

THE SUSTAINABILITY OF PUBLIC DEBT IN NIGERIA

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ABSTRACT

The study investigated the sustainability of public debt in Nigeria between 1986 to 2021 in the face of rising budget deficit and government expenditure with a significant loss of revenue amidst the COVID-19 pandemic. The study adopted the present value budget constraint (PVBC) approach using stationarity tests for the variables involved and a co-integration analysis to assess if the country's debt profile is sustainable or not.

The result shows a long-run relationship between the natural logarithm of government expenditure and its determinants such as debt-to-GDP ratio, oil revenue, inflation tax, etc., which suggests that PVBC holds, and the Nigerian public debt is sustainable within the reviewed period. The study concludes that the Nigerian public debt profile has remained within internationally acceptable limits of sustainability since the external debt relief in 2005.

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LIST OF ABBREVIATIONS

CBN	Central Bank of Nigeria
DMO	Debt Management Office
EXCH	Exchange Rate
GDP	Gross Domestic Product
GOVTEXP	Government Expenditure
IMF	International Monetary Fund
INF	Inflation Rate
INFTAX	Inflation Tax
NBS	National Bureau of Statistics
NESP	Nigerian Economic Sustainability Plan
OILREV	Oil Revenue
POP	Population Growth
PVBC	Present Value Budget Constraint
SSA	Sub-Sahara Africa
TOP	Trade Openness
VAT	Value Added Tax
VECM	Vector Error Correction Model

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Borrowing, both by government and private entities, is an important tool for financing investment critical to achieving sustainable development, as well as for covering short-term imbalances between revenues and expenditures. Government borrowing can also allow fiscal policy to play a countercyclical role over economic cycles. However, high debt burdens can impede growth and development.

The literature has proposed different approaches to defining and assessing debt sustainability. It has been described as a short, medium, or long-term concept. Cassie (2013) defined debt sustainability as a country's capacity to finance its policy agenda and service the ensuing debt without unduly adjustments that may compromise its macroeconomic stability and/or that of its economic partners. While debt plays a crucial role in the economy, its size is important for effective and independent policymaking. Excessive debt levels can weigh on an economy's growth as highly indebted countries are constrained by the extent of fiscal manipulation to play with and in most cases, they do reduce their investment and consumption. This is in line with debt limits on countries by the World Bank and International Monetary Fund developed Joint Bank-Fund Debt Sustainability thresholds.

The debt sustainability issues evaluated in line with the inter-temporal budget constraint connote that without some major corrections in fiscal policy, the present debt profile of the country will remain under pressure (Mahmood & Shahnaz, 2012). Similarly, it could also imply high inflation

persisting as a result of financing budgetary deficit via seignorage revenue, via, borrowings from the Central Bank of Nigeria. In the same vein, International Monetary Fund (2013) revealed that public debt among countries can be regarded as sustainable when the primary balance needed to at least stabilize debt under both the baseline and realistic shock scenarios is economically and politically feasible, such that the level of debt is consistent with an acceptably low rollover risk and with preserving potential growth at a satisfactory level. In contrast, if no realistic adjustment can bring an acceptable low level in the primary balance, the public debt is considered unsustainable. In sum, the higher the level of public debt in Nigeria for example, the more likely that fiscal policy in the country and public debt are unsustainable. This follows the fact that a higher debt requires a higher primary surplus to sustain it. On the whole, higher debt is usually associated with lower growth and higher interest rates, thus requiring an even higher primary balance to service it. Countries use debt sustainability thresholds to keep track of debt profile and guide their borrowing decisions in a way that matches their financing needs with their current and prospective repayment ability, taking into account the economic circumstances.

Countries incur debt by borrowing and borrowing becomes necessary following the scarcity of resources. However, borrowing can enable countries to finance important development programmes and projects – but, the burden of debt repayment can be overwhelming on a country's finance without repayment. The resulting rise in public debt such as in Nigeria will likely heighten the tension between meeting important development goals and containing debt vulnerabilities. The government is a special borrower on several forms as summarized: First, it is usually not expected to die or disappear so that there is no obvious end-period when all debts should be repaid. Second, default by the government is a particularly scary prospect because the size of the entity typically entails considerable destruction of wealth, a collapse in national

income, and a guaranteed misery for those who cannot insure against such risks, usually the less people in the society (Borensztein & Panizza, 2008). Third, a government is sovereign. This means that (i) it cannot be liquidated, (ii) that it can often create that money to meet its obligations denominated in domestic currency, and (iii) it can also raise revenue at discretion by linking taxes – at least up to the point when tax rates become so toxic for the economy that revenue ultimately fall in response to higher rates.

Thus, debt sustainability does not ordinarily mean that the government budget constraint will be fulfilled but whether the strategies used to maintain the sustainability are feasible and desirable. However, raising inflation to reduce the real value of nominal obligations denominated in local currency is always excluded from the acceptable strategies to the budget constraint. As submitted by Reinhart and Rogoff (2009), the inflation tax is not only a shadow form of negligence, it is also unthinkable in an economy where the independent Central Bank anchors on inflation expectations. Since the global financial crisis, and COVID-19 pandemic global debt has reached an all-time high level. The increase has been driven by a synchronized building in debt among emergent market and developing economies, Nigeria inclusive, with total (public & private) debt in these countries reaching a record-high of almost 170 percent of gross domestic product (GDP) in 2018, an increase of 54 percentage points of GDP since 2010 (*Kose et al.*, 2020).

Furthermore, lockdown measures to the COVID-19 pandemic have negatively impacted government revenues worldwide, many of which are still facing with the urgency of supporting negatively affected households and businesses. Income-to-GDP ratios have fallen short of their projection numbers in 2020 and 2021 (Heitzig et al 2021). Similarly, expenditure-to-GDP ratios have increased for most countries (World Bank, 2022). From the general to the specific, in sub-Saharan Africa, the public deficit has deepened, and debt in nominal terms has risen

considerably. The general debt-to-GDP ratio in SSA has increased from 55.4 percent in 2019 to more than 60 percent in 2020 and 2021 (Cissokho, 2022). In Nigeria, total public debt increased by 1.08 percent from US\$ 86.4 million (₦32.9 billion) in the fourth quarter of 2020 to US\$ 87.2 billion (₦33.1 trillion) in the first quarter of 2021. The increase was led by the domestic debt (61.4 percent of total debt) which increased by 2.5 percent, while foreign debt decreased by 1.5 percent. The increase in public debt is on the back of shortfalls in government revenue owing to the effects of the pandemic (DMO, 2021).

Meanwhile, some fiscal policy responses have been initiated to cushion the effects of debt overhang and to ensure the sustainability of the Nigerian debt challenges. These policy responses include fiscal reforms and related structural macroeconomic reforms embarked upon in the early 2005 seen Nigeria exiting from the debt trap of the Paris Club debt profile and of recent following the economic recessions of 2014 and 2016 and the COVID-19 pandemic induced economic disruption, the Nigerian Government revised downward in projection of the 2020 fiscal budget; a COVID-19 intervention fund equivalent of 3.1 percent of GDP to: support the incomes of vulnerable people; provide conditional cash transfers; allocate ₦GN 150 billion to meet the spending needs of states and local authorities, and providing an NGN 2.3 billion recovery plan to finance labour-intensive projects (agriculture, roads, housing and others). Furthermore, as part of the COVID-19 recovery strategy, the Nigerian government approved in June the USD\$5.9 billion (NGN 2.3 trillion) Nigerian Economic Sustainability Plan (NESP) in order to stimulate and diversify the economy, retain and create jobs, and extend more protections to the poor and ultimately deal with the fiscal challenges arising from the pandemic.

The theoretical and empirical evaluations of debt sustainability have been carried out in many countries – developing and developed by a good number of researchers and research

organizations. For example (Ncube & Zuzana, 2015; Alberola & Jose, 2006; Antingi-Ego *et al.* 2021; Omoloshio *et al.*, 2016; Ryan & Isaya, 2014; Wese & Lekinyi, 2020; Islam, undated; Panayotis & Sophia, 2011; Ramu, 2021; Chandia *et al.*, 2019; Kapil *et al.*, 2019; Dossa *et al.*, 2020; Ben Hassine Khalladi, 2019; Asiama *et al.*, 2014; Schumacher & Mauro, 2015; Siva & Javnog, undated; Khadan, 2019; Begum & Flath, 2020; El-Mahdy & Torayehi, 2009; Mahmood & Shahnaz, 2012). For the developed countries, studies include (Stanek, 2014; Ozkaya, 2013; Mihaiu, 2014; Curtasu (2011); Pompeo *et al.*, 2022; Albu & Pelinesau (2000). For Nigeria in particular, the case study country, the studies include (NESG 2017; Ozigbu, 2018; Adewumi *et al.*, 2019; Omoloshio *et al.*, 2016; Oladunjoye & Yunusa, 2008; Imoisi, 2021). From these scanty studies in Nigeria and from the reviewed studies, the following research lapses were observed: (i) poor measure of debt sustainability and different measures of debt sustainability (ii) omission of major explanatory variables and aggregation of public debt and external debt in the same empirical model (iii) poor theoretical framework and poor understanding of debt sustainability analytical approach; Meanwhile this study is similar to some other studies although with major differences. For example, Oladunjoye and Yunusa (2018) for using the present value budget constraints (PVBC) and no-ponzi scheme/game theoretical framework.

The question of whether countries can maintain their debts at sustainable levels remains pertinent for even the developed and developing countries, while debt relief as experienced in 2005 in Nigeria provided the country and other low-income countries with new opportunities of exiting from the overhang, it is one-off intervention to restore debt sustainability which does not address the root causes of unsustainable debt accumulation and its challenges. Understanding what debt sustainability means, how it can be monitored, and how debt should be managed to avoid such scenarios of overhang and its deleterious consequences on the domestic economy is therefore of

utmost concern to policy makers and researchers. Therefore, this study attempted to empirically investigate the sustainability of Nigerian public debt from 1986 to 2021, using the Present Value Budget Constraint (PVBC) or the Non-Ponzi scheme approach and the application of econometric technique of unit root tests and co-integration approaches. To achieve the aim of this study, this study used variables like the natural logarithm of government total expenditure, the lagged value of government expenditure, gross domestic product, oil revenue; debt-to-GDP ratio; population growth, inflation tax (inflation rate X real money stock) an additional over and above the previous studies, trade openness; exchange rate and value added tax. The inclusion of these variables is to bridge the knowledge gap and to enhance the analytical robustness of this study. The research questions of this study are drawn from the statement of the problem in terms of the rising debt profile of the Nigerian economy; the failure or the inadequacy of initiated policy responses to halt the rising tide of the country's debt and the research gap in terms of poor measurement of debt sustainability, under-specification of model variables, omission of important variables and poor theoretical framework.

1.2 THESIS OBJECTIVE

The main objective of this study is to examine the sustainability of the Nigerian public debt. Specifically, this study sought among others:

- (i) To investigate the impact of oil revenue, debt-to-GDP ratio and inflation tax on the natural logarithm of government expenditure in Nigeria.
- (ii) To determine the unit root/stationarity of oil revenue, debt-to-GDP ratio, inflation tax and logarithm of government expenditure in Nigeria.
- (iii) To empirically evaluate the long-run relationship between government expenditure, oil revenue, debt-to-GDP ratio and inflation tax in Nigeria.
- (iv) To suggest policy measures in the light of the empirical evidence that Nigerian policy makers could adopt to effectively address the rising public debt.

The research hypotheses of this study formulated in their null and alternate form are in line with the statement of the problem and research questions.

1.3 THESIS CONTRIBUTION

This study extends and contributes to the literature on the sustainability of public debt in Nigeria in four major ways. First, we elaborate conceptually and theoretically on why debt sustainability matters and why policy attempts should be focused on it; second, we document stylized facts on recent public debt profiles. Third, this study empirically evaluates the key drivers of public debt sustainability in Nigeria. Four, we offer policy suggestions that would help policy makers to keep in check of the rising public debt and to ensure its sustainability in Nigeria. Therefore, this study has theoretical contribution through the inter-temporal budget constraint and empirically

through the use of the unit root and co-integration tests, the two major tests for debt sustainability, and the inclusion of relevant additional variables especially the inflation tax which to the best of the researchers' knowledge has not been used in the empirical literature. This is far and above, the use of inflation rate and high-powered money used by previous authors. Pragmatically, the policy recommendations would serve as policy input for debt sustainability in Nigeria.

1.4 THESIS ORGANIZATION

This study is organized into five chapters. Chapter one is the introduction. This chapter introduces the subject matter within the context of the Nigerian economy. Chapter two is the theoretical considerations, which examine the conceptual and empirical literature in order to establish the knowledge gap. Chapter three is on the empirical model while chapter four is the results presentations and analysis. Chapter five is on the summary, conclusion, and policy recommendations. This chapter also contains the limitations of this study and an agenda for future studies on debt sustainability.

CHAPTER 2: THEORETICAL CONSIDERATION

2.1 CONCEPTUAL LITERATURE

Public debt sustainability

Countries Medium-Term Expenditure Framework (MTEF) is normally formulated so that public debt is sustained. A sustainable debt provides confidence that the government will be able to borrow and pay potential creditors. Unsustainable debt levels, on the other hand, are a risk to government expenditures on development and social programs since a greater part of tax revenue would be diverted to debt service (Ryan & Isaya, 2014).

The concept of sustainability of debt has emerged from the definition based on meeting some indicators and thresholds, to a more general approach where it is conceived as a process (Foncerrada, 2005). The process has to do with actions and functions targeted at sustaining the debt floors and then the borrowing and the consequences of debt services. It shows cases of minimum aspects that are very important to the debt sustainability process.

The International Monetary Fund (IMF, 2003) maintained that the ability of a government to meet thresholds set on a group of indicators should be the basis for assessing the sustainability of public debt. Accordingly, the indices ensure that countries remain solvent such that they are able to meet their debt obligations on time without constraining their growth and development objectives. The ratio of the budget deficit to gross domestic product (GDP) is one such measure since it is a proxy for fiscal sustainability. In more recent times, the accumulated debts and the

cost of servicing them have been expressed as a ratio of GDP, sustainable revenues, and government expenditures.

