Debt Dynamics and Fiscal Sustainability in Nigeria

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Abstract
This study investigated the stabilizing effect of sustainable fiscal policy on public debt dynamics as well as the impact of debt dynamics on fiscal sustainability in Nigeria for the period (1980 – 2022). Using secondary data obtained from the Central Bank of Nigeria Statistical Bulletin (2023), World Development Indicators (WDI, 2023), Debt Management Office (DMO – various years), Penn World Table (PWT – multiple years), and World Economic Outlook (WEO – various years), the study used suitable cointegration and other econometrics techniques viz: Dynamic Ordinary Least Squares (DOLS), Markov-switching model and polynomial models. It was found, amongst other things, that (i) Automatic debt dynamics can influence debt dynamics, (ii) The robustness or otherwise of primary fiscal balance determines the direction of changes in the total debt stock, and (iii) positive debt dynamics vis-à-vis dwindling revenue flows and growing government expenditure, would result in fiscal unsustainability. It was recommended, amongst other things, that since automatic debt dynamics is one of the significant influences on debt dynamics and is being fuelled by the direction of adjustments in inflation and interest rate, there is a need for concerted efforts at stabilising inflation and interest rate to stabilise public debt dynamics. Also, the study revealed that the size of the primary balance influences the changes in public debt stock. It was recommended that the authorities should endeavour to maintain a robust primary fiscal surplus to stabilise growth in public debt, if not minimise it and grow the economy.

Keywords: Public debt dynamics, fiscal sustainability, primary balance, revenue, expenditure.
JEL Classification: C22; H63; H71; J38; P35

Introduction

Debt issuance is necessary to enhance the government's ability to finance required expenditures. It plays a vital role in fiscal adjustments in economies, especially regarding deficit financing and correcting budget balance disequilibrium. It can also make for budgetary policy playing a countercyclical role within economic cycles. Thus, it is acceptable for the government to borrow, provided there is consistency with a comprehensive fiscal policy path. However, Cecchetti et al. (2011) assert that there are two angles to the debt argument – the two-edged sword argument.

High public debt and reckless debt issuance (like borrowing for consumption or debt servicing) may injure economic growth and sustainable development without a consistent fiscally sustainable structure (Checherita & Rother, 2010). In Nigeria, there has been persistent appreciation in debt stock, which has resulted in a sharp rise in public debt ratios and stress on the country's resources, leading to more borrowing to finance gaps – a creation of a vicious circle of debt burden. According to Nigeria's Debt Management Office (DMO, 2023; 2024), Nigeria's total public debt grew from ₦39.56 trillion or $95.78 billion in 2021 to ₦97,340,708.25 trillion or $108,229.34 billion in 2023. In the same vein, the debt-to-GDP ratio increased from 22.47% in 2021 to 42.34% in 2023, higher than Nigeria's 40% benchmark by 2.34%, showing that the debt-to-GDP ratio is growing faster in response to increased borrowing and tepid growth of the economy. On the other hand, the government's total revenue in 2021

stood at ₦5.51 trillion, but rose to ₦11.88 trillion in 2023, but ₦7.66 trillion was paid out in debt servicing in the same year. Though there was a surplus of ₦4.22 trillion after debt servicing that year, the speed of growth in debt stock underscores the urgent need for policy adjustments towards addressing Nigeria's debt burden.

On the other hand, the central aim of fiscal sustainability is of utmost importance, as it hinges on the need to offer a country the level of macroeconomic stability needed to uphold its budget deficit and public debt within a bearable limit (Ehrhart & Llorca, 2008). As enshrined in the draft Medium Term Expenditure Framework/Fiscal Strategy Paper (MTEF/FSP) for the period (2023 – 2025), Nigeria's debt-to-revenue ratio grew from 81.1% in 2020 to 99.9% in 2021, to 118.9% in 2022 and steeply to 149% in 2023 (Economist Intelligence Unit [EIU] 2022; DMO, 2023). This rapid growth in the debt-service-to-revenue ratio underlines Nigeria's unsustainable fiscal policy structure and possible insolvency.

