest share with 70.54% followed by Bilateral by 15.47% and Commercial with 13.99%. However, the tide changed in 2018 as the commercial component has the highest share with 44.19 % followed by Multilateral with 43.58 and then Bilateral with 12.23 %. This indicates that Nigeria is securing more loans at higher interest rate.

Nigeria's total external debt as at December 31, 2004 stood at US$ 35.99 Billion. About US$ 30 billion was owed to the Paris Club of creditors. After much negotiations and lobbying Nigeria secured debt relief programme from the club.

Precisely, on June 29, 2005, Nigeria and the Paris Club reached an historic agreement on the write-off of some US$18 billion in debt representing 60% of total debt owed and $12 billion was to be paid by Nigeria within the agreed timeframe The agreement was implemented from October 2005 to March 2006 and Nigeria was able to meet the terms as agreed.

According to Okonji-Iweala, (2012), "debt relief was implemented in three stages between October 2005 and March 2006. Nigeria's external debt burden fell from US$35 billion to approximately US$5 billion. In March of 2006, Nigeria made its final payment to the Paris Club. Nigeria's debt-relief package was the second-largest ever for any country in the Paris Club's fifty-year history, and Nigeria was the first low-income country to be allowed to execute a discounted buy-back on a portion of its debt".

External Debt Outstanding by Source, 2014-2019 (US$' Million)

Source		2014	2015	2016	2017	2018	2019
1.	Multilateral	6,799.36	7,560.43	7,988.22	10,241.44	11,014.34	12,660.38
2.	Bilateral	1,412.07	1,658.00	1,918.06	2,372.00	3,091.68	3,847,41
Sub-Total		**8,211.43**	**9,218.43**	**9,906.28**	**12,613.44**	**14,106.02**	**16,507.79**
3.	Commercial:						
a.	Eurobonds	1,500.00	1,500.00	1,500.00	6,000.00	10,868.35	10,868.35
b.	Diaspora Bond	0	0	0	300.00	300.00	300.00
Sub-Total		1,500.00	1,500.00	1,500.00	6,300.00	11,168.35	11,168.35
Grand Total		**9,711.45**	**10,718.43**	**11,406.28**	**18,913.44**	**25,274.36**	**27,676.14**

DMO, 2019

III.   Literature Review

External debt sustainability is topical issue occasioned since the global debt crisis in the 1980s. On what is a sustainable debt strategy Soludo (2003) opines that it is a strategy which, over a reasonable time horizon, engenders that the country /region escapes from debt and encourages dependence of the nation as well as functions as a traps for pervasive poverty and inequality. On the other hand, the former Vice President of the World Bank distinctly warmed that unsustainable buildup of debt creates a huge problem and acts as a disincentive to new investors and crowds out spending for essential services, as government would strive to meet its debt obligations, Madavo (2003). There are avalanche of literature on the subject matter and this section would reviews some researches that related to external debt sustainability.

Guria and Sokal (2020) in the assessment of India's External Debt Sustainability and Vulnerability observed that due to India's prudent management of its external sector policies, external vulnerability was low and India performed better that other emerging market in terms of external debt to GDP ratio and debt service ratio. Most of India's peers, however, surpass its level of reserve cover of short-term debt (residual maturity) and external financing requirement.

Nya and Onyimadu (2019) researched on fiscal policy and public debt sustainability in Nigeria between 1990 and 2017, employing an error correction model and IMF/World Bank debt burden indicators such as solvency and liquidity ratios. The results showed that Nigeria's debt has been sustainable over the last 8- 10 years using the solvency ratios. Also, the liquidity indicator (debt service/export earnings) revealed that Nigeria was capable to meet its short term liabilities, as the debt burden indicators were below the indicative threshold of 20%. For the fiscal policy sustainability, the result revealed that the fiscal variables were cointegrated, pinpointing to the fact that fiscal policy in Nigeria was sustainable.