International Monetary Fund has also included the ratio of domestic debt to GDP as a proxy for debt sustainability, which should be below the 15 – 20 percent range. Furthermore, in the measurability of public debt sustainability, the ratio of the rate of interest and the rate of growth of the economy (Reddy, 2006) is used. According to the author, this approach takes into consideration the interest rate at which the government borrows which should not be greater than the rate of growth of the economy. Therefore, tersely summarized, an unsustainable debt manifests when the ratio of debt to GDP increases.

The composition of public debt in terms of domestic and foreign sources has also been identified as an important determinant of debt sustainability. A greater proportion of internal debt ensures that debt service expenditure remains in the domestic economy rather than being paid out of the country. More so, exchange rate risk is minimized. Meanwhile, excessive borrowing from the domestic market can crowd out private sector borrowing since interest rates could be pushed up.

The G-24 Technical Group Meeting (2004) summarized the following regarding debt sustainability framework for low income countries as follows: (i) judging debt sustainability using debt indicators raises a number of conceptual and definitional issues. These relate to the types of debt to include in debt stock and debt service payment i.e. the numerator in the debt ratios; the way to measure debt burden; judgment of payment capacity, ii). The denominator in the debt ratios; and the choice of thresholds for the selected ratios, (iii) When assessing debt sustainability – three measures of debt burden are normally considered; normal stock of debt expressed in a single currency (US dollars); stock of debt measured in present value (PV) terms

by discounting the future stream of debt service payments by a series of discount rates relevant to the principal currencies in which the country has borrowed, and the annual or multi-year payments due on debt services. The nominal stock of debt and debt services payments were the preferred measures of debt burden until the early 1990s when the World Bank, IMF and the Paris Club began to use the present value of debt. Another issue that has come up in the use of the present value in estimating debt indicators has been the fluctuations in the discount rates used for estimating the present values. Prizzon and Mustapha (2014) posited that the commencement of any analysis of debt sustainability is the government's budget constraint, which implies that the current government expenditure on goods and services in addition to the cost of servicing current debt must be equal to the current tax revenue plus the issuance of new debt.

In this study, we conceptualized the sustainability of public debt and its assessment under the assumption of the Present Value Budget Constraint (PVBC) or of the no – ponzi game (NPG) condition set of time series data on government expenditure revenue, deficits and / or debts and we used the natural logarithm of government expenditure to measure debt sustainability. This is in sync with the theoretical framework of the present value budget constraint (PVBC).

2.2 REVIEW OF BASIC THEORIES

The issue of debt sustainability is widely debated both in the theoretical and empirical literature. Some of the basic theories reviewed are (i) classical theory, (ii) Keynesian theory and its extensions, (iii) Fiscal Reaction theory and inter-temporal budget constraint theory of public debt.

a. Classical Theory

The classical theory of public debt was propounded by Adam Smith and the rest of the classical economists in the 1930s. This theory is based on the assumptions of unfavorable public borrowing and the laissez-faire principle given that state interventions in the economy should be minimal. The debt according to Adam Smith severely retards the natural progress of a nation towards wealth and prosperity since resources that could be used productively from the private sector of the economy are diverted by the state in order to finance its unproductive activities. He however proposed balanced budget, where all government expenditures are financed by taxation. The classical theory of public debt is expository; however, it has been criticized and usually considered inappropriate for modern economies including the Nigerian economy. Our study will not be anchored on the classical theory of public debt.

b. Keynesian Theory of Public Debt

The Keynesian theory of public debt was formulated in the late 1930s. This is premised under the assumption that deficit spending is often used in the Keynesian perspective to economic stimulus, in which the government takes on debt while using its spending power to create demand and stimulate the economy. These ideas of Keynes led to the imposition of a policy of active state intervention in the economy. Most importantly, the main notion in Lerner's theory of functional finance is that the government's fiscal policy, spending and taxation, the borrowing and repayment of loans, and the issuance of new money and withdrawal of money from circulation must be carried out in line with its effect on the economy. Lerner, therefore, formulated two rules of functional finance: (i) total government spending should be maintained at a level that will be sufficient to buy goods produced by all who wish to work but not enough to

increase inflation through a demand, (ii) the government should borrow money only when it is justified that society should have less money and more government bonds due to the effect of debt financing of the budget deficit. The Keynesian theory of public debt is good but not without criticisms especially on the use of increased level of taxation and discouragement of investment on the economy. The other extension of the fiscal theory of public debt is the present value budget constraint theory.

c. Present Value Budget Constraint (PVBC) Theory

The modern treatment of the government budget constraint was popularized by Sargent and Wallace (1981). The assumption of this theory is that when the primary fiscal stimulus surplus is fixed, an open-market state of debt and contraction of base money, produce higher inflation. The theory demonstrates that under certain assumptions of policy behaviour, debt-financed cuts in lump-sum taxes can stimulate aggregate demand, in apparent contradiction to Ricardian equivalence. The present value budget constraint theory of public debt has been seriously supported in the development literature. By accounting for each country's specific circumstances, the PVBC framework tries to help borrowing countries balance their need for funds with the current and prospective ability to repay their debts. Linking a country's borrowing potential to its current and prospective ability to service should help countries avoid accumulating excess debt. The Present Value Budget Constraint (PVBC) formed the theoretical framework of this study since it is very much in line with the modern literature on debt sustainability.

2.3 EMPIRICAL LITERATURE REVIEW

As stated earlier, empirical evidence abounds on public debt sustainability. This section presents some of the empirical literature. Debrun, Ostry, Williams and Wyplosz (2019) surveyed the knowns and unknowns about debt sustainability, including the tools helping us to understand vulnerabilities and to inform our judgments. The study concluded among others that uncertainty around public debt developments is large and difficult again not all debts are born equal, as the currency composition, maturity structure, type of creditor, and ownership of the debt affect exposure to roll over and liquidity.

As expository as the study is, it lacks empirical validation and therefore, policy derivation may be difficult to achieve from the study. This is the gap our study intends to bridge by carrying out empirical verification of debt sustainability.

Bilan (2010) presented models of public debt sustainability assessment and their utility. The study posited that public debt sustainability is one of the main challenges that public indebtedness policy has to face in the long run; the main disadvantages and problems arising from their practical application. Again, the study was more theoretical than empirical and therefore lacks empirical validity and content, which this study provides.

Ncube and Zuzana (2015) examined public debt sustainability in Africa building resilience and challenges ahead. The study was anchored on the primary balance and the real interest-growth differential. The authors concluded that fiscal policies will be needed greatly in the maintenance of debt sustainability especially some interest-rate growth differentials are likely to narrow over the longer term. Although contributive to knowledge, it lacked empirical content and contribution. The study lacked empirical model and no adequate econometric technique was

applied. These lapses were covered by the current study that empirically considered debt sustainability in Nigeria, an African country.

Alberola and Montero (2006) investigated debt sustainability and procyclical fiscal policies in Latin America from 1981 – 2004 by applying the Hodrick – Prescott filter to the real GDP series and the panel data estimation technique. Although the study is empirical in nature and focused in developing economies (Latin America) like our study for Nigeria, however, it lacked a theoretical framework like our study. Further, the use of panel data may not give adequate policy information since it considers the group of countries lumped together under one study.

Atingi-Ego, Timuno and Makuve (2021) discussed public debt accumulation in sub-Saharan Africa which is experiencing a looming debt crisis, from the period 2008 – 2016. The variables used are real GDP growth rate, primary balance and export, government revenue, and foreign direct investment (FDI). The result revealed that debt sustainability analysis tends to underestimate the trajectory of debt burden indicators. Furthermore, the pace of debt accumulation has been high in countries for which the forecast of GDP growth rates has been optimistic. This study adopted a descriptive approach and was focused on the 54 sub-Saharan African countries without taking into consideration countries' heterogeneity. This may seriously affect policy making. Our study is country-Specific – Nigeria, and uses the government's public debt constraints.

Posta, Marelli and Marcello (2022) analyzed COVID-19, economic policies, and public debt sustainability in Italy from 2020 – 2021. Some of the identified variables used are public debt, public debt-to-GDP and debt deficit. The study concluded that the pandemic that struck the world in 2020 had an immediate and severe impact on the economic system, causing an

unprecedented fall in GDP and a big risk in public deficits and debts. The study suggested that fiscal policy should be used in a coordinated manner to reinforce economic growth and improve public debt sustainability. The study is contributory to knowledge; however, our study differed from the previous study following the empirical content and context of our study. Furthermore, ours is strictly on the sustainability of public debt in Nigeria and paid less attention to COVID-19 pandemic.

Pyan and Isaya (2014) investigated Kenya's public debt dynamics and sustainability from 1983 to 2014 using both the co-integration and stochastic sustainability approaches. The variables used are domestic debt, foreign debt, nominal exchange rate nominal interest rate, and the primary balance. The result showed that public debt in Kenya within the review is sustainable. In addition, depreciation in the exchange rate did not have significant effects on the average interest rates on external debt. The major shortcoming of the study is the lack of theoretical framework, although it is empirical and similar to our study.

Were and Lenyinki (2020) explored public debt sustainability and debt dynamics in Tanzania using the IMF-World Bank debt sustainability framework. The study revealed that debt sustainability based on the fiscal reaction function approach is weak, as the challenge lies in ensuring that debt remains sustainable, given the need to stir up development and government expenditures to address infrastructure gaps amid dwindling donor financing and vulnerability to exogenous shocks, particularly in light of the COVID-19 pandemic. The study, therefore, suggested leveraging of concessional borrowing, efficient public investment, enhanced debt management, and domestic resource mobilization as critical elements. As good as the study is, it was not anchored on any theoretical framework of the present value budget constraint. This current study bridges this knowledge gap of the former study.

Islam (undated) investigated public debt sustainability in Bangladesh from the period FY90 – FY07 covering variables, such as GDP growth rate, inflation, interest rate, exchange rate, primary deficit (including Seignorage), export growth, and current account balance. The empirical results show that the differential between growth and interest rate, reduction in primary deficit, export growth and improvement of current account balance has stronger influence in changing the overall public debt-GDP and external debt-export ratios. The study recommended among others that either the interest rate on debt or GDP growth needs to be maintained at levels such that the GDP growth-real interest rate differential may increase further.

Chandia *et al.* (2019) examined the sustainability of the public and external debt burden of Pakistan and India for the period 1971 – 2017. The variables used are interest rates, the exchange rate, budget deficit, and GDP growth. The results of the study indicate that the primary budget deficit and current account deficit have played a significant role in the accumulation of public debt and external debt, respectively in Pakistan and India. The study concluded that the public debt and external debt of Pakistan and India are sustainable long in a weak form.

Magazzino & Mutascu (2019) analyzed the relationship between public primary deficit and debt for Italian sustainability over the 1862 – 2013 years. The strategy adopted is the wavelet approach. The variables used are tagged public debt, primary deficit, and inflation rate. The empirical evidence suggests the presence of substantial fiscal sustainability in the long run for Italy. The use of the wavelet approach made the study pay more empirical attention to the timing and frequency of the public debt than the sustainability of the public debt. Furthermore, the study is silent of a theoretical framework. This lapses the study will bridge by using the inter-temporal budget constraint and using variables identified in the literature as drivers of public debt. Most

significantly, our study uses inflation tax as against inflation rate used by the study. The inclusion of inflation tax is a value addition.

Adewumni, Zacharia and Asogwa (2019) examined public debt sustainability in Nigeria after the exit from Paris club in the presence of statistical break between the periods of 1988 and 2016 using the Autoregressive Distributed Lag (ARDL) using employing the fiscal reaction function framework. The results show that fiscal actions by the Nigerian government are not sustainable. The study therefore recommended that government should reduce its over dependence on crude oil revenue, and harness other potential revenue generating commodities such as the agricultural sector in order to reduce its debt burden. The use of ARDL in determining the sustainability of the Nigerian public debt is methodological inadequate. Furthermore, the study has no concrete theoretical framework. These shortfalls in the study is what this study intends to bridge as the knowledge gap.

Khadan (2019) examined fiscal sustainability in the 10 Caribbean countries over the period 1991 – 2017 using the panel co-integration models of government revenue and expenditure. The study used the inter-temporal budget constraint framework. Some of the variables used are government revenue and government expenditure in the percentage of GDP. The evidence from panel co-integration models of government revenue and expenditure shows that past fiscal behavior is weakly sustainable. The weak sustainability finding is reinforced by evidence from an extended fiscal reaction function which showed that the primary balance improves by about 0.02 for a percentage point increase in the debt ratio. This is a panel data, however, the study never accounted for country differences. The use of two variables and missed important variables may affect policies for debt sustainability. This gap in the study is bridged by the current study.

Mahmood and Shahnaz (2012) examined the debt sustainability issue in Pakistan for the period from 1971- 2011 using the present value of budget constraint approach. The variables used are government current and development expenditures, public debt, external debt, real interest rate, domestic debt and high powered money. The results show that the series of government expenditure, revenue and discounted debt are non-stationary. The necessary conditions for debt sustainability are not met and debt has remained unsustainable throughout the period under examination. The study recommended that the debt profile of the country will remain under pressure if a major correction in fiscal policy is not made. This study is related to our study in approach and methodology. However, the inclusion of public debt, domestic debt and external debt in the study are prone to data aggregation problems. This study used the debt-to-GDP ratio to capture the debt profile-external and internal debts (Public debts). Our study used inflation tax (inflation rate and stock of real money supply) which is a better measure than the high-powered money used by Mahmood and Shahnaz (2012).

Asiama, Akosah and Owusu-Afriyie (2014) examined fiscal sustainability in Ghana from 2000Q1- 2014Q1 using the Autoregressive Distributed Lag (ARDL) Bounds testing approach. The variables used are the ratio of primary balance, public debt to GDP, inflation and exchange rate, and a dummy variable to capture the effect of Heavily Indebted Countries (HIPC) initiatives. The findings suggest that the government's fiscal behaviour is consistent with the inter-temporal budget constraint, but the fiscal adjustment appears to be very low. To ensure long-term fiscal sustainability, the study supported deliberate policies such as fiscal anchors and a Fiscal Responsibility Act that could help to curtail expenditure overruns, especially during election cycles, promote less expensive sources of borrowing and engender strong coordination between fiscal and monetary authorities. This study is related to our study on the use of the inter-

temporal budget constraint. But the major challenge of the previous study is the omission of important variables like government expenditure and government revenue. In our study, the variables were included such as oil revenue, trade openness, value-added tax (consumption tax) and government expenditure percentage of GDP.