There is empirical evidence that high public debt levels impede economic growth and discourage capital accumulation (Checherita & Rother, 2010; Bal et al., 2014 and Attard, 2019). The familiar routes in this regard include surging inflation, interest rate appreciation, dwindling private investments, increases in distortionary taxation and declining growth-enhancing primary spending (Kosikowski, 2005; Neck and Sturm, 2008). Nigeria's inflation rate rose from 17.71% in May to 19.64% in August, 2022; by December, 2023 and June, 2024, it had jumped to 28.92% and 34.69%, respectively. Also, new official data have not been released after the 33.3% unemployment rate of 2020. However, it. is projected that the unemployment rate is more than 35% while the youth unemployment rate hovers around 50% and 60% (Ekpo, 2024). In the same vein, the lending rate, which was 14% in 2022, has risen to 29.49% in 2024 (CBN, 2024), while the GDP growth rate, which stood at 3.11% in 2022, has plummeted to 2.98% in 2024, taking Nigeria's misery index to more than 62% (Ekpo, 2024).

As Mupunga and Le Roux (2014); Alesina (2015); Collard et al. (2015) and Gomez-Puig & Sosvilla-Rivero (2017) have all argued that a comprehensive study of public debt dynamics and fiscal sustainability is crucial for understanding the solvency and liquidity of governments. Therefore, this study aims to examine the stabilising effect of fiscal policy on the persistently growing public debt stock (public debt dynamics) in Nigeria as well as the impact of public debt dynamics on fiscal sustainability in Nigeria.

2. Literature Review

This study considers an abridged review of the literature, covering the conceptual framework, theoretical framework and empirical review.

2.1. Conceptual and Theoretical Frameworks

Debt dynamics and fiscal sustainability are crucial aspects of macroeconomic stability, particularly for developing countries like Nigeria. Understanding the interplay between these two factors is essential for policymakers to formulate strategies that ensure long-term economic growth and development. Debt dynamics refer to the changes in a country's debt over time, influenced by factors such as interest rates, economic growth, primary fiscal balances, and exchange rates. The debt-to-GDP ratio is a common measure used to assess the sustainability of public debt. In Nigeria, the debt dynamics are shaped by both external and domestic factors such as external debt, domestic debt and debt service burden (Adeniyi & Olusegun, 2020; Obafemi & Ifere, 2019; Adedeji et al., 2019) on the other hand, Fiscal sustainability refers to the ability of a government to maintain its current fiscal policies without leading to an unsustainable increase in debt levels. It implies that the government can meet its current and future debt obligations without resorting to excessive borrowing or compromising economic stability. In Nigeria, fiscal sustainability is challenged by several factors including revenue generation (Iyoha & Oriakhi, 2008), expenditure management (Onuoha, 2020), and persistent fiscal deficits (Olawoye & Owolabi, 2021). The interaction between debt dynamics and fiscal sustainability is complex and multifaceted. In Nigeria, high debt levels and weak fiscal discipline can create a vicious

cycle where rising debt leads to higher debt service costs, which in turn exacerbate fiscal deficits and further increase debt levels. On the other hand, sound fiscal policies that promote economic growth, diversify revenue sources, and control public expenditure can help stabilize debt dynamics and ensure fiscal sustainability (Olowu & Ayodele, 2019; Akpan & Abang, 2020).

There are diverse theoretical perspectives on the subjects of debt dynamics and fiscal sustainability. For instance, while the debt-growth nexus posits that moderate levels of debt can stimulate growth by financing productive public investments, excessive debt can lead to a debt overhang, stifling growth and making debt repayment difficult (Pattillo et al., 2002), fiscal reaction function (FRF) argue that a government will adjust its primary balance in response to rising debt to ensure sustainability (Bohn, 1998). In Nigeria, empirical evidence suggests that the government's fiscal response has often been procyclical, exacerbating debt sustainability issues during economic downturns (Olomola, 2012). Other theories like debt overhang theory (Krugman, 1988), Ricardian equivalence theory (Barro, 1974), intertemporal budget constraint (IBC) (Blanchard, 1990) and the primary balance approach (Bohn, 1998), amongst others, have advanced the forgoing arguments, taking different perspectives and have been applicable in different economies. It is part of the focus of this study to see how these theories respond to Nigeria's economic environment and problems.