Odubuasi et al (2018) empirically investigated the effect of external debt on the economic growth of Nigeria from 1981 to 2017. The independent variables were external debt stock, external debt service cost and government capital expenditure as while gross domestic product was the dependent variable. Using Augmented Dickey fuller (ADF) to test for the stationarity of the data, Granger Causality was used to obtain the cause effect relationship among the variables and Error Correction Mechanism (ECM) for the short and long run relationships. The results showed that external debt stock and government capital expenditure have positive and significant effect on economic growth in Nigeria, whereas external debt service cost is not significant in explaining economic growth. The study recommends amongst others, that external loans should be used for capital expenditure rather than recurrent expenditure

Burhanudin et al (2017) in their paper, the real effect of government debt on sustainable economic growth in Malaysia from 1970-2015 used the Autoregressive Distributed Lag (Ardl) method. The finding revealed that there are positive significant long- and short-run relationships between government debt and sustainable economic growth. The results indicate that Malaysia's government debt is an important macroeconomic element for sustainability of economic growth in Malaysia.

Melina, et al (2016) studied Debt, Investment, Growth, and Natural Resources (DIGNAR) model for analyzing the macroeconomic and debt sustainability in resource-rich developing countries. It captures pervasive problems of these countries that may be aggravated during scaling-ups, including investment inefficiency and limited absorptive capacity. It noted that spending without saving or borrowing against future revenues can expose the economy to debt sustainability risks. The paper allows for flexible fiscal specifications: investment can be jointly financed by resource revenues and debt; a resource fund may be used as a buffer; and distorting fiscal adjustments are subject to feasibility constraints.

Kidochukwu (2015) in his paper, noted that sustainable debt is the level of debt that allows a debtor country to meet its current and future debt services obligations in full, without recourse to further debt relief or rescheduling, avoiding accumulation of arrears, while allowing an acceptable level of economic growth or without compromising growth. The IMF debt sustainability threshold of 45% for Nigeria was leverage upon, the study examines the country's borrowing space under the International Monetary Fund (IMF) debt sustainability threshold and other low-middle income countries. From the findings, the study revealed that IMF recommended

that sustainability threshold is not growth augmenting but will act as a hindrance to economic growth in Nigeria. The debt sustainability threshold of 45% for Nigeria is not growth supportive.

Sheikh et al (2014), conducted the external debt sustainability analysis for the eight SAARC economies using the data from 2000 to 2013. Three types of techniques- univariate unit root tests, panel unit root tests and the cointegration tests were applied. According to the first and second type of tests results, the external debt of SAARC countries is unsustainable in isolation but sustainable. The findings of third type of tests showed that the external debt of the SAARC is unsustainable individually and wholly with some exceptions. The research concluded that the external debt of SAARC economies is unsustainable so they should develop their internal resources rather than going for the foreign loans as well as encourage saving and investment environment in their countries.

Sucharita (2014) researched on the trend and composition of India's debt situation at Central and state level, it was observed that poorly structured debt has been important cause of indulging economic crisis in several emerging economy. Also, the paper examine India's debt sustainability through the theoretical debt sustainability criteria. It concluded that India's current public debt level can be termed sustainable as it had small external debt and a manageable interest rate cost as well as economic growth. However, to the extent that internal borrowings by the public sector crowd out private sector domestic borrowings, the country's vulnerability to external developments may grow as the private sector's external debt increases.

Adler and Sosa (2013) researched dealt on the external conditions as well as debt sustainability of Latin America. The result supported the claim that growth conducive external position of a country could boost the economy in the 21st century. The results of the study revealed that the external factors did not seem to be the concern of debt sustainability of Latin America, just domestic growth buffers especially the fiscal policy instrument are the source of concern.

Burcu Kiran (2012) investigated external debt sustainability in Turkey from 1970-2010, using fractionally integrated approach. The research employed took into consideration first step and second step possible structural breaks in the data. The results showed that the process is non-stationary with long memory, therefore, there is no evidence of external debt sustainability in Turkey in the first step. In the second step,. the results in the context of structural breaks still showed that the external debt in Turkey is also not sustainable.

Muhanji and Ojah (2011) in their paper, "Management and sustainability of external debt: a focus on the emerging economies of Africa" noted that African countries have had the notoriety of being characterized by unsustainable external debt. Despite various announced intents by world development agencies to overturn this trend, there appears to be only minimal progress. The authors considered inadequate infrastructure, lack of governance and ineffective management of external shocks as the main rational for the persisted Africa's external debt problems The authors advocated for African-relevant thresholds for sustainable external debt, and highlight quantifiable improvements African countries can experience if they were to adopt better governance infrastructures and effective management of external shocks.