Imoisi (2021) examined fiscal policy and sustainability of public debt in Nigeria from 1970-2019. The ARDL bounds test was used as the analytical framework. The variables used are public debt, interest rate, real gross domestic product and inflation rate. The results show that budget deficit has a positive and significant impact on public debt in the long-run and short-run, while interest rate, real gross domestic product, budget deficit, and inflation rate were statistically insignificant irrespective of the period and thus had no impact on public debt. The study recommended among others that the budgeting procedure at the Federal and State levels in Nigeria needed to be reassessed to make sure that allocative efficiency is achieved in the budgeting system. As insightful as the study is, it has some challenges –it lacks a concrete empirical framework, and the sustainability was not anchored on the PVBC framework. These lapses in the study motivated this present study. The relevant omitted variables were included in the present study.

2.4 SUMMARY OF LITERATURE REVIEWED

The review of the extant literature commenced with the conceptualization of debt sustainability. In summary, the related concepts shown by the literature on debt sustainability are solvency, debt overhang, doom loop, adjustment fatigue, fiscal space, snowball effect and Ponzi game, transversality condition, and inter-temporal budget constraint. The basic theories reviewed are the classical theory of public debt and the Keynesians including Lerner's public debt theory and

the inter-temporal budget constraint. In the empirical review, related studies in Nigeria and outside Nigeria were reviewed. From the review of the empirical studies, some studies are overtly related to the present study (Adewumni *et al.*, 2019; Mahmood & Shahnaz, 2012; Ryan & Isaya, 2014; Were & Lekinyi, 2020; Asiama *et al.*, 2014; Hela, 2019). However, major differences between the present study and these previous studies are identified in the knowledge gap in the succeeding section.

2.5 GAP IN LITERATURE

The gaps identified in the literature are summarized as follows: i) With the exception of Adewumni *et al.*, 2019 ; Imoisi, 2021 and Nigerian Economic Summit Group (NESG), 2017, majority of these studies are cross-country studies, ii) With particular reference to the Nigerian previous studies, there were serious measurement problems of debt sustainability. Such measurement of the explained variable could lead to misinformation about debt sustainability in practice and policy. Furthermore, there was also the problem of inadequate theoretical framework. The use of other frameworks other than the inter-temporal may amount to the misrepresentation of theoretical information. The cross country studies, most of them lack empirical validation and content; as such the policy recommendations may be subjected to empirical questions. These observations in the previous studies relate to the sustainability of public debt in terms of empirical invalidity, lack of theoretical framework, and omission of important variables in the model specifications.

2.6 HISTORICAL BACKGROUND: DEBT AND DEBT RELIEF INITIATIVES IN NIGERIA

The Nigeria public debt comprises both external and domestic debts owed by the federal and state governments. As of December 31, 2021 the total public debt in Nigeria was 39,556,032.50 million naira (US\$95,779.64 million). The federal government of Nigeria accounted for 83.75 percent while the state governments and federal capital territory accounted for 16.2 percent. This shows that most Nigerian public debt was borrowed by the federal government. Also out of the total public debt in Nigeria, we can observe that total external debt accounts for 40.08% while the total domestic debt accounted for 59.92%. A look at Nigeria's debt profile in the past reveals that Nigeria was more externally indebted. From *pie chart 1*, we can see that external debt accounted for 78.1% of total public debt in 2004 whereas domestic debt accounted for only about 21.9% of the total public debt. This period was the pre-debt relief package era as Nigeria was yet to secure a debt relief package from its creditors.

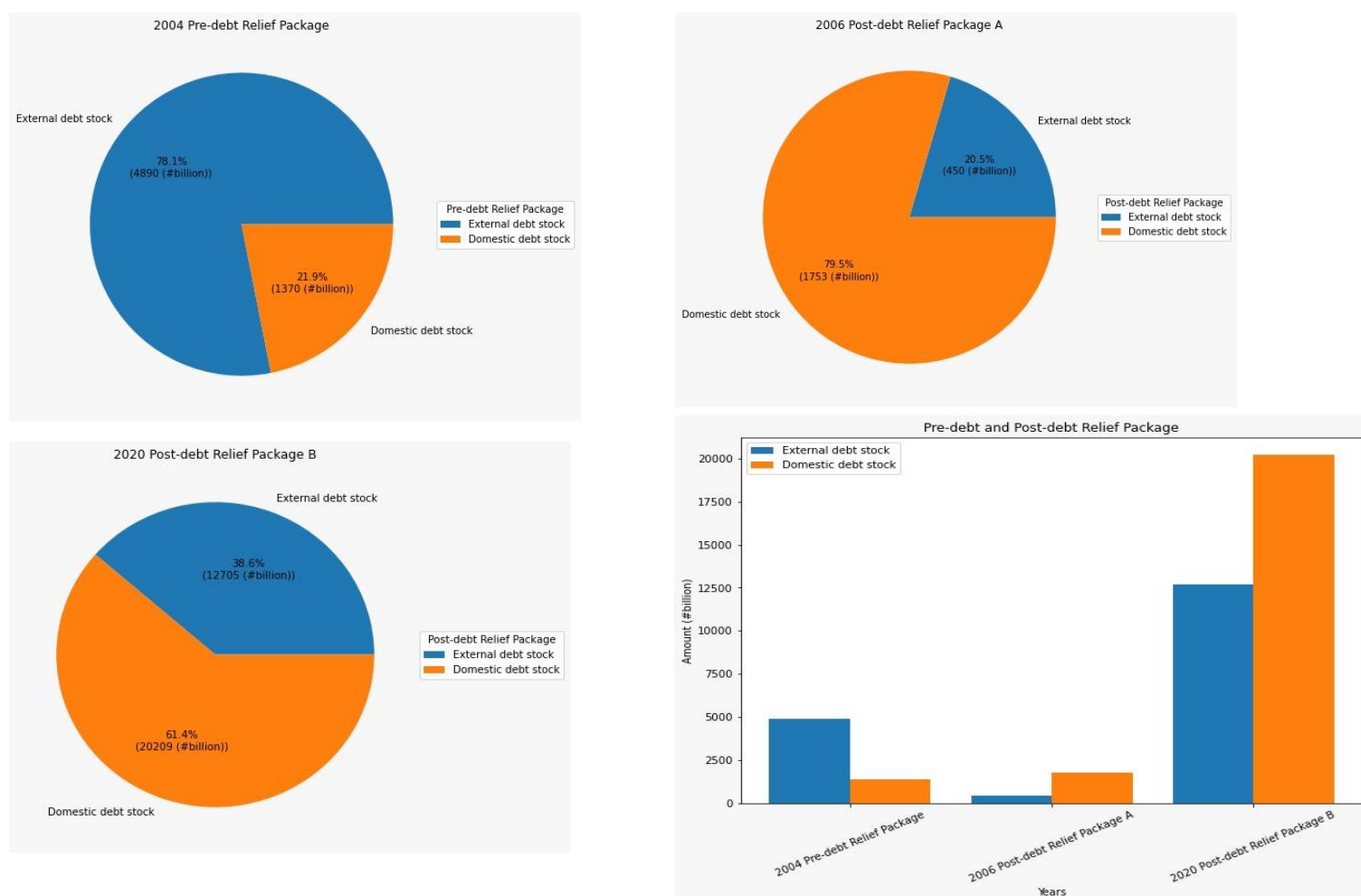


Figure 2.1: Nigeria's Public Debt (2004, 2006 and 2020)

Source: DMO(2022)

However, this pattern changed dramatically after 2005 due to the debt relief deal with the Paris Club in 2005. The Paris Club creditors granted a debt relief package of about US\$18 billion on June 29, 2005, as reported by the Debt Management Office (DMO) of Nigeria. From the second pie chart (2006 post-debt relief package A), Nigeria became more domestically indebted as external debt only accounted for 20.5 percent of the total public debt whereas domestic debt accounted for 79.5percent of the total public debt.

COVID-19 pandemic brought great distress to the government as government expenditure increased whereas revenue reduced as can be seen in *Table 2.1*. This situation added to the country's overall fiscal deficit amounting to about -6,171.8 billion naira in 2020 and the Nigerian government had to borrow in order to finance this deficit. This brought about a 20 percent increase in the total public debt from 27,401.38 billion naira recorded at the end of 2019 to 32,915.51 billion naira in 2020. The public finance in Nigeria recorded a deficit in its fiscal policy from the years (2000 to 2020) observed as can be seen in *Table 2.1*. This deficit has to be financed mostly from borrowing and this impacts the total debt stock of the country. This can help to explain why Nigeria's public debt has been on the rise. However, despite the rise in the Nigerian debt stock the 2020 post-debt relief package B chart above shows that the country is yet to return to the pre-debt relief level and that the external debt accounted for only 38.6% as against 78.1percent recorded in 2004.

Notwithstanding that Nigeria is domestically indebted, it is important to understand that their external debt creditors have changed significantly. According to data from the debt management office of Nigeria, Paris Club and multilateral creditors accounted for 93.68 percent of total external debt in Nigeria as at the end of 2004 whereas multilateral creditors accounted for 53.78 percent of total external debt in 2020. In addition, 45.66 percent of total external debts are owed to bilateral creditors and bond holders in 2020 with China (EXIM Bank of China) and bondholders occupying about 95 percent of total external debt under this category. The recent creditors of Nigeria might not be lenient enough to cancel or stop debt service payments for most loans as compared with the pre-debt relief era. Therefore, it is paramount to understand when Nigerian public debts become unsustainable.

Table 2.1**Selected data relating to debt sustainability**

Year	Total Debt Stock (NBillion)	External Debt Stock (NBillion)	Domestic Debt Stock (NBillion)	Total Debt Service (NBillion)	Total Govt. Revenue (NBillion)	Total Govt. Exp. (NBillion)	Overall Deficit(-) (NBillion)	Nominal GDP (NBillion)	Total debt/GDP (%)	Total debt/Revenue (%)	Total debt service/Revenue (%)
2000	3,995.6	3097.4	898.0	288.7	597.3	701.10	-103.80	7,062.8	56.6	669.0	48.3
2001	4,193.3	3,176.3	1,017.0	394.5	797.0	1,018.0	-221.0	8,234.5	50.9	526.1	49.5
2002	5,098.9	3,932.9	1,166.0	318.3	716.8	1,018.2	-301.4	11,501.5	44.3	711.4	44.4
2003	5,808.1	4,478.3	1,329.7	447.0	1,023.2	1,226.0	-202.7	13,557.0	42.8	567.6	43.7
2004	6,260.6	4,890.3	1,370.3	435.9	1,331.6	1,504.2	-172.6	18,124.1	34.5	470.2	32.7
2005	4,221.0	2,695.1	1,525.9	1,299.4	1,758.3	1,919.7	-161.4	23,121.9	18.3	240.1	73.9
2006	2,204.7	451.0	1,753.3	1,073.6	1,937.2	2,038.0	-100.8	30,375.2	7.3	113.8	55.4
2007	2,608.5	439.0	2,169.6	371.5	2,333.7	2,450.9	-117.2	34,675.9	7.5	111.8	15.9
2008	2,843.6	523.0	2,320.3	531.5	3,193.4	3,240.8	-47.4	39,954.2	7.1	89.0	16.6
2009	3,818.4	590.0	3,228.0	541.9	2,643.0	3,453.0	-810.0	43,461.5	8.8	144.5	20.5
2010	5,241.6	690.0	4,551.8	406.8	3,089.2	4,194.6	-1,105.4	55,469.4	9.4	169.7	13.2
2011	6,519.6	897.0	5,622.8	592.3	3,553.5	4,712.1	-1,158.5	63,713.4	10.2	183.5	16.7
2012	7,554.3	1,016.7	6,537.5	766.0	3,629.6	4,605.3	-975.7	72,599.6	10.4	208.1	21.1
2013	10,044.2	1,373.6	8,670.6	934.4	4,031.8	5,185.3	-1,153.5	81,010.0	12.4	249.1	23.2
2014	11,243.1	1,631.5	9,611.6	923.9	3,751.7	4,587.4	-835.7	90,137.0	12.5	299.7	24.6
2015	12,603.7	2,111.5	10,492.2	1,083.2	3,431.0	4,988.9	-1,557.8	95,177.7	13.2	367.3	31.6
2016	17,360.0	3,478.9	13,881.1	1,336.3	3,184.7	5,858.6	-2,673.8	102,575.4	16.9	545.1	42.0
2017	21,725.8	5,787.5	15,938.3	1,618.0	2,847.3	6,456.7	-3,609.4	114,899.2	18.9	763.0	56.8
2018	24,387.1	7,759.2	16,627.8	2,249.1	4,185.6	7,813.7	-3,628.1	129,086.9	18.9	582.6	53.7
2019	27,401.4	9,022.4	18,379.0	2,094.8	4,894.0	9,714.6	-4,820.6	145,639.1	18.8	559.9	42.8
2020	32,915.5	12,705.6	20,209.9	2,445.3	3,992.8	10,164.6	-6,171.8	154,252.3	21.3	824.4	61.2

Source: DMO, IMF, CBN & NBS (2022)

Following COVID-19 pandemic and with Nigeria's public debt rising, the question on everyone's mind is whether Nigeria's public debt levels has returned to pre-debt relief initiative level. A look at debt/GDP ratios in the table above and graphs below shows that Nigeria's total debt to GDP reduced by almost 80% following the debt relief package in 2005 (from about 35 percent in 2004 to about 7 percent in 2006). The debt/GDP ratio has been on the rise ever since

the relief package and as at the end of 2020, it increased to about 21 percent and following the international threshold of 30%, we can safely say that Nigerian public debt is still sustainable.

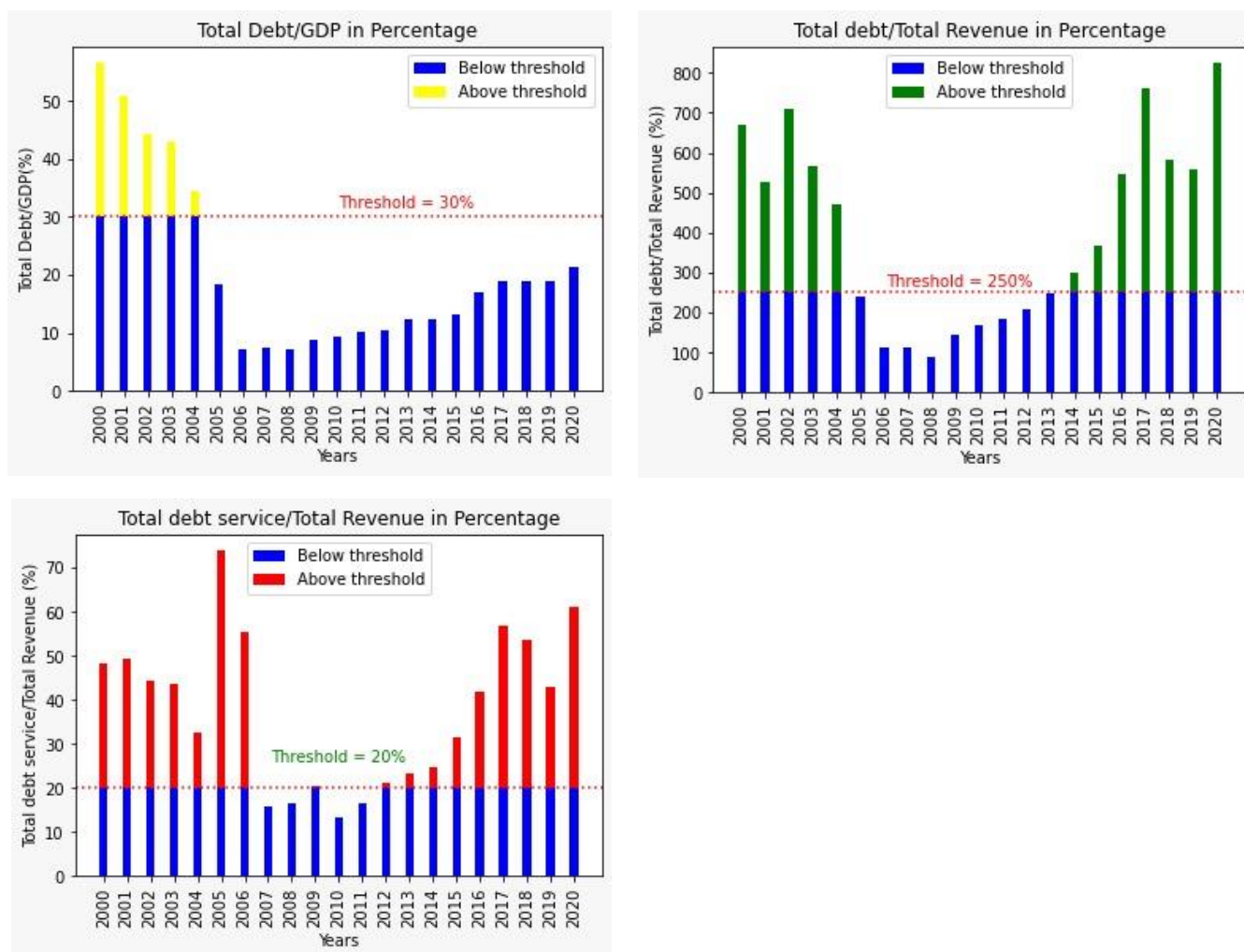


Figure 2.2: Selected Debt Sustainability Indicator

Source: DMO, IMF, CBN & NBS (2022)

However, the debt/GDP ratio might not give us a true picture of the situation as debt is not serviced out of GDP but through government revenue. The total debt/revenue in 2020 reported 824% which was far above the international threshold of 250 percent and as a result shows that

the public debt in Nigeria might be unsustainable. This shows that the annual government revenue will not be enough to settle Nigeria's public debt.

Similarly, the total debt service/GDP reported about 2 percent in 2020, and judging by the figures, we can assume that Nigeria's public debt is sustainable. However, we do not service debt from GDP but through revenue. Therefore, it is necessary to look at total debt service/revenue in Nigeria. Nigeria's debt service/revenue was below the international threshold of 20 percent after the debt relief initiative but has remained above the threshold from 2012 till 2020 that was observed. This shows that the total government revenue is not capable of servicing the country's debt and taking care of the fiscal budget, hence might continue to mount pressure on the total public debt as the country might resort to borrowing in order to finance its budget deficit and also service debts.

Before the exit of Nigeria from the Paris Club in 2005, a good number of debt sustainability indicators were not sustainable. These indicators truly were far from the internationally accepted standards of the IMF and the World Bank (Adewumni *et al.*, 2019). Examining the trend of public debt in Nigeria, Onuoha (2008) revealed it to be generally insignificant and negligible. The Nigerian fiscal space has been characterized by rising government spending, largely financed by external borrowings and constant fall in oil revenue, the major source of revenue for the Nigerian economy. As such, the interest payment on the borrowed funds kept rising in leaps and bounds (Otonne & Oyenuga, 2019). As a result of the accumulation of arrears, constant fall in oil revenue, and spiking public debt servicing, the Nigerian government applied for debt relief in 1986, 1989, 1991, and 2000 (Rieffel, 2005). After the payment to the Paris Club in 1992, the subsequent payments to the Club of creditors were declined. By 2005, about 86 percent of the total external loans were owed to the Paris Club, including the debt; interest arrears on the debt;

interest charged on the interest arrears; as well as the penalty charges on the debt, since no repayment was made in 1992. After the relief, with the third phase of the exit structure completed, both the external debt component and public debt dropped drastically owing to the fall in external debt observed and compelled by the Paris Club becoming zero.

The volatility in the oil price, as well as the foreign reserve depletion for domestic purposes, have raised much concern about the ability to service the humongous Nigerian debt profile and the ability of the Nigerian Government to finance its inter-temporal budget without external or internal borrowings.

CHAPTER 3: METHODOLOGY

This chapter provides the empirical model of the Nigerian public debt sustainability. To achieve this purpose, this chapter is presented as follows: theoretical framework; empirical model specification; description of model variables/ justification, estimation technique and procedures and data sources.

3.1 THEORETICAL FRAMEWORK

The theoretical framework of this study is the intertemporal budget constraint. The basic idea of this framework is that when the Government runs a deficit, it is implicitly promising to run sufficient surpluses in the future in order to repay the accumulated debt and interest. In other words, the sum of all current and expected non-interest outlays —expressed in present value terms — must not exceed the sum of all discounted revenues, including seignorage. The framework may be formally derived as follows:

$$\sum_{t=0}^n \left(\frac{1}{1+r} \right)^t [T_t - G_t] = OD_0 \quad (1)$$

Where r is the real interest rate on Government debt, T_t is the total tax revenue, G_t is the Government expenditure at period t and OD_0 is the original debt. This means that the discounted accumulation of budget surpluses must be sufficient to service the initial debt. Now let's assume that taxes (T) are collected on national income (GDP) at a constant tax rate $\tau > 1$ and that GDP grow at a constant real growth rate $\vartheta > 0$. So tax collections at time t are given by:

$$T_t = \tau(1 + \vartheta)GDP_{t-1} \quad (2)$$

Where T_t is the total tax revenue, τ follows a random walk and GDP_{t-1} is gross domestic product in the previous period.

Let us assume that government spending (G) grow at a constant rate $\Theta \geq 0$.

$$\text{So, } G_t = (1 + \Theta)G_{t-1}$$

Substituting $T_t = \tau(1 + \vartheta)GDP_{t-1}$ and $G_t = (1 + \Theta)G_{t-1}$ into equation (1), we have

$$\sum_{t=1}^n \left(\frac{1}{1+r}\right)^t [\tau(1 + \vartheta)GDP_{t-1} - (1 + \Theta)G_{t-1}] = OD_0 \quad (3)$$

Dividing both sides by lagged GDP_{t-1} , we have:

$$\sum_{t=1}^n \left(\frac{1}{1+r}\right)^t [\tau(1 + \vartheta) - (1 + \Theta) \frac{G_{t-1}}{GDP_{t-1}}] = \frac{OD_0}{GDP_{t-1}} \quad (4)$$

If we focus on the terms in the bracket, we get a condition where the initial outstanding debt is equal to zero.

$$\tau(1 + \vartheta) \sum_{t=1}^n \left(\frac{1}{1+r}\right)^t - (1 + \Theta) \sum_{t=1}^n \left(\frac{1}{1+r}\right)^t \frac{G_{t-1}}{GDP_{t-1}} = 0 \quad (5)$$

If we set $n = \infty$, then we have

$$\frac{\tau(1+\vartheta)}{r} - (1 + \Theta) \sum_{t=1}^{\infty} \left(\frac{1}{1+r}\right)^t \frac{G_{t-1}}{GDP_{t-1}} = 0 \quad (6)$$

$$\frac{\tau(1+\vartheta)}{r(1+\Theta)} = \sum_{t=1}^{\infty} \left(\frac{1}{1+r}\right)^t \frac{G_{t-1}}{GDP_{t-1}} \quad (7)$$

Where the term on the right-hand side is the present value of all future spending ratios and cannot exceed the left-hand side or the debt becomes unsustainable, that is, GDP will not be sufficient to sustain the stock of government debt. If Θ is too large, the condition will be violated. Or if τ and / or ϑ is too small, the condition will be violated. The model is premised on

the ratio of government spending to GDP, not total debt to GDP, since it captures how the debt evolves.

It is easy to incorporate unexpected inflation. If the interest rate on government debt (r) is fixed or adjust only slowly to inflation expectation then an increase in inflation will reduce the real interest rate on government debt, so the value of τ will fall. This increases the present value of future budget surpluses in the first equation and makes the condition more likely to hold. So budget surpluses could be smaller or even negative for periods of time. Inflation tax could be included as a source of financing government spending. The inflation tax is $\pi_t M_t$ where π_t is the inflation rate and M_t is the monetary base. However, we can assume that the Central Bank of Nigeria operates independently of the government so that the government does not collect the inflation tax.

At this point, two assumptions are made. First, it has been shown (Hamilton & Flavin, 1990) that the public debt sustainability does not rule out the possibility that the government runs a deficit inclusive of interest payments: this is not inconsistent with the temporal budget constraint. On the contrary, a permanent net of interest deficit is not sustainable in the long run. Second, the present value borrowing constraint does not imply that the public debt must be sooner or later fully repaid; such a constraint allows the stock of debt to grow indefinitely, provided its rate of growth is not greater than the rate of interest paid by the government.

Prizzon and Mustapha (2014) and Rapu (2003) posited that the starting point of debt sustainability is the government's budget constraint, which requires that current spending on goods and services plus the cost of servicing current debt equals current tax revenue plus the issuance of new debt.

3.2 EMPIRICAL SPECIFICATION

Oshikoya and Tarawalie (2009) has advocated the use of the Present Value Budget Constraint (PVBC) approach on debt sustainability analysis within the framework of the government budget constraint. The use of PVBC is premised on the assumption that liabilities can grow at the growth of the economy. It involves the assessment of No-Ponzi game (NPG) condition for a set of time series data on government expenditure, government revenue, fiscal balance, public debt and inflation tax rate. It requires econometric techniques of stationarity tests and co-integration analysis. The starting point for these tests is to take the first difference of the present value of the debt stock to get an empirical testable representation of the inter-temporal government budget constraint. A sustainable debt policy should ensure that the No-Ponzi game (NPG) condition holds, that is, the present value of the stock of debt goes to zero in the limit.

The models in equations (1-7) can be transformed by including other important variables as expressed in equation (8)

$$\text{LnGOVTEXP}_t = f(\text{LnGDP}_t, \text{LnOILREV}_t, \text{DEBTG}_t, \text{POP}_t, \text{INFTAX}_t, \text{TOP}_t, \text{EXCH}_t, \text{LnVAT}_t) \quad (8)$$

Where: GOVTEXP : Government total expenditure; GDP is gross domestic product; OILREV is oil revenue; DEBTG is debt-to-GDP ratio; POP is population growth; INFTAX is inflation tax; TOP is trade openness; EXCH is exchange rate, VAT is value added tax.

To solve for the optimal level of $\frac{G_{t-1}}{\text{GDP}_{t-1}}$ in each period that satisfies the intertemporal budget constraint, one needs to set up a constrained maximization problem. The objective function could be a societal welfare function that contains $\frac{G_{t-1}}{\text{GDP}_{t-1}}$ and other variables that are included in (8). For the policy maker, the choice variable is $\frac{G_{t-1}}{\text{GDP}_{t-1}}$. The solution for the optimal spending ratio would

then include the parameters in the intertemporal budget constraint and the other variables, depending upon the form of the social welfare function. This would take the general form of $\frac{G_{t-1}}{GDP_{t-1}} = f(r, \tau, \theta, \vartheta, \mathbf{X})$ where \mathbf{X} is a vector containing the other variables. However this would require choosing the form of a social welfare function and there is not much agreement on a “best” function to use, so we do not attempt to explore this problem. Therefore, (8) forms the basis for testing the sustainability hypothesis in Nigeria where the model included in the variables must be co integrated in the PVBC model.

3.3 DESCRIPTION OF MODEL VARIABLES AND JUSTIFICATION

The variables included in the model are described and justified for their inclusions. The variables in rates and percentages are not expressed in their natural logarithms, while the variables in nominal values are logged to express them in elasticities so as to enhance their linearity.

Log of Government Expenditure (LnGOVTEXP): This is the decision variable of this study. It's inclusion as the dependent variable is justified following the theoretical framework of this study. The model is premised on the ratio of government expenditure to GDP, since it captures how the Nigerian debt evolves. Jibir and Aluthge(2019) used government expenditure as a dependent variable in modeling the determinant of government expenditure in Nigeria. This is based on the condition that GDP is sufficient to sustain the stock of government debt. Government expenditure is in nominal values, therefore, it is expressed in its natural logarithms to enhance its linearity.

Lagged Government Expenditure (GOVTEXP_{t-1}): The lagged government expenditure is included to account for inertia in relation to past government spending influencing the pattern of the present government expenditure (Taiwo, 1989). Government spending partially adjusts to

shocks to the other independent variable in (8) in each period at a declining rate. It is expressed in its natural logarithm form to enhance its linearity.