Loganathan et al (2010) empirically analysed the long-run and short-run relationship between external debt and macroeconomics performance of Malaysia. The macroeconomics variables were: government's revenue, balance of payment and government reserve. The authors utilized time-series econometric method with annual data series 30 years (1988-2008). The finding suggested a significant long-rung and short-run relationship between external debt and some macroeconomics variables performance with 13 percent of rate of adjustment to reinstate equilibrium condition in the long run. In general, the result of this study revealed that, Malaysia's external debt is 'sustainable' with its macroeconomics performance, although it had several phases of unstable economic scenario for the last 2 decades.

El-Mahdy and Torayeh (2009) employed annual data for the period of 25 years (1981-2006), the finding from the co-integration model showed that the public domestic debt in Egypt has a strong negative impact on growth. The sustainability of debt was examined using some algebra methods. The finding further indicated that the current path of debt pursued in Egypt was considered sustainable. For debt to stay sustained in the future, major fiscal reforms are required and policies should be adopted to defend an increasing growth-interest rate differential.

Jafri (2008) used the Debt Sustainability Analysis (DSA) technique based on simple accounting approach, in analyzing the external debt sustainability of Pakistan's in medium term framework. The author used various scenarios (baseline and two alternatives) in making projections. The finding indicated a growth in the external debt to GDP ratio in both, the small individual shock and large combined shock to the components of external debt.

IV. Data Sources and Method of Analysis

The research used secondary data, and annual time series data from the Central Bank of Nigeria Statistical Bulletin, Debt Management Office and International Debt Statistics of the IMF. The estimation methods includes Augmented Dickey-Fuller (ADF) and Zivolt and Andrews Unit Root test, Gregory-Hansen Co-integration test, ARDL Error Correction Term (ECT) and Toda-Yamamoto Causality test.

4.1 . Model Specification and Results Analysis

The model assumes a linear relationship. The linear specification is done to investigate the impact of external debt sustainability on economic growth of Nigerian economy. A balanced datasets for the period 1980-2018 which consist of the annual data of selected relevant variables.

S/N	VARIABLE	DESCRIPTION	DEFINITION
1.	GDP	Gross Domestic Product @PPP	Inflation-adjusted measurement of economic output in an economy. It is used to represent economic growth in our model.
2.	EXDGNI	External debt to GNI	It is the expression of external debt stock as percentage of GNI (Proxy for External Debt Sustainability)
3.	EXD	External Debt Stock	Total Debt owed to creditors outside Nigeria.
4.	DSEXP	External Debt Service to Export	It is the expression of external debt service as percentage of export (Proxy for External Debt Sustainability).
5.	EXDS	External Debt Service	Total Debt service including debt repayment and interest on foreign debt.
6.	INFL	Inflation	It is the expression of rate at which prices of goods and services rise
7.	EXR	Exchange rate	Nigeria official exchange rate

Following Munir et. al (2016), the linear model is as specified below:

Functional Specification

RGDP = f(EXD, EXDS, DSEXP, EXDGNI, INFL, EXR) --------------- (1)

Transformed to econometric terms as

RGDP= β_0+ β_1 EXD +β_2 EXDS + β_3 DSEXP + β_4 EXDGNI + β_5 INFL + β_6 EXR + U_t ----(2)

Where:

GDP= Gross Domestic Product (a proxy for economic growth)

EXD = External debt Stock

EXDS = External Debt Service

DSEXP = External debt Service –to-Export

EXDGNI = External Debt Stock to Gross National Income

INFL = Inflation

EXR = Exchange rate

U= Error term

β_0 is a constant parameter

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ are parameters to be estimated

Apriori expectation

$\beta_0 > 0, \beta_1 > 0, \beta_2 > or < 0, \beta_3 > 0, \beta_4 > 0, \beta_5 > 0$