Gross Domestic Product (GDP): Gross domestic product has been identified as one of the explanatory variables explaining government spending. Some of the empirical studies on the GDP-government expenditure nexus include Gyles (1991), Adamu & Hajara (2015), Facchini & Melki (2013), Jalles (2019), and Obeng & Sakyi (2017). All of these studies estimate negative relationship from GDP to public expenditure, contrary to the Wagner hypothesis. This means that overall, growth and development is not always true of the Nigeria economy in the size of government expenditure. Intuitively, this is also true of the Nigeria economy where the yearly budget has not been positively associated with growth. Most government expenditure is for recurrent expenditures than capital expenditures that can occur as a result of growth. Therefore, we hypothesized a negative outcome for gross domestic product and government expenditure.

Oil Revenue (OILREV): This is an explanatory variable in the model measured in nominal value (US\$) per barrel. The assumption is based on the revenue-spend hypothesis popularized by Friedman(1978), that changes in government revenue brings about changes in government expenditure. There are empirical studies that have estimated the relationship between oil revenue and government expenditure (Athanasenas *et al.*, 2014; Aworinde, 2013; Blackley, 1986; Bolat, 2014, Dizaji, 2014). Meanwhile, Aladejare (2019) concluded that the oil price, price level and oil revenue are the major determinants of government expenditure in Nigeria. We therefore assume an unambiguous relationship between oil revenue and government expenditure. The oil price relationship with government expenditure in Nigeria will depend on the production per barrel, the dollar price of oil and the stability of the global economy free from known shocks.

Debt-to-GDP (DEBT): This is a proxy for public debt. The influence of public debt servicing on public expenditure has been investigated. Aregbenye and Akpan(2013) used disaggregated data for Nigeria that suggested that debt servicing reduces all form of government expenditure. Okafor and Eiya(2011) further estimated a positive relationship between public debt and government expenditure. We hypothesized a negative relationship between both variables in Nigeria.

Population growth (POP): POP is included in the model as an explanatory variable. Some of the considered population indicators according to Thorn (1972) include urbanization and life expectancy as possible determinants for government expenditure expansion. Applied studies on the relationship include Epifani and Gancia (2009) and Abeng(2005), studies that suggest that an increase in population contributes positively and significantly to government expenditure. We hypothesize a positive relationship between population growth and government expenditure.

Trade openness (TOP): This is the ratio of import and export as a percentage of GDP. There is empirical evidence that revealed a positive and significant association between trade openness and government expenditure (Cameron, 1978; Rodrick, 1998; Shelton, 2007). We expect a positive association for trade openness for Nigeria within the reviewing period.

Value-added tax (VAT): This is a consumption tax, that is, tax revenue to the government. Revenue and government expenditure has been examined in the empirical literature. Lee *et al.*,(2013) posited that a VAT is relatively efficient tax in comparison to the income tax alternative, but has little impact on government expenditure due to its very inelastic demand for the goods that are taxed. The tax would then have little effect in reducing consumption and raise a lot of revenue for the Government. We suspect a positive effect of VAT on government expenditure.

Inflation tax (INFLTAX): This is the revenue from money creation. The inflation tax is not just an inflation rate, it is the inflation rate multiplied by the money stock. It is included in the model as a source of financing for government spending. We hypothesize a positive relationship between government spending and the inflation tax.

Exchange rate (EXCH): This is measured as the price of a unit of currency expressed in terms of other currencies. In this case the American dollar (US\$). Previous researches have examined theoretically and empirically the relationship between government spending and the real exchange rate. As Frenkel and Razin(1996) summarized for a small open economy, government expenditure(financed by lump-sum taxes) influences the real exchange rate via a resource-withdrawal channel and consumption-tilting channel. Wataru *et al.*, (2016) suggest that an increase in government purchases appreciates the real exchange rate and increases consumption significantly in developing countries, while, it depreciates the real exchange rate and decreases consumption in advanced countries. We assume a positive association between the real exchange rate and government expenditure.

3.4 ESTIMATION TECHNIQUES AND PROCEDURE

The analytical technique of this study is the present value budget constraint (PVBC). In the present value constraint approach or lender-based method, a government is solvent if the flow of the expected value of future resources is at least equal to the face of value of the stock of debt. The PVBC approach is subject to less criticism than the International Monetary Fund - World Bank debt sustainability analysis (DSA) that does not sufficiently consider the current account balance and foreign exchange constraint in a fully-fledged government budget constraint. The PVBC approach tries to help borrowing countries to balance their needs for funds with their current and prospective ability to repay their debt. Oshikoya and Tarawalie (2009) advocated that

the use of the Present Value Budget Constraint does not make the assumption that liabilities can continue to grow at the growth rate of the economy. The PVBC for assessing debt sustainability involves econometric testing of the PVBC or the NPG condition for a set of time series. The idea is that government spending and GDP cannot drift apart in the long run as this would violate the condition in (7) – an exploding government spending to GDP ratio. While they can drift apart in the short run, sustainability of the debt requires a long run equilibrium between the two to form a more or less stable debt-GDP ratio. Testing for a long run equilibrium requires tests of stationarity for the variables in (8) and a co-integration analysis (Okogbue, 2012). A co-integrating relationship in (8) suggests that the PVBC holds and the public debt is sustainable, otherwise the PVBC does not hold and the public debt is not sustainable.

3.4.1 Unit Root Test

The first step in testing for a long run equilibrium for the regression model in (8) is to test for stationarity. A stationarity process is a stochastic process and a stochastic process is stationary when a time series has a constant mean and variance over time of all the included dependent and independent variables. This is necessary given the time series innovations. Conventionally, macroeconomic aggregates are dynamic and these time series innovations have shown that these data may not be stationary at their levels and may be represented as stationary at first differences or second differences (Dickey et al., 1991). A variable that is integrated at order zero, or in levels, is denoted with $I(0)$, while at order one, $I(1)$.

To test for a unit root in each variable, this study will employ the Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) tests. The choice of these test statistics is motivated by the fact that these tests control for higher order autocorrelation and furthermore, to avoid the spurious regression estimates which may appear to be significant and meaningful but, in reality, are

meaningless and insignificant (Hamilton, 1994). The regression equation for the ADF unit root test without trend is given as:

$$\Delta Y_t = \beta_0 + \beta_1 Y_{t-1} + \sum_{i=1}^n \alpha_i \Delta Y_{t-i} + U_t \quad (9)$$

Where: β_1, β_2 are the regression coefficients with β_0 as the intercept, n is the number of lagged changes in Y_t necessary to make U_t serially uncorrelated. Testing the null $H_0: \beta_1 = 0$ against the $H_a: \beta_1 < 0$, the null of unit root is rejected if the observed t-statistics is sufficiently negative compared to the critical value and U is the error term and Δ is the first difference operator.

3.4.2 Co-integration Test

Co-integration requires that all of the variables in (8) be stationary of the same order. If that is the case, a cointegrating vector of slope coefficients can be found that insure that the error term is $I(0)$. In the case of a single independent variable, there is only one vector containing just one slope coefficient, ie. $Y_t - \beta X_t = u_t \sim I(0)$. In the multivariate case, more than one vector of slope coefficients is possible to insure an $I(0)$ error term. This condition for cointegration can be written in matrix form as $\beta y_t \sim I(0)$ where $y_t = X_1 + X_2 + \dots + X_k$. A convenient normalization is $\beta = \{1, -\beta_1, -\beta_2, \dots, -\beta_k\}$ since this gives the error term as a result. However there may be different combinations of values for the slope coefficients that give a stationary error term.

A co-integration test is used to test for the existence of debt sustainability in Nigeria. It will establish the existence of a long-run relationship between government expenditure and the independent variables in (8) for Nigeria. The aim is to evaluate if the Nigerian public debt is sustainable or unsustainable. If the variables in (8) are not all stationary of the same order, the specification of (8) is called into question and cointegration is unlikely.

For the co-integration test in the case of all variables being stationary of the same order, we will employ the Johansen-Juselius (1990) maximum likelihood method.

This method assumes a cointegrating relationship as the null hypothesis so that the model can be written in error correction form with only a single independent variable as

$$\Delta Y_t = \gamma_0 + \alpha_1(Y_{t-1} - \beta_1 X_{t-1}) + \sum_{i=1}^j \delta_i \Delta Y_{t-i} + \sum_{i=1}^j \theta_i \Delta X_{t-i} + u_t \quad (10)$$

The bracketed term on the right-hand side is the estimated error in predicting last period's value of Y , so that the estimated value of α_1 is the adjustment coefficient to the long run equilibrium. If Y_t and X_t are found to be cointegrated using the Engle-Granger test, the estimated errors can be inserted into the bracketed term and OLS or MLE can be used to estimate the adjustment coefficient. Lagged differences of the variables are included to account for any possible serial correlation.

In the multivariate case, the Johansen co-integration test requires the estimation of a vector error correction model (VECM) espoused in the next section. In the VECM approach, the variables need not be all stationary of the same order since the method includes a number of lagged variables. So it is a much more general test that allows for different dynamic structures.

The presence of co-integration suggests that PVBC holds and the public debt is sustainable, otherwise PVBC does not hold and public debt is not sustainable.

3.4.3 Further Approaches: Vector Error Correction Model

If the variables in (8) are not all stationary of the same order, all is not lost. The results then suggest that (8) is not a long-run equilibrium model excluding the lagged dependent variable, however, a model can still be estimated that includes the lagged dependent variable and

appropriate differencing to make the variables stationary if any of them are found to be I(1) based on the unit root tests. Therefore, in a case where (8) does not suggest long-run equilibrium model, then estimating the short-run and long-run impacts of a change in GDP on government spending becomes imperative as shown in the vector error correction model (VECM). If a set of variables are found to have one or more co-integrating vectors then a suitable estimation technique is VECM which adjusts to both short-run changes in variables and deviations from equilibrium. Through VECM, we can interpret long-term and short-term equations. The advantage of VECM over VAR (vector autoregressive) is that the resulting VAR from VECM representation has more efficient coefficient estimates (Azali, 2001). The VECM approach estimates a system of equations where each variable is differenced and appears as a dependent variable in regression on the lagged value of itself and lagged values of the other variables in differences. The VECM regression from (8) can be expressed as follows:

$$\begin{aligned} \Delta \text{LnGOVTEXP}_t = & \alpha + p_1 \text{ECM}_{t-1} + \sum_{i=1}^q \beta_0 \Delta \text{LnGOVTEXP}_{t-1} + \sum_{i=1}^q \beta_1 \Delta \text{LnGDP}_{t-1} + \\ & \sum_{i=1}^q \beta_2 \Delta \text{LnOILREV}_{t-1} + \sum_{i=1}^q \beta_3 \Delta \text{DEBTG}_{t-1} + \sum_{i=1}^q \beta_4 \Delta \text{POP}_{t-1} + \sum_{i=1}^q \gamma_1 \Delta \text{INF TAX}_{t-1} + \\ & \sum_{i=1}^q \gamma_2 \Delta \text{TOP}_{t-1} + \sum_{i=1}^q \gamma_3 \Delta \text{EXCH}_{t-1} + \sum_{i=1}^q \gamma_4 \Delta \text{LnVAT}_{t-1} + \mu_{1t} \end{aligned} \quad (11)$$

Where $\beta_{0,1,2,3,4}$, and $\gamma_{1,2,3,4}$ are the short-run coefficients, Δ is the symbol of difference operator, q is the lag order, ECM_{t-1} is the error correction term, p_1 is the speed of adjustment parameter with a negative sign and μ_{1t} is the random error. Further, the ECM_{t-1} term is the lagged value of the residuals derived from the co-integrating regression of the dependent variable on the regressors. It contains long-run information derived from the long-run co-integrating relationship.

Table 3.1

Description of Variables and Sources of Data

Variables	Description	Sources
Government expenditure	Dependent variable. Nigerian government expenditure as percentage of GDP	CBN
Lagged Government expenditure	The lagged spending-GDP ratio is enhance the models long-run and short-run elasticities	CBN
GDP	Nominal Gross domestic product	CBN
Oil revenue	A proxy for public revenue in line with the revenue-spend hypothesis	CBN
Debt-to-GDP	Proxy for debt stock of the government	DMO
Trade openness	The degree of trade openness is a proxy using the ratio of volume of trade (import plus export) to GDP	CBN
Population growth	Population growth rate	WDI
Value –added tax	Consumption tax	NBS
Inflation tax	Inflation rate multiplied by money stock	CBN
Exchange rate	Nominal exchange rate	CBN

Note: CBN is Central Bank of Nigeria; NBS stands National Bureau of Statistics; DMO is Nigerian Debt Management Office and WDI is World Bank Development Indicator. All data are measured in nominal form and in local currency.

Source: Researcher's compilation (2022)

CHAPTER 4: EMPIRICAL RESULTS AND ANALYSIS

4.1 RESULTS PRESENTATION AND ANALYSIS

4.1.1 Descriptive Statistics

The descriptive statistics for the model in equation (8) of the last chapter are presented before the stationarity and co-integration results. These statistics include selected measures of central tendency and dispersions. The sample size is thirty-five years, i.e., from 1986 to 2021. The results are presented in Table 4.1.

Table 4.1

Descriptive Statistic Results

	DEBT/GDP	EXCH RATE	INFTAX	GDP	GOVTEXP	OILREV	POP	TOP	VAT
Mean	7.910	74.014	4.53	2.710	6.095	6.335	2.606	11.326	3379.42
Median	5.869	92.338	1.53	2.530	6.552	6.585	2.595	7.518	1731.838
Maximum	18.316	157.498	2.52	4.288	8.553	9.091	2.717	32.368	1116.85
Minimum	0.303	0.894	1.65	1.684	2.568	2.092	2.520	0.072	12.60
Std. Dev.	5.907	61.718	6.80	0.773	1.889	2.183	0.07	10.560	3757.906
Skewness	0.484	0.055	1.817	0.63	-0.423	-0.44	0.213	0.646	0.899
Kurtosis	1.892	1.216	5.152	2.356	1.922	1.971	1.586	2.088	2.345
Jarque-Bera	2.616	3.857	21.549	3.316	3.316	2.245	2.635	3.019	4.255
Probability	0.270	0.145	0.000	0.190	0.190	0.325	0.267	0.221	0.119

Note: DEBT = Debt-to-GDP ratio; EXCHRATE = Exchange rate of Nigerian Naira to Dollars (US\$); INFTAX = Inflation tax multiply by money stock; GDP= Gross Domestic Product, GOVEXP= Government expenditure (dependent variable); OILREV = Oil revenue (USD); POP = Annual population growth rate; TOP = Trade openness; VAT = Value added tax revenue

Source: Researchers' computation using Econometric Views (Software) 10 version.

From Table 4.1, it was noted that the average value of the debt-to-GDP ratio stood at about 7.910 with a maximum of 18.316 and minimum value of 0.302 between the reviewing period 1986 to 2021. Debt-to-GDP has a standard deviation of 5.907, with a positive skewness of 0.484 indicating that the mean ratio occurs above the median value with a kurtosis of 1.892.

The nominal exchange rate has a mean value of 74.014 with a standard deviation of 61.718. The kurtosis was noted to have a positive and platykurtic, suggesting that the distribution was flat relative to normal distribution. The Jarque- Bera was noted to have a value of 3.857, less than the standard value, which suggests that normality cannot be rejected for the nominal exchange rate.

The inflation tax has an average rate of 4.53, a maximum value of 2.52 and a positive standard deviation of about 6.80. The skewness for inflation tax is positive, while the kurtosis was leptokurtic, suggesting that the distribution for inflation tax rate is peaked relative to normal distribution. It has a Jarque-Bera of about 21.549, which is high above the standard value [J-B > 5.99] at 95% confidence level, which implies the rejection of the null hypothesis for normal distribution. However, it was significant at the 5 percent significance level. This suggests that inflation tax has an association with government spending in Nigeria within the reviewing period.

Gross domestic product has an average value of 2.7, which suggest that the economy was growing at an average of 2.7 on a year-on-year basis. The standard deviation has a positive value of 0.773, which is the least volatile compared with the other variables in this study. The skewness is positive, suggesting an asymmetric tail extending out to the right of the distribution. The kurtosis has a value of 2.356, suggesting a platykurtic distribution-flat distribution relative to normal distribution. The Jarque-Bera value of 3.316 suggests that we do not reject the null hypothesis, i.e., there is normal distribution.

For the government expenditure, the average value is about 6.095 with a less volatile standard deviation. However, it has a negative skewness of -0.423, suggesting symmetry in the distribution as it is close to zero, though not exactly to zero. The kurtosis has a value of about

1.922, suggesting a flat height in the distribution of government expenditure. The Jarque-Bera result implies the acceptance of normality in the distribution.

Furthermore, the result suggests that oil revenue has a mean value of 6.335, with a standard deviation of 2.183. It has a skewness value of about -0.44 which is close to zero, suggesting symmetric distribution of oil revenue. Oil revenue has a kurtosis of 1.971 which suggests a flat height in the distribution pattern. The Jarque-Bera result implies normality with an insignificant p-value of 0.325.

The population growth has a fairly high growth rate at an average of 2.606 yearly throughout the reviewing period. The standard deviation is 0.7 which suggest low volatility with positive skewness. The kurtosis and Jarque-Bera for population growth were 1.586 and 2.635 respectively. The p-value is insignificant at 5% level of significance. This suggests that population growth is not a major driver of government spending in Nigeria within the reviewing period.

Trade openness which is measured as the value of export plus import divided by gross domestic product. The mean value is 11.326, suggesting low degree of competitiveness of the Nigerian economy in relation with the rest of the world. The standard deviation is quite close to the mean, while the skewness is positive at about 0.646 and a positive kurtosis of 2.088, suggesting flat height of the distribution. The Jarque-Bera result was noted be normal in distribution.

The value-added tax revenue has a mean value of 3279.4 with a very high volatility among all the variables of the model. It has a positive skewness closer to zero which implies symmetry in the normal distribution. The kurtosis of less than 3.0 for the normal distribution suggests a flat height. The Jarque-Bera is less than $[J-B < 5.99]$, suggesting normality in the distribution and

insignificant p-value at the 5 percent of significance. The high volatility in the standard deviation of values added tax revenue is attributed to the rapid fluctuations in rate of VAT over short-period of time in Nigeria from 5 percent to 7 percent within a policy space of two years.

4.1.2 Correlation Matrix Results

The correlation coefficients were presented in order to reveal if there are chances of having the problems of multicollinearity and over-parameterization in this study. The problem of multicollinearity is such that impacts negatively on the robustness of the data for policy inference. It is characterized by spuriousness which impacts on the validity of the variables. The results of the correlation matrix are presented in Table 4.2

Table 4.2

Correlation Matrix Result

Variables	DEBT/ GDP	EXCH RATE	GOVT EXP-1	INFL TAX	GDP	OIL REV	POP	TOP	VAT
DEBT/GDP	1.000	0.761	0.426	0.328	-0.203	0.713	-0.079	0.521	0.476
EXCHRATE	0.760	1.000	0.849	-0.449	0.7111	0.923	0.926	0.477	0.893
GOVTEXP-1	0.426	0.849	1.000	0.943	-0.318	0.797	0.728	0.961	0.961
INFLTAX	0.328	-0.449	0.943	1.000	-0.223	0.654	0.700	0.884	0.885
GDP	-0.203	0.7111	-0.318	-0.223	1.000	-0.242	-0.274	-0.321	-0.335
OILREV	0.713	0.923	0.797	0.654	-0.242	1.000	0.295	0.882	0.827
POP	-0.079	0.926	0.728	0.700	-0.274	0.295	1.000	0.631	0.705
TOP	0.521	0.477	0.961	0.884	-0.321	0.882	0.631	1.000	0.979
VAT	0.476	0.893	0.961	0.885	-0.335	0.827	0.705	0.979	1.000

NOTE: All variables previously defined in Table 4.1. **Source:** Researchers' Computation Using EViews 10.0

From the results, there is a negative correlation between the debt-to-GDP ratio and gross domestic product. This result is not surprising since GDP appear in both variables; however, the correlation coefficient is not large at -0.203. Moreover, oil revenue correlates with government spending at 0.797. This correlation could be as a result of Nigeria's high dependence on oil revenue. It was also shown that GOVTEXP-1 correlate with VAT at a correlation coefficient of

0.961. Furthermore, POP correlates with EXCHRATE at a correlation coefficient of 0.926 while TOP correlates with GOVEXP-1 at a correlation coefficient of 0.961 and TOP correlates with VAT at a correlation coefficient of 0.979. It should be noted that the high positive correlations could likely be the result of strong trend components shared by these variables.

4.1.3 Unit Root Tests

A unit root test for each variable is the first step in testing for a co-integration regression (9). Unit root and co-integration tests are important tests often used to circumvent the inherent limitations of traditional models as well as to avoid spurious regression. To this effect, the results of the Augmented Dickey-Fuller (ADF) test and Phillips-Perron (PP) were presented in Table 4.3. A time series Y_t is integrated of order d , denoted as $I(d)$. If a time series Y_t is stationary to begin with (i.e., it does not require any differencing), it is said to be integrated of order zero, denoted by $I(0)$. The null hypothesis is generally defined as the presence of a unit root and the alternative hypothesis is either stationary, trend stationary or explosive root depending on the test used.

Table 4.3**Unit Roots Test (ADF)**

Augmented Dickey-Fuller (ADF) Test			
Variables	Levels	1st Difference	Status
DEBT/GDP	-3.4067***	-	I (0)
EXCHRATE	-2.4715	-5.021372***	I (1)
GOVTEXP	-1.5105	-4.938194***	I (1)
INFTAX	-2.9677**	-	I (0)
LNGDP	-3.63290***	-	I (0)
LNGOVTEXP	-3.679322***	-	I (0)
LNOILREV	-0.8799	-5.940735***	I (1)
POP	-1.43021	-3.699***	I (1)
TOP	-2.8081*	-7.476501***	I (1)
VAT	-2.3184	-5.432567***	I (1)

Note: ADF critical values, 1%: -3.406; 5% level: -2.95; 10% level: -2.62, ***, **, and * denote stationary at 1%, 5% and 10% levels of significance. For the ADF, the automatic maximum lag length based on Schwarz information criterion is applied.

Source: Researchers' Computation using EViews 10

From the Augmented Dickey-Fuller unit root test, it was suggested that the variables have mixed orders of integration, I(0) and I(1). Some are integrated of order zero (DEBT/GDP;INFTAX;LNGDP;LNGOVTEXP) while others are integrated of order one, I(1):(EXCHRATE;GOVTEXP;LNOILREV;POP;TOP;VAT).

Table 4.3b**Unit Root Test (PP)**

Phillips-Perron test (PP)			
Variables	Levels	1st Difference	Status
DEBT/GDP	-3.646***	-	I (0)
EXCHRATE	1.9724	-5.021372***	I (1)
GOVTEXP	-3.639***	-	I (0)
INFTAX	-2.3184	-7.255***	I (1)
LNGDP	-3.632***	-	I (0)
LN GOVTEXP	-2.4715	-30.10472***	I (1)
LN OILREV	-1.5105	-5.9347***	I (1)
POP	-2.3184	-5.876731***	I (1)
TOP	-2.4715	-7.728306***	I (1)
VAT	-1.9724	-5.450487***	I (1)

Note: PP critical values: 1% = -3.404; 5% level = -2.96; 10% = -2.615, ***, ** and * denote stationary at 1%, 5% and 10% levels of significance. For the PP test, the Newey-West automatic using Bartlett Kernel is applied

Source: Researchers' Computation using EViews 10

From the PP test as presented in Table 4.4b, it was also confirmed that the debt-to-GDP ratio, lag of government expenditure and the log of gross domestic product variables are integrated of order zero. However, the nominal exchange rate, inflation tax, log of government expenditure, and log of oil revenue were integrated at order one, I(1). Furthermore, the population growth rate, trade openness and value- added tax revenue were integrated of order I(1).

4.1.4 Co-integration Test Results

Having established the order of integration of the data series, this study went further to determine the number of co-integrating vectors (CE) between the variables. Thus, since the main focus of this study is to determine the sustainability of public debt in Nigeria, we conduct a co-integration test using the Johansen co-integration procedure as presented in Table 4.4¹.

Table 4.4(a)

Unrestricted Co-integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.989030	374.8202	125.6154	0.0000
At most 1*	0.929118	225.9059	95.75366	0.0000
At most 2*	0.791770	138.5636	69.81889	0.0000
At most 3*	0.741523	86.78288	47.85613	0.0000
At most 4*	0.588220	42.13559	29.79707	0.0012
At most 5	0.227102	12.85580	15.49471	0.1202
At most 6*	0.123625	4.354710	3.841466	0.0369

Note: Trace test indicates 5 Cointegrating eqn (s) at the 5% level, * denotes rejection of the hypothesis at the 0.05 level, ** Mackinnon – Haugh – Michelis (1999) P-values

¹ Both the Eigenvalue test and the Trace test essentially test for the statistical significance of the adjustment coefficients in the VECM model. The VECM is restricted to exclude the adjustment coefficients (implying no long run equilibrium), then allowed to include the adjustment coefficients. A likelihood ratio test determines if the restricted VECM should be rejected. The details of the tests are complex and need not be discussed here.

Table 4.4b**Unrestricted Co-integration Rank Test (Maximum Eigen-value)**

Hypothesized No of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.989030	148.9143	46.23142	0.0000
At most 1*	0.929118	87.34226	40.07757	0.0000
At most 2*	0.791770	51.78073	33.87687	0.0002
At most 3*	0.741523	44.64729	27.58434	0.0001
At most 4*	0.588220	29.27979	21.13162	0.0029
At most 5	0.227102	8.501091	14.26460	0.3300
At most 6*	0.123625	4.354710	3.841466	0.0369

Note: Max-eigenvalue test indicates 5 Cointegrating eqn.(s) at the 0.05 level, * denotes rejection of the hypothesis at the 0.05 level, ** Mackinnon – Haugh – Michelis(1999) P – values

Source: Researchers' Computation using EViews 10

From the unrestricted co-integration rank test of trace statistic, it was revealed that there are 5 co-integrating equations at the 0.05 significance level which suggests that (8) is a long run equilibrium model and the possibility of strong sustainability of debt in Nigeria which agrees with the empirical results of IMF (2015); IMF (2005) and Okogbue(2012). Furthermore, given that the p-values of the 5 co-integrating equations are less than the 0.05 significance level ($P < \beta < 0.05$) we conclude that a long-run relationship between the natural logarithm of government expenditure and its drivers in the Nigerian economy within the reviewing period. This is in consonance with the PVBC sustainability criteria where $\beta = 1$ means that β is statistically significant as confirmed by Johansen and Juselius (1990). The same outcome applies to the maximum eigen-value co-integrating rank with 5 co-integrating equations. The presence of a long-run relationship between the natural log of government expenditure and its determinants at the 0.05 percent significance level supports the sustainability of the Nigerian public debt within the reviewing period. This result agrees with previous empirical studies in Nigeria outlined in the

empirical literature review. Table 4.5 reports the coefficient estimates for the VECM equation in (11) with GOVTEXP as the dependent variable.

Table 4.5

Short-Run Dynamic Error Correction Results

Variable	Coefficient	Std.Error	T-Statistics
C	0.416975	0.07258	5.74492
D(GOVTEXP(-2))	0.044744	0.14436	0.30995
D(GDP(-2)) *	-0.004312	0.00196	-2.20403
D(DEBTG(-2))	-0.004321	0.00489	-0.88325
D(INFLTAX(-2)) *	-0.233576	0.09472	-2.46605
D(VAT(-2))	-0.334838	0.43309	-0.77313
D(OILREV(-2))	-0.034259	0.07823	-0.43793
D(TROP(-2)) *	0.041102	0.01857	2.21350
ECM*	-0.069066	0.02096	-3.29531
R-Squared 0.816429			
Adjusted R-Squared 0.654455			
F-statistic 5.040481 > (p-value of 0.05)			

Optimal lag order was selected using the Akaike information criterion (AIC).

Source: Researchers' computation using EViews 10 version

$$ECM_{t-1} = 1.000(LNGOVTEXP)_{t-1} + 0.128897(LNGDP)_{t-1} + 0.077891(DEBTG)_{t-1} - 2.181409(LNINFLTAX)_{t-1} - 1.493730(LNVAT)_{t-1} + 3.511135(LNOILREV)_{t-1} + 0.133780(TROP)_{t-1} - 5.113055$$

The ECM term is an estimate of the previous period's error or residual, using slope coefficients that are estimated in a first-stage regression. This error term is computed and then included as an independent variable in a second-stage regression.

$$\Delta \ln GOVTEXP_t = -0.069ECM_{t-1} + 0.044\Delta \ln GOVTEXP_{t-1} - 0.004\Delta \ln GDP_{t-1} - 0.004\Delta DEBTG_{t-1} - 0.234\Delta \ln INFLTAX_{t-1} - 0.335\Delta \ln VAT_{t-1} - 0.034\Delta \ln OILREV_{t-1} + 0.041\Delta TROP_{t-1} + 0.417$$

The results as presented in Table 4.5 suggest that the coefficient of ECM (-1) for government expenditure conforms to a priori expectation (it is negative and significant at 5%). Its value of -

0.069066 implies convergence of the variables from the short-run to the long-run path. The coefficient of the ECM implies that previous years errors will be corrected in the following year at an adjustment rate of 6.9%. Therefore, the speed of adjustment towards equilibrium state for the model is 6.9%, which suggest that it adjusts slowly towards equilibrium.