Linear and Dynamic ARDL Models

The linear and dynamic ARDL frameworks are employed to examine the effects of external debt sustainability on the Nigeria economic growth. This paper therefore specifies both the linear and dynamic Autoregressive Distributed Lag (ARDL) models, (Pesaran and Shin (1999) and Pesaran et al. (2001). The attractions around the models are noteworthy in that they help to circumvent the problem of endogeneity, they accommodate mixed order of integration in the series and produce short run and long run (along with error correction) parameter estimates.

$$Y_t = a_0 + \emptyset 0 Y_{t-i} + \emptyset 1 X_{t-i} \dots \emptyset k X k_{t-i} + \sum_{i=1}^{p-1} \alpha i \Delta Y_{t-i} + \sum_{j=0}^{q-1} \beta 1j \Delta X1_{t-j} + \cdots$$

$$+ \sum_{j=0}^{qk} \beta kj \Delta X k_{t-j} \dots + E_t$$

Where the change in the dependent variable is a function of a constant, its value at t_{-1} (appearing in levels), values at t_{-1} of all regressors appearing in levels, as well

as up to p and qk lags of the first difference of the dependent variable and regressors respectively.

We adopt the conventional bounds testing procedure to evaluate the cointegration between the variables using the Pesaran et al. (2001) critical values; the lower and upper bounds $F_{tab(LB)}$ and $F_{tab(UB)}$. This done by comparing the calculated F-statistics with the critical values. The decision rule for testing the null is such that:

Scenario	Decision	Implication
$F_{cal} > F_{tab(UB)}$	Reject H_0	There is cointegration
$F_{cal} < F_{tab(LB)}$	Do not reject H_0	There is no cointegration
$F_{tab(LB)} < F_{cal} < F_{tab(UB)}$	Indecisive	Test is inconclusive

Toda and Yamamoto Augmented Granger Causality Test.
Economic series could be either integrated of the different orders or non-cointegrated or both.
The unit root results of the variables for this paper were not of the same order of integration and were cointegrated. In this case, the ECM cannot be applied for Granger causality test.
The Toda and Yamamoto (1995) augmented Granger causality test method is based on the following equations

$$Yt = \mu + \sum_{t-1}^{p+m} \alpha i Yt_{-i} + \sum_{t-1}^{p+m} \beta i Xt_{-i} + U1_t$$

$$Xt = \mu + \sum_{t-1}^{p+m} \gamma i Xt_{-i} + \sum_{t-1}^{p+m} \delta i Yt_{-i} + U2_t$$

"
"
"

$$Nt = \mu + \sum_{t-1}^{p+m} \rho i Nt_{-i} + \sum_{t-1}^{p+m} \varphi i Xt_{-i} + Un_t$$

Where m is the maximum order of integration of the variables in the system and p is the optimal lag length of Y_t and X_t, and the error terms are assumed to be white noise.

Descriptive Statistics
Table 1: Descriptive Statistics if the Variables used

Statistic	LGDP	LEXD	LEXDS	LDSEXP	LEXDGNI	LINFL	LEXR
Mean	181506.1	25690.52	1739.25	10.36103	34.90282	19.08436	86.28795
Std Dev	165309.3	9317.016	1699.112	9.27117	30.94008	17.09286	87.12961
Skewness	-0.77006	-0.5285	0.55235	0.39129	-0.14223	-0.14395	1.4909
Kurtosis	6.1253	3.5778	2.9488	1.9173	2.2365	3.3286	6.787
Jarque- Bera	19.220	2.298	1.936	2.826	1.051	0.302	36.784
Probability	0.00007	0.31703	0.37976	0.24345	0.59121	0.85975	0.00000

Source: Extract from Regression Printout using Stata 15
Note: LGDP: Gross domestic product (@PPP), LEXD: External Debt, LEXDS: External Debt Service, LDSEXP: Debt Service to Export ratio, LEXDGNI: External Debt to Gross National Income, LINFL: Inflation, LEXR: Official Exchange rate.

Unit Root Test
The unit root test was carried out on the variables using the Augmented Dickey-Fuller (ADF) without structural break at constant and at trend and Zivolt and Andrews (1995) with structural break at both constant and trend. The results below show that all the variables tested with or without Structural break were not stationary at level except inflation and others were stationary only at first difference. The fact that the variables were stationary at different order of integration however connotes the likely existence of long run relationship among the variables. The study therefore tested for cointegration using the autoregressive distributed lag (ARDL) cointegration bound test and the Gregory-Hansen cointegration test which accounts for the structural breaks/Regime shift.