The coefficient of lagged differenced government expenditure is positive with a standard error of 0.0447 and t-value of 0.310. The positive value of the lagged differenced government expenditure, although statistically insignificant, suggests the inertia of past government expenditure impacting positively on current government expenditure.

Differenced gross domestic product has a negative coefficient and a statistically significant impact on government expenditure. Similarly, differenced debt-to-GDP ratio shows a negative relationship but statistically insignificant. This implies that government expenditure on the Nigerian economy within the reviewing period has no positive relationship. This could be attributed to structural challenges including infrastructural difficulties, a weak institutional framework and episodes of recession and induced COVID-19 pandemic recession of 2020.

The differenced inflation tax has a negative association with government expenditure, with a t-statistic of -2.466. Anecdotal evidence has shown that in a regime of tight monetary policy or low growth liquidity, government expenditure is not associated with inflation, meanwhile, in an expansionary regime, an increase in the money supply has more effects on inflation rather than production.

The results further suggest that the differenced value added tax is negatively associated with government expenditure but statistically insignificant. This could be attributed to weak tax policies in the country.

The differenced oil revenue is negatively associated with government expenditure, with a statistically insignificant t-value of -0.43793, suggesting that oil revenue has contributed to government expenditure with negative results including corruption, which is outside the scope of this study.

The differenced ratio of export plus import to gross domestic product (trade openness) suggests a positive association with government expenditure with a t-value of 2.21350, suggesting a statistically significant impact on government expenditure. This is in contrast with the result of Oyeleke and Taiwo (2016) that suggests a negative and significant impact of capital and recurrent expenditures on trade openness.

The result of the coefficient of determination (R^2) suggests that 81.6% of the variation in differenced government expenditure is predicted by the statistical model under study, a reasonably high value for a model with variables in differences. The adjusted R^2 identifies the percentage of variation in government expenditure explained by the model after accounting for the number of independent variables and its value of 0.654 also suggests a reasonably good fit. The value of the F-statistic at about 5.040 indicates the overall significance of the vector error correction model.

4.1.5 Model Reliability and Stability Test Results

The robustness checks of the model were also conducted to examine the statistical properties of the estimated model for policy inference and purposes. The model was tested for normality of the residuals using the Jarque-Bera and the serial correlation test using the Breusch – Godfrey serial correlation LM test. The initial result of the Jarque- Bera suggested the rejection of normality of the distribution at 74.07693. However, since equation (8) is in log-form, we take the antilog of

the residuals before computing the normality distribution statistic so as to have a robust estimate for government spending as presented in Table 4.6. The result shows that government spending after taking the antilog suggests normal distribution. The stability tests were conducted using the Bahmani – Oskooee and Shin (2002) cumulative sum of recursive residual. The reliability result is presented in Table 4.6 and the stability result is presented in Figure 4.1

Table 4.6
Diagnostic Tests

	Test	F – statistics	Probability
1.	Normality (Jarque-Bera statistic)	11.35983	0.6576
2.	Serial correlation (Breusch – Godfrey LM-test)	1.043033	0.4676

Source: Researchers' Compilation (2022)

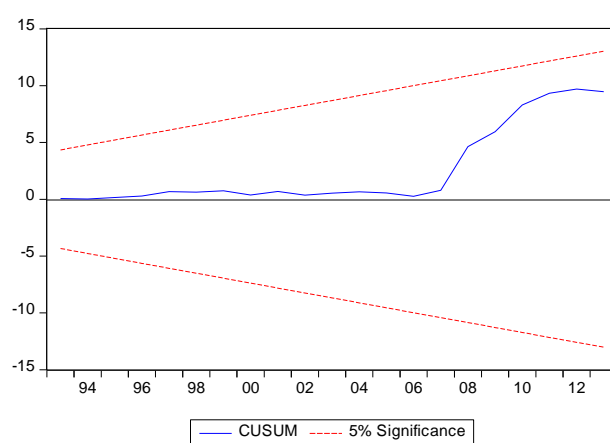


Figure 4.1: Cumulative Sum

Source: Researchers' Plot using EViews 10

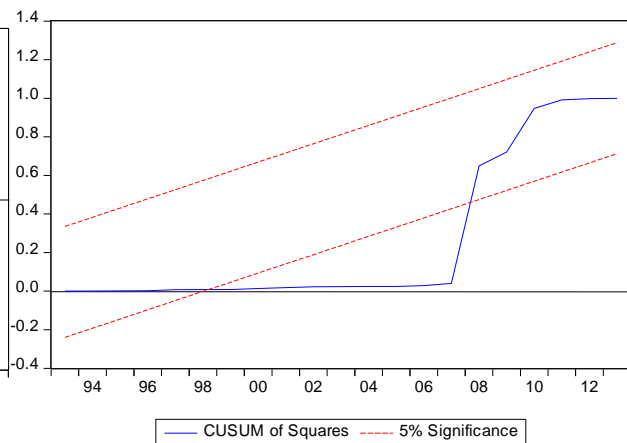


Figure 4.2: Cumulative Sum of Squares

Source: Researchers' plot using EViews 10

From the stability of model test, it was observed that neither the recursive residuals nor the CUSUM of squares plot cross the 0.05 percent critical line, therefore, we can safely conclude that the estimated parameters of the short-run dynamics and long-run (sustainability) of the

public debt are relatively stable. In other words, a stable public debt sustainability function exists over the sample period.

4.2 EVALUATION OF RESEARCH HYPOTHESES

The **first** research hypotheses of this study are formulated as follows:

H_0 : There is no significant impact of oil revenue, debt-to-GDP ratio and inflation tax on the log-of-government expenditure in Nigeria.

H_1 : There is a significant impact of oil revenue, debt-to-GDP ratio and inflation tax on the log of government expenditure in Nigeria.

The research hypotheses were tested with the standard 5 percent level of significance, i.e. ($\alpha = 0.05$). The decision rule is, if the p-value is less than α , H_0 , the null hypothesis is rejected and the H_1 , the alternate is accepted. The results of the co-integration test were used in answering the research question and the hypothesis. From Tables 4.4a & 4.4b, there are long-run co-integrating equations on both trace statistics and max-eigen-value between the variables of interest. This implies that oil revenue, debt-to-GDP ratio and inflation tax and other model included variables have long-run impact on the log of government expenditure in Nigeria within the reviewing period. This result also implies the sustainability of public debt in Nigeria. We therefore accepted H_1 and concluded that there is a significant impact of oil revenue, debt-to-GDP ratio and inflation tax on the log of government expenditure in Nigeria within the reviewing period.

The **second** research hypothesis is formulated as follows:

H_0 : Oil revenue, debt-to-GDP ratio and inflation tax has no level of stationarity with the log of government expenditure in Nigeria.

H_1 : Oil revenue, debt-to-GDP ratio and inflation tax has a level of stationarity with the log of government expenditure in Nigeria.

This research hypothesis was addressed using the result of the unit-root test. From the table (4.3a & 4.3b) ADF and PP and using the 5 percent level of significance, it was revealed that the variables have I(0) and I(1) levels of integration and that major of the variables have probability values less than 0.05.

We therefore conclude that oil revenue, debt-to-GDP and inflation tax and other model included variables have some levels of stationarity with the log of government expenditure in Nigeria. This implies that log of oil revenue, debt-to-GDP ratio, inflation tax, log of GDP, population growth, value added tax, real exchange rate and trade openness influences the sustainability or otherwise of public debt in Nigeria

The **third** research hypothesis is stated as follows:

H_0 : There is no significant long-run relationship between oil revenue, debt-to-GDP ratio and inflation tax with the log of government expenditure in Nigeria.

H_1 : There is significant long-run relationship between oil revenue, debt-to-GDP ratio, and inflation tax with the log of government expenditure in Nigeria.

The co-integration result presented in Tables 4.4a and 4.4b were used to answer the research hypothesis at the 0.05 level of significance. From the tables, there were 5 co-integrating equations using the trace and maximum eigen-values at the 5 percent level of significance. The majority of the probability values were less than 0.05 also confirming significant long-run relationship and sustainability of the public debt in Nigeria.

We therefore accept the alternative hypothesis and reject the null hypothesis and therefore concluded that oil revenue, debt-to-GDP ratio and inflation tax has significant long-run relationship with the log of government expenditure in Nigeria within the reviewing period. This long-run relationship explains the sustainability of the Nigerian public debt.

4.3 DISCUSSION OF EMPIRICAL RESULTS

The discussion of the empirical findings was done in line with the objectives of the study. From the key econometric estimation result using the Augmented Dickey-Fuller unit root result, it was revealed that the variables were integrated of order zero and one. The obtained results are similar to the previous related studies on debt sustainability(Asiama, Akosah & Owusu-Afriyie, 2014) Following the mixed results from the unit root tests for public debt, we proceeded to the co-integration, it was revealed that there's a long-run relationship between the log of government expenditure and the determinants: debt-to-GDP ratio, exchange rate, lag of government expenditure, inflation tax and the log of gross domestic product, trade openness, value added tax and population growth. With developments in the Nigerian economy, it was shown that the country's debt profile has remained largely within internationally acceptable limits of sustainability since the external debt relief that was received in 2005. In contrast, in 2000, the ratio of total debt to total government revenue was 669.0 percent, above the international

threshold of 250 percent with ₦3,097.38 billion, as total external debt constituting 780 percent of total public debt and representing 159.2 percent of total exports (above the international threshold of 100 percent). Meanwhile, total debt service as percentage of government retained revenue was 182 percent, slightly lower than the internationally set sustainability threshold. From the indicators, in 2000, the Nigerian public debt was near unsustainability. In 2001 and 2002, the situation was the same with debt unsustainability. However, in 2005, the debt-sustainability indicators reveal that the country's debt was sustainable. In the aftermath of the country's debt cancellation in 2005, some policy responses including adherence to the fiscal rule in line with the World Bank – Medium Term Expenditure Framework (MTEF) and Fiscal Strategy Paper (FSP) and the enthrone of fiscal consolidation enabled the government to lower overall deficit until the 2008/2009 sub-prime financial crisis (Omolosho, Bawa and Sani (2016) posited that Nigeria's debt remained sustainable during 2005 – 2014) which created some level of unsustainability in the Nigerian public debt. Again, the COVID-19 pandemic which took place especially in 2020 has caused some increase in Nigerian Government spending just like in some other countries. The COVID-19 pandemic heightened public borrowing in Nigeria in order to contain the pandemic. The Nigerian fiscal deficit has grown from NGN953.6 billion in 2015 to NGN 3.61 trillion in 2022. The fiscal deficit for 2022 amounts to ₦6.39 trillion representing 3.46% of Nigeria's gross domestic product. While this is above the 3% threshold stipulated in the Fiscal Responsibility Act, the widening gap has been attributed to the increased government expenditure needed to sustain the fast pace of economic recovery following the COVID-19 pandemic.

Expectedly, the Federal Government of Nigeria planned to finance the 2022 fiscal deficit with borrowings from domestic sources (₦2.57 trillion), foreign sources (₦2.57 trillion), multi-lateral

/ bi-lateral loans drawdown (₦1.16 trillion) and privatization proceeds (₦90.7 billion). With the increase in planned borrowing government debt as a percentage of GDP is expected to grow from 35.7% in 2021 to 36.7% in 2022, thus, significantly the debt burden of Nigeria posing a risk to debt sustainability (KPMG, 2022).

From the Johansen co-integration results, both the trace statistics and the max-eigen showed co-integrating relationship between the variables. This implies long-run relationship and the sustainability of public debt in Nigeria. This result supports previous studies and findings on the sustainability of public debt in Nigeria. The model included variables are the determinants of public debt in Nigeria (Oladunjoye & Olalekan, 2018), in other words, debt-to-GDP ratio, exchange rate; lag of government expenditure; log of GDP, log of oil revenue, population growth, trade openness and value-added tax are some of the determinants of debt sustainability in Nigeria. Aderemi, Fagbola, Ebere, and Sokunbi (2020) revealed that external debt has a significant positive impact on exchange rate fluctuation in the short-run in Nigeria. Improved revenue collection (oil and non-oil) will help to narrow the fiscal deficit to an average of 4.5 percent of GDP.

Fiscal data from the Central Bank of Nigeria (CBN) shows that Nigeria's federal government fiscal deficit was ₦7.3 trillion in 2021, which is ₦1.32 trillion (22.1 percent) higher than the ₦5.98 trillion in 2020. The total expenditure increased from ₦10 trillion in 2020 to ₦11.7 trillion in 2021, representing to 16.9 percent increase. Further disaggregation showed that recurrent expenditure as a share of total expenditure was 78.4 percent in 2021, a decrease from 83.9 percent in 2020, suggesting that capital expenditure remains poor. The total revenue increased from ₦4.02 trillion in 2020 to ₦4.4 trillion in 2021, representing a 9.3 percent increase. The rise in fiscal gap is because the growth in government expenditure out space revenue (CSEA, 2022).

In summary, debt sustainability and debt management in Nigeria can be captured succinctly as follows: Before the creation of the Debt Management Office in 2000, the Central Bank of Nigeria (CBN) in the course of discharging its debt service function with respect to domestic debt management plays an important role in both the primary and secondary markets for government securities. The Central Bank of Nigeria also provides a secondary market for government securities whereby those securities held by the Bank are offered to the public for sale and public holdings can be dis-invested at a discount for early withdrawals (Okunroumu, 1992).