Table 2 Unit Root Test

ADF Unit root Without Structural Break Zandrews Unit root With Structural Break

Variable	Levels(Cons&Trend)	1st diff(Cons&Trend)	Levels(Cons&Trend)	1st diff(Cons&Trend)	Order Integration
LGDP	-0.234	-6.514***	-4.218 (1987)	-9.354*** (2006)	I(1)
LEXD	-2.256	-3.942**	-2.639 (2012)	-5.853*** (2007)	I(1)
LEXDS	-2.536	-4.672***	-2.837 (2002)	-5.305*** (2011)	I(1)
LDSEXP	-1.214	-4.612***	-2.923 (2012)	-6.610*** (2009)	I(1)
LEXDGNI	-1.482	-3.400**	-2.667 (2012)	-7.039*** (2007)	I(1)
LINFL	-3.781***	-	-4.726** (1993)	-	I(0)
LEXR	-1.877	-3.834**	-3.361 (2000)	-5.850*** (1987)	I(1)

Source: Extract from Regression Printout using Stata 15

Note: The statistics reported are the t - Statistics with the associated break dates in brackets. LGDP: Gross domestic product (@PPP), LEXD: External Debt, LEXDS: External Debt Service, LDSEXP: Debt Service to Export ratio, LEXDGNI: External Debt to Gross National Income, LINFL: Inflation, LEXR: Official Exchange rate. ***, **, * signify 1%, 5% and 10% significance levels respectively. Values in "( )" are the break dates revealed by the unit root tests with structural break. Zandrews Unit root Critical values: 1%: -4.93 5%: -4.42 10%: -4.11. ADF Critical values at levels: -3.668 -2.966 -2.616 @ 1% 5% 10% resp. ADF Critical values at 1st Diff: -3.675 -2.969 -2.617 @ 1% 5% 10% resp

Cointegration Test
The Auto-Regressive Distributed Lag Bound Co-integration test
   Sequel to the mix in the result of the unit root tests presented in table 2 above, this study carried out the co-integration test using the Auto-Regressive Distributed Lag Bound Co-integration test. Pesaran, Shin and Smith (2001) provided two asymptotic critical values (lower and upper) bounds for testing the existence of co-integration when the regressors are purely I(0) or I(1). The results presented below show that the F-statistics of 4.611 is higher than the upper bound critical value at 5% level of significance and therefore the null hypothesis of no cointegration can be rejected.

Table 3: ARDL Bound Co-Integration Test

Estimated Model	F-Statistics	
	K_3 4.611	
Critical Values	**Lower Bound I(0)**	**Upper Bound I(1)**
1%	3.15	4.43
5%	2.45	3.61
10%	2.12	3.23

Source: Authors' computation using Stata 15 2019.

The Gregory-Hansen Cointegration Test
   The ARDL Bound Co-integration test was used above because the variables are integrated of different orders but because of breaks in the series identified in the unit root test, the ARDL will yield inconsistent results hence the study carried out the Gregory and Hansen (1996) test designed for cointegration testing when controlling for structural breaks. The Gregory and Hansen cointegration test is carried out on the non stationary variables since it can only be performed on non-stationary series with identical order of integration, I(n). The test is conducted in three models; at constant, constant and trend and regime shift based on the traditional ADF, Z_t and Z_a.

   The results of Gregory and Hansen presented below shows the Z_t Statistic and ADF are greater than the critical values at 5%, an indication that the null hypothesis of no cointegration can be rejected with a break point in year 2000. This result corresponded with the bound test which equally reported the existence of a long run relationship (Cointegration) among the variables.

Table 4: Gregory-Hansen Cointegration Test

	ADF		Z_t		Z_a	
Gregory-Hansen Models	**Statistic**	**Break Point**	**Statistic**	**Break Point**	**Statistic**	**Break Point**
Intercept Shift	-7.98***	2000	-8.08***	2000	-49.15	2000
Intercept & Trend	-8.32***	2000	-8.43***	2000	-50.54	2000
Regime Shift	-8.38***	2000	-8.50***	2000	-51.11	2000

Source: Extract from Regression Printout using Stata 15

Note: Break Date: 2000. ***, **, * signify 1%, 5% and 10% significance levels respectively. G-Hansen (Intercept Z_t) Critical values: 1%: -6.05 5%: -5.56 10%: -5.31. G-Hansen (Intercept &Trend Z_t) Critical values: -5.83 -6.36 -5.59 @ 1% 5% 10% resp. G-Hansen (Regime Z_t) Critical values: -6.92 -6.41 -6.17 @ 1% 5% 10% resp

Linear and Dynamic ARDL without and with Structural Breaks

This study at this point verified if the break point identified in the unit root and Gregory-Hansen test has significant effect on the model to avoid making a wrong inference that are not best fit for the model. Dummy coefficient for the break point was generated and used to estimate the ECM of both linear and dynamic ARDL to ascertain if the break point has influence on the results. The results are presented below;

Table 6: Linear and Dynamic ARDL without Structural Break

Variables	Linear ARDL Without Structural Break		Dynamic ARDL Without Structural Break	
	Short-run	Long-run	Short-run	Long-run
ECT	-0.015		-0.021	
	(0.000***)	-	(0.000***)	-
LEXD				
	0.013	0.955	0.976	0.984
LEXDS	(0.947)	(0.000***)	(0.000***)	(0.000***)
LDSEXP				
	-0.004	0.039	0.040	0.035
LEXDGNI	(0.716)	(0.015**)	(0.014**)	(0.005**)
LINFL				
EXR	0.009	-0.038	-0.039	-0.029
	(0.417)	(0.009**)	(0.13**)	(0.016**)
	0.016	-0.954	-0.974	-0.952
	(0.933)	(0.000***)	(0.000***)	(-0.000***)
	0.002	-0.003	-0.002	-
	(0.518)	(0.553)	(472)	
	-0.005	-0.003	0.005	0.002
	(0.595)	(0.138)	(0.127)	(0.127)

Source: Extract from Regression Printout using Stata 15
Note: Break Date: 2000. ***, **, * signify 1%, 5% and 10% significance levels respectively. ECT is the error correction term that is expected to be negative and statistically significant. The statistics reported are the parameters with the associated probability values in brackets

Table 5: Linear and Dynamic ARDL with Structural Break

Variables	Linear ARDL With Structural Break		Dynamic ARDL With Structural Break	
	Short-run	Long-run	Short-run	Long-run
ECT	-0.151	-	-0.131	-
	(0.000***)		(0.000***)	
LEXD				
	-0.127	0.929	0.081	0.975
LEXDS	(0.415)	(0.000***)	(0.745)	(0.000***)
LDSEXP				
	-0.009	0.021	0.018	0.017
LEXDGNI	(0.357)	(0.055*)	(0.150)	(0.231)
	0.014	-0.031	-0.015	-0.026
	(0.131)	(0.003**)	(0.223)	(0.060*)
	0.142	-0.936	-0.122	-0.938
	(0.350)	(0.000***)	(0.633)	(0.000***)

Source: Extract from Regression Printout using Stata 15
Note: Break Date: 2000. ***, **, * signify 1%, 5% and 10% significance levels respectively. ECT is the error correction term that is expected to be negative, less than one in absolute values and statistically significant. The statistics reported are the parameters with the associated test statistic values in brackets. Break point coefficient for dynamic ARDL -0.314 (0.645). Break point coefficient for linear ARDL -0.362 (0.205)

The linear and dynamic ARDL were carried out to determine the sustainability of Nigeria's external borrowing without and with structural breaks. The report shows that the probability values of the break point coefficients of both the linear and dynamic ARDL of 0.205 and 0.645 respectively is greater than 0.05 at 5% significance level. This implies that the Structural breaks have no significance effect on the overall results of the model. This is further confirmed by the stability test results using the cusum test. The results of the dynamic ARDL which was estimated in their first difference indicated a positive and significant relationship existing between external debt, debt service and gross domestic product with or without structural break in the long run. Negative and significant relationships exist between DSEXP and EXDGNI and GDP also in the long and short run. This result indicated that Nigeria external debt sustainability proxy of the ratio of export to debt service (DSEXP) and Gross National Income to External debt (EXDGNI) has a negative impact on the gross domestic product both in the long run and short run with or without Structural breaks.