Within the periods of the 1997 to 1999, the Central Bank of Nigeria managed Nigeria's domestic debts using the followings: Acquisition of domestic debt in terms of floating debt instrument and terms of issue; restructuring of domestic debt (overdraft facilities by Ways and Means Advances), and servicing of domestic debt (through the rediscount facilities and the sinking fund). For the Management of external debt within the period 1997 to 1999, the Central Bank of Nigeria in collaboration with the Federal Ministry of Finance adopted the following policy measures: Embargo on new loans (debt stock), placement of limit on debt service payments; debt restructuring (refinancing of trade arrears; debt rescheduling; debt buy-back), and debt conversion. The government and policymakers also keyed into international debt reduction strategies (The Baker plan, 1985; The Paris Club, 1987; the African Development Bank (ADB) Plan; The Brady plan (1989); The IMF Facilities (Structural Adjustment Facility), External Fund Facility, the Enlarged Access Policy; the Enhanced Structural Adjustment Facility and Compensatory and Contingency Financing Facility, The World Bank Facilities (Structural Adjustment Lending among others were policy approaches initiated and adopted to make Nigerian public debt sustainable.

Nigeria has made several policy efforts within this period to solving the problem of both external and internal debts and so it continues to adapt strategies similar to what she adopted over the past years—1997–1999. These strategies included refinancing, restructuring, buy back, collateralization, debt conversion arrangements and different external borrowing guidelines. During the 2000 – 2003 periods, the domestic loans represent which represented the gross liability of government – federal, state and local governments’ transfer obligations to citizens and corporate firms within the country. The domestic – debt consists of securitized loans such as Treasury bills, and Certificates, Development stocks, Treasury Bonds and State government bonds as well as unsecuritised loans such as public sector debt to banks and local contractors.

Prior to the establishment of Debt Management Office (DMO) in Nigeria, the management of external debt has been under the control of Central Bank of Nigeria. The increasing responsibility and to ensure the sustainability of Nigeria debt led to the establishment of a special department in collaboration with the Federal Ministry of Finance for debt management. The Debt Management Office in Nigeria was instituted on 4th October, 2000 with the intention to have a central co-ordination of debt. The establishment of DMO aimed at ensuring good debt management practices for debt sustainability, particularly in reducing debt stock and cost of public debt serving in a manner that promotes resources for investment in poverty reduction programmes; raising funds to fund government deficits at affordable costs and manageable risks in the medium and long-term; achieving positive outcome on macroeconomic management of monetary and fiscal policies and consulship avoiding debt crisis. The Debt Management Office of Nigeria, as part of its establishing mandate will help to promote and project the country’s image as a disciplined and organized nation, capable of managing its assets and liabilities (Oke & Sulaiman, 2012).

The year 2005 was significant in Nigeria's debt history. In that year, Nigeria concluded and obtained a debt relief programme with the Paris Club on a US\$30 billion debt with her creditor. In record, the country agreed to pay US\$12 billion, while an amount of US\$18 billion was canceled. In line with the OECD-DAC (OECD – Development Assistance Committee) rule, most of the US\$18 billion has been registered as overseas Development Assistance (ODA) by the fourteen creditors involved. Meanwhile, the cancellation was mired in controversies. An important argument against the debt cancellation was that Nigeria is an oil with country that could pay its debt. Again, Nigeria has poor track record in terms of policies including debt policies and governance, which raises the doubt that the country would use the debt relief savings well. Similarly, it was argued that Nigeria was a low income country with a gross domestic income per capita of US\$320 as in 2005 with 54 percent of its 150 million people as at 2005 living in penury and poverty. Furthermore, the cancellation was premised on the necessity of the country to achieve the Millennium Development Goal (the United Nations Development Action Blueprint) (World Bank, 2005, Okonjo-Iwella, 2008). It was based on the fact that most of the debts were arrears and that the Paris club creditors should have cancelled the debt before then (2005).

In 2007, the Nigerian Government instituted the fiscal Responsibility Act of 2007 which is to provide institutional framework for more efficient and effective management and sustainability of the public debt. The Fiscal Responsibility Act (FRA) on its part established the Fiscal Responsibility Commission (FRC) charged with the responsibility of enthrone a regime of prudent, ethical and effective management of public monies and resources across all tiers of Government. It also provides that the Federal Government of Nigeria shall set up a limit (moratorium) on the consolidated debts of the federal and state governments, and any

government that exceed such limit will be denied further borrowing until the excess is reduced. The conditions for borrowing under the Fiscal Responsibility Act include legislative approvals for the loans and their purposes, cost-benefit analysis and the application of loans.

Debt Management Office Policy focuses on the development of the domestic bond market, which was resuscitated in 2003 and to close the finance gap. In order to be effectively guided in its new focus, the DMO formulated a five year strategic plan, 2008 – 2012, which is to ensure that National and Sub-National Governments subscribe to the principles of prudent and sustainable borrowing and effective utilization of resources and to create a robust domestic debt market supportive of private sectors development.

According to the DMO, one of the implicit but unmistakable lessons from the crisis of Nigeria's unsustainable external debt in the 1970s, 1980s and 1990s was the need to have a reliable domestic bond market as a viable alternative source of borrowing by government. Going forward in terms of maintaining a manageable and sustainable debt, the Debt Management Office from 2011 to date, has focused on the following policy measures: strengthening portfolio management; improving the quality of the bond market; catalyzing the exploitation of the opportunities of the bond market by the real sector; harnessing resources from the Nigerian Diaspora; and managing new externalities. Overall, the bond issuance has presented a significant landmark in Nigeria's quest for a sustainable debt.

Currently, for countries in Nigeria's peer group (medium performers in the Country Policy and Institutional Assessment (CPIA) critical framework), the critical thresholds are: Debt GDP ratio, 40%' Debt-Export-ratio, 150%' Debt-Revenue ratio, 250%' Debt service-Export ratio, 20%' and Debt Service-Revenue ratio, 30%.

4.4 POLICY IMPLICATION

The policy implication of this study can be summarized into:

- i. The variable of the study shows a long-run relationship with the log of government expenditure.
- ii. The co-integration results also show the sustainability of public debt in Nigeria.
- iii. The empirical results also show that the included variables are the determinants of public debt in Nigeria.
- iv. It was also revealed that any negative or positive impact of these variables will negatively or positively affect public debt.
- v. From the VECM results, it was suggested that trade openness and population growth positively and significantly impacted on government expenditure while inflation tax, exchange rate and gross domestic product were negatively and insignificantly related with government expenditure.

CHAPTER 5: SUMMARY, CONCLUSION AND POLICY RECOMMENDATIONS

5.1 SUMMARY OF THE STUDY

This study examined the sustainability of the Nigerian public debt from the period of 1986 to 2021. From the related empirical literature reviewed, some of the short-comings of the previous studies include: i) poor measurement of debt sustainability , ii) omission of major explanatory variables and aggregation of public and external debt in the same empirical model leading to probable multicollinearity challenges, iii) poor theoretical framework and inadequate understanding of debt sustainability. Therefore, to bridge this seemingly gap in the literature, this study examined the sustainability of public debt in Nigeria so as to contribute theoretically, empirically and pragmatically/policy- wise in the extant body of knowledge on the subject of sustainability. This study covered the period mentioned above and applied the Present Value Budget Constraint (PVBC) or the No-Ponzi Game(NPG) theoretical postulations under the assumptions of the inter-temporal budget constraints and the unit root or stationarity and the conventional co-integration approaches using the Trace statistic and Maximum –Eigen values, suitable applications to debt sustainability analysis.

In the review of basic theories, some theories were reviewed. These include the classical theory of debt, and the Keynesian theory and its extension of the theory of inter-temporal budget constraint. In empirical review of the literature, cross-country and country specific studies in relation to debt sustainability were reviewed bearing in mind the author(s), the location of the study, the purpose of the study, the analytical technique, the variables of the study, the key findings of the study and the weakness/knowledge gap.

The historical development of debt and the management of debt were presented. In particular, the establishment of the Debt Management Office (DMO) in 2000 was significant and a precursor to the debt relief of 2005 in Nigeria from the Paris Club of creditors. In Chapter Three of this study, the intertemporal budget constraint was presented as the theoretical framework of the study and that was followed by an empirical model building, where the natural logarithm of government expenditure was the proxy for debt sustainability in sync with the PVBC analytic. The model explanatory variables are the lag of government expenditure, past value determines present value or behaviour of public debt, the logarithm of gross domestic product, the log of oil revenue, debt-to-GDP ratio, population growth, inflation tax (seigniorage), trade openness, which defines the competitiveness of the Nigerian economy with the rest of the world economy, real exchange rate and value added tax, a consumption. These determinants of public debt in Nigeria were included and justified by both the theoretical and empirical literature.

The sources of the data for these variables are the Central Bank of Nigeria (CBN) and National Bureau of Statistics (NBS), the official repository of economic data in Nigeria from the periods 1986 to 2021 to enhance robustness of economic analysis. In the data presentation, the preliminary tests of the descriptive statistics and the correlation matrix were presented showing the feature of the data in line with the statistical-economics of measures of central tendency and dispersion. This was followed by the econometric pre-test of stationarity using the conventional tools of Augmented Dickey –Fuller (ADF) and Phillip-Perron(PP) tests. The results show that the variables were integrated of order zero, $I(0)$ and order one, $I(1)$.

The co-integration tests were carried using the unrestricted trace statistics and maximum-eigen value. Both trace statistics and max.-eigen statistics showed 5 co-integrating equations at the 0.05 significant levels. Also, the coefficient of ECM(-1) for government expenditure of -0.069

implies convergence of the variables from the short-run to the long-run path and suggest that it adjusts slowly towards equilibrium. The presence of long-run relationship between the log of government expenditure and the determinants are plausible indications of debt sustainability in Nigeria. This finding corroborates with previous findings on the debt sustainability in Nigeria.

The model reliability tests were carried out using the normality, and autocorrelation tests in line with the stochastic assumption of the ordinary least square estimates (OLS). The Jarque-Bera was used for the normality and the Breusch-Godfrey serial correlation Lagrange Multiplier (LM) test for autocorrelation. The values of these tests were significant at the 5 percent standard level and therefore confirm the robustness of the model for policy inference.

The evaluation of the research hypotheses showed the acceptance of the alternate hypothesis at the 0.05 significance levels and the conclusion of debt sustainability in Nigeria. The policy implications of this study were also discussed.

5.2 CONCLUSION OF THE STUDY

The overarching objective of this study is to examine the sustainability of the Nigeria public debt. This objective is tied around the statement of the research problems emanating from the identified problem relating to debt overhang and rising profile, inadequacy of economic policy to address these challenges and the research from past empirical attempts in studying debt sustainability.

The theoretical foundation of this study is on the inter-temporal budget constraint and the choice of this framework is in line with the current literature on debt sustainability. The methods employed in this study are the unit root test, co-integration tests and vector error correction

model. These methods are justified empirically and theoretically. From the co-integration tests, the anchor tests for public debt sustainability, it was shown that there are 5 co-integrating vectors at the 5 percent significance levels. The coefficient of ECM (-1) for government expenditure of -0.069066 which implies convergence of the variables from the short-run to the long-run path confirms the sustainability of public debt in Nigeria. The existence of unit root at the accepted level of significance, $I(1)$ and $I(0)$ addresses the second objective of this study while the presence of long-run relationship or co-integration addresses the first and third objective of this study. The co-integration of these variables also impliedly illustrates the impact of these determining variables on public debt in Nigeria. The last objective of this study which is to suggest policy measures for sustaining the Nigeria public debt is presented in the next section.

5.3 POLICY RECOMMENDATIONS

In line with the policy implications of this study and the objectives, the following policy measures to promoting or sustaining the public debt in Nigeria are suggested:

- i) Government expenditure in Nigeria at both the national and sub-national levels including Government Ministries, Agencies and Departments should be monitored and checked. This could be done by the executive or the legislative arms of the Nigerian Government.
- ii) Arising from the above suggestion, extra-budgetary expenses common with the Nigerian Government should be checked by a virile legislature, devoid of affiliation with the executive.
- iii) The debt stock at any point in time should be monitored and evaluated in line with the standard platforms and criteria. This can be efficiently done by the Ministry of Finance and the Debt Management Office, to avoid the debt relapsing unto unsustainable nature.

- iv) The Government should initiate or strengthen fiscal policy measures to effectively control the allocation and implementation of public funds to reduce deficit budget and exchange rate fluctuation in Nigeria. This can be achieved through the strengthening of the Medium Expenditure Framework (MTEF), the Fiscal Strategy Paper (FSP) and the Fiscal Responsibility Act (FRA).
- v) Policy efforts should be intensified by the Government to tax policies in Nigeria so as to reduce the inequities in tax matters as well as avoidance and evasion of tax. This will augment the revenue from oil and its shocks.

5.4 AGENDA FOR FURTHER STUDIES AND LIMITATIONS OF THIS STUDY

Currently, for countries in Nigeria's peer group (Medium Performers in the Country Policy and Institutional Assessment Critical Framework) the critical assessments are: Debt-to-GDP ratio of 40%; Debt-to-Export ratio of 150%; Debt-to-Revenue ratio of 250%; Debt Service-Export ratio of 20% and Debt Service-Revenue ratio of 30%. These thresholds cannot be determined using the unit root or co-integration as suggested by the PVBC analytic. Therefore, subsequent studies should utilize approaches that can determine these ratios.

It is also suggested that future studies should incorporate institutional framework in terms of economic framework and political framework in measuring public debt sustainability in Nigeria (control of corruption; voice and accountability, government effectiveness, rule of law or political stability and conflicts)

5.5 CONTRIBUTION TO KNOWLEDGE

This study has contributed to knowledge of public debt sustainability in the following ways:

- i) Additional variables were included in this study- the use of natural log of government expenditure as a proxy for debt sustainability, inflation tax(seigniorage), population growth and trade openness were novel variables introduced in the analysis of public debt. This is empirical relevance of this study.
- ii) The inter-temporal budget constraint and its applicability in this study is also a value addition. It shows its theoretical relevance to public debt sustainability analysis for Nigeria
- iii) The scope of this study from 1986-2021 is another contribution of this study. Few studies in Nigeria ended some years ago. The dynamics of public debt warrants continuous and updated empirical studies on debt sustainability in Nigeria. This study has provided this avenue for update.
- iv) The stylized facts of this study on debt profile in Nigeria illustrate graphically the scenarios and magnitude of public debt in Nigeria. Painting this picture of debt profile will present a ready and handy tool for assessing public debt and its management for sustainability in Nigeria.

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