Table 7: Toda-Yamamoto model with structural breaks

Variable	GDP	EXD	EXDS	DSEXP	EXDGNI
GDP		62.17 (0.000***)	63.28 (0.000***)	62.20 (0.000***)	60.50 (0.000***)
EXD	4.62 (0.2018)		23.52 (0.000***)	4.98 (0.1731)	4.66 (0.1988)
EXDS	11.36 (0.009***)	9.36 (0.028**)		29.83 (0.000***)	11.00 (0.011**)
DSEXP	5.98 (0.112)	6.19 (0.1026)	33.22 (0.000***)		5.60 (0.1326)
EXDGNI	24.79 (0.000***)	24.77 (0.000***)	34.43 (0.000***)	21.99 (0.000***)	

Source: Extract from Regression Printout using Stata 15
Note: The statistics reported are Chi-square statistics with the associated probability values in brackets. The break dates included in the estimation are the dates obtained for the series from the unit root analyses conducted with structural breaks.

The results of Toda-Yamamoto models reported in Table 5 above show that there exist a bi-dimensional causality between external debt-gross national income (EXDGNI) and the gross domestic product and uni-dimensional causality between external debt service-export ratio (DSEXP) and the gross domestic product. The negative causality effects of debt sustainability proxies here is a confirmation of the earlier results obtained from the dynamic ARDL estimates. External debt and debt service equally exhibited significant causality relationship with the gross domestic product

V.   Concluding Remarks

Nigeria in recent time is faced with the challenges of infrastructural decay, security and capital inadequacy and therefore often resort to external borrowing repeatedly from foreign countries and international financial institutions. These have giving rise to huge total debt and high debt service obligations.

Motivated by the increasing debt burden in the country, this paper analysed the sustainability of Nigeria's external debt and its implication on the economy. Among the several findings of this paper is that external debt service-export ratio and external debt-gross national income ratio proxies of debt sustainability impacted negatively on economic growth in Nigeria both in the short and long run. The Toda-Yamamoto causality test equal showed negative impact of the duo on Nigeria's gross domestic product. The implication of these findings calls for the restructuring of the present Nigeria foreign debt policies to avoid its consequential upshot of debt overhang and crowding out effect.

VI.   Policy Recommendations

The main recommendation from the findings of this study is that the country should invest external debts in self-liquidating projects that promotes investment and growth. Loans should be applied on investment in infrastructures that promotes productivity and human capital development. A well-developed capital market that will attract enough foreign portfolio investment where government can raise funds to finance its budget deficits is highly recommended. Measures that will stabilize exchange rates in the country should be put in place to check its adverse effects on the economy.

References

[1].   Adepoju, A. A., Salau, A.S., and Obayelu, A.E., (2007). The effects of External debt management on sustainable economic growth and development: Lessons from Nigeria" Munch Personal RePEC Archive (MPRA). 2147,1-30
[2].   Adler, G. and Sosa, S. (2013). External Conditions and Debt Sustainability in Latin America. IMF Working Paper. WP/13/27

[3]. Burcu Kiran (2012) The Sustainability of Turkish External Debt: Evidence From Fractionally Integrated Approach Under Structural Breaks. Ekonomska istraživanja VOL 25 NO 1

[4]. Burhanudin, M. D., Muda, R., Nathan, S. B., & Arshad, R. (2017). Real effects of government debt on sustainable economic growth in Malaysia. Journal of International Studies, 10(3), 161-172. doi:10.14254/2071-8330.2017/10-3/12

[5]. Guria and Sokal (2020) "An Assessment of India's External Debt Sustainability and Vulnerability" Reserve Bank of India Bulletin January 2020

[6]. IMF (2000). The logic of debt relief for the poorest countries'. Washington, DC:IMF. September. Mimeo.

[7]. IMF (2001). The impact of debt reduction under the HIPC initiative on external debt service and social expenditures'. Washington, DC: IMF. 10 September. Mimeo.

[8]. IMF-World Bank, 2017, "Review of the Debt Sustainability Framework for Low-Income Countries,": Proposed Reforms (September) (Washington).

[9]. [Kidochukwu O. (2015) IMF Recommended Debt Sustainability Threshold for Nigeria. Is It Growth Augmenting? An Optimization Algorithm Approach *OIDA International Journal of Sustainable Development, Vol. 08, No. 11, pp. 81-90, 2015*

[10]. Krugman, P. (1988). Financing vs. forgiving a debt overhang'. *Journal of Development Economics*, 29 (November): 253-68.

[11]. Loganathan, N., Sukemi, M.N., and Sanusi, A.Z (2010): External Debt and Macroeconomics Performance In Malaysia: Sustainable Or Not*? Global Economy and Finance Journal Volume 3. Number 2. September 2010. Pp. 122 - 132*

[12]. Melina G., Yang S.S., and Zanna L (2016)Debt sustainability, public investment, and natural resources in developing countries: The DIGNAR model. Economic Modelling 52 (2016) 630–649

[13]. Muhanji, S.and Ojah, K (2011) Management and sustainability of external debt: A focus on the emerging economies of Africa

[14]. Munir. Q., Kok. S.C and Abdulnasir.W. (2016) Public Debt Sustainability And Economic Growth in Malaysia: Threshold And CAUSALITY ANALYSIS 27th International Academic Conference, Prague, 20 October 2016

[15]. Nya, I and Onyimadu. C.O. (2019). Fiscal Policy and Public Debt Sustainability in Nigeriahttps://www.researchgate.net/publication/334152083_Fiscal_Policy_and_Public_Debt_Sustainability_In_Nigeria

[16]. Ogbonna. C and Okosu. N. D. (2019) Econometric Analysis of the Effect of External Debt on the Economic Growth of Nigeria: International Journal of Advances in Scientific Research and Engineering (ijasre) Volume 5, Issue 11 November – 2019

[17]. Okonjo-Iweala, (2012). "Reforming the Unreformable, Lessons from Nigeria" The MIT Press Cambridge Massachusetts, London, England

[18]. Okonjo-Iweala, N., Soludo, C. and Muhtar, M. (eds.) (2003). "The Debt Trap in Nigeria". Trenton NJ: *Africa World Press Inc.*

[19]. Sheikh, M.R., Abbasi, M.N., Iqbal,S., Masood, S. (2014) External Debt Sustainability Analysis: A Case of SAARC Countries *International Journal of Management Research and Emerging Science, Volumes 4 Issue 1 (2014) PP. 27-46*

[20]. Soludo C.C. (2003): "*Debt Poverty and Inequality"* in Okonjo-Iweala, Soludo and Mulitar (Eds), the Debt Trap in Nigeria, Africa World Press NJ, Pg 23-74.

[21]. Sucharita S. (2014) "DEBT SUSTAINABILITY OF INDIA" Department of Economics, School of Social Sciences, Central University of Jharkhand (CUJ), Ranchi-835205 (Jharkhand),

[22]. UNTAD (2017) DEBT VULNERABILITIES IN DEVELOPING COUNTRIES: A NEW DEBT TRAP? Volume I: Regional and Thematic Analyses

[23]. https://www.development-finance.org/en/topics-of-work/debt-strategy-information/debt-sustainability.html

[24]. https://www.worldbank.org/en/topic/debt-sustainability#2

[25]. https://www.imf.org/external/pubs/ft/dsa/

[26]. https://unctad.org/meetings/en/SessionalDocuments/tdb_efd2d2_en.pdf

[27]. https://www.un.org/en/ecosoc/president/statement_2014/statement_ecosoc_president_14_october_2014.pdf

[28]. https://unctad.org/meetings/en/SessionalDocuments/a70d278_en.pdf

[29]. https://www.statista.com/statistics/383195/national-debt-of-nigeria-in-relation-to-gross-domestic-product-gdp/

[30]. World bank (2018) "Debt Sustainability Analysis", Retrieved from https://www.worldbank.org/en/topic/debt/brief/dsa