2.2. Empirical Literature

In the literature, studies argue for the three strands of conclusions and two other emerging facts for developed economies (like the OECD countries), emerging market economies, and transition economies. These strands of arguments are the neutrality of public debt – economic growth interactions (Abdullahi, 2016; Afonso, 2008; 2005), the positivity of public debt – economic growth interactions (Hemming et al., 2003; Burnside, 2003; 2005; Clements et al., 2004; 2005; Das, 2016), and the negativity of public debt – economic growth interactions (Bird, 1971; Eberhardt et al., 2015; Mhlaba & Phiri, 2017; Tule et al., 2017; Hollmayr, 2018; Nganga et al., 2019). The two emerging facts are 1. The Non-linear or Threshold Effect argument. It emphasises a threshold above which public debt changes can be injurious or profitable, depending on the direction of the dynamics. The scholars believe that the interaction between public debt dynamics, economic growth and macroeconomic stability is nonlinear and heterogeneous, basing the argument on some stipulated (simulated) threshold (Branch & Adderley (2009); Herndon et al., 2014; Egert, 2015; Omotosho et al. (2016 in the case of Nigeria); Icaza, 2017). 2. The issue of the stabilisation effect of sustainable fiscal policy on public debt dynamics. Scholars have argued that achieving fiscal sustainability can help smooth the changes (volatility or cyclicality) associated with public debt, thereby quelling macroeconomic instability and vulnerability (e.g., Domar, 1944; Claeys, 2005; Ferreira, 2009; Burger & Marinkov, 2012; Camarero et al.,2013; Muzenda, 2014; Aimola & Odhiambo, 2018.

In the literature review, a few facts stand out: first, the studies are predominantly in the developed economies of Europe (especially the OECD countries), America, Emerging Market Economies (EME), transition economies and some developing economies of Asia and South America. A few works in the literature on Africa concentrate on South Africa and Kenya, with a very insignificant percentage on Ghana and Nigeria. This lack of country-specific studies is a significant gap in the current research landscape, and addressing this gap is crucial for the development of effective macroeconomic policies, as it would bring to the fore the peculiarity of the macroeconomic dynamics of individual economies. Moreover, the issue of technique is essential. Aside from a handful of studies like Saibu (2018) and Essien et al. (2016), the method used has been predominantly OLS in Nigeria. OLS is deficient by ignoring the asymmetric nature of some of the variables in their interaction with one another. Also, most of the studies concentrated mainly on the impact of debt on growth, ignoring the flip side of fiscal issues that border on public debt and the consequent fiscal sustainability question. This study bridges these gaps by deploying an eclectic approach and techniques to generate new answers.

3. Methodology and Data

This study employed a cocktail of techniques to arrive at new sets of findings that address the questions of debt and fiscal sustainability akin to the Nigerian economic situation to aid deliberate policy adjustments.

3.1. Model 1: The Stabilising Effect of Fiscal Policy on Debt Dynamics in Nigeria

In considering the theoretical perspectives on the issues, analysis of public debt dynamics begins with the dynamic budget constraint, expressed in the light of intertemporal budget constraint (IBC) which entails public debt at a particular time being equal to the unpaid public debt at any other time plus interest payment on unpaid debt less the primary deficit. Thus, in examining the stabilising effect of fiscal policy on debt dynamics in Nigeria, we reason, along with Escolano (2010) and Mupunga and Le Roux (2014), that the public debt dynamics equation may be given recursively as:

$$D_t = (1 + r_t)D_{t-1} - B_t + SF_t \qquad \text{Equation 3.1}$$

where D_t is the unpaid debt at time t, B_t is the primary balance at time t, r_t is the implicit real interest rate at time t, considered as debt interest payments expressed as a percentage of the debt stock in the preceding period and SF_t is the stock-flow adjustment that guarantees consistency between net indebtedness and variation in the observed public debt stock. Several variables are involved in the stock-flow adjustment, and they include the differences in the public debt as a result of exchange-rate fluctuations in the local currency, as well as that of the public-debt-denominated currencies, the effect on the public debt ratio resulting from financial asset accumulation, residual statistical adjustments and other statistical inconsistencies. The implicit interest rate can be seen as a desirable approximation to the real interest rate the country pays, when likened to the spread between the interest rates on sovereign bonds countries may issue over and above the United States treasury bonds.

If we divide equation (3.1) by nominal GDP, we will have the following:

$$\frac{D_t}{p_t y_t} = \frac{(1 + r_t)}{(1 + \pi_t)(1 + g_t)} * \frac{(D_{t-1})}{p_{t-1} y_{t-1}} - \frac{B_t}{p_t y_t} + \frac{SF_t}{p_t y_t} \qquad \text{Equation 3.2}$$

The nominal GDP is algebraically defined as: $p_t y_t = (1 + \pi_t)(1 + r_t)p_{t-1} y_{t-1}$, where y_t is the real GDP at time t, p_t is the real GDP deflator at time t, π_t is the inflation rate at time t, r_t is the real interest rate at time t and g_t is the actual growth rate at time t. thus, equation (3.2) can then be represented thus:

$$d_t = \varphi_t d_{t-1} - b_t + sf_t \qquad \text{Equation 3.3}$$

where $\varphi_t = \frac{(1+ r_t)}{(1+\pi_t)(1+g_t)} = \frac{(1+ r)}{(1+g)}$, $d_t = \frac{D_t}{p_t y_t}$. $b_t = \frac{B_t}{p_t y_t}$ and $sf_t = \frac{SF_t}{p_t y_t}$

The parameter φ in equation (3.3) is known as the automatic debt dynamics, which may make it possible to accumulate public debt without the government issuing new debts. As reflected in equation (3.3), changes to the automatic debt dynamics are explained by the rate of inflation (π_t), the real interest rate (r_t) and the growth rate of the economy (g_t). The other determinants of the change in the public debt ratio, as shown in equation (3.3), are the underlying cyclically adjusted primary balance and the stock-flow adjustment, which is a residual. Fiscal policymakers control the primary balance, while interest rates depend on the actions of monetary authorities. A priori, the impact of these variables on the automatic debt dynamics and the debt-to-GDP ratio are $r_t > 0/+$, $g_t < 0/-$ and $\pi_t < 0/-$ respectively.

In deriving the model, therefore, we decompose changes in public debt – captured in the form of debt-to-GDP ratio – into its macroeconomic components viz: primary fiscal balance, actual interest rates, and real GDP growth, and we can establish the relative contributions of these components to public debt dynamics. But Blanchard (1990) believes that to stabilise the debt-to-GDP ratio at its current value, it is required that the primary balance be equal to the interest-rate-growth difference ($r_t - g_t$), multiplied by the initial debt-to-GDP ratio (d_t). Thus, from the debt dynamics expression in Equation (3.1), we took $subscription$ both sides of the expression, resulting in a dynamic equation thus:

$$\Delta d_t = (\varphi_t - 1)d_{t-1} - b_t + sf_t \qquad \text{Equation 3.4}$$

The debt dynamics expression (equation 3.4) can be decomposed into three components viz: the primary-balance-to-GDP ratio (b_t), the snowball effect ($(\varphi_t - 1)d_{t-1}$), and the stock-flow adjustment

(sf_t). Therefore, to stabilise Nigeria's public debt at the current level, Δd_t must be equal to zero for a level of interest rate and growth rate of the economy, hence the equation:

$$b_t = (\varphi_t - 1)d_{t-1} + sf_t, \text{ where } (\varphi_t - 1) = \frac{r_t - g_t}{1 + g_t} \quad \text{Equation 3.5}$$

Following Equation (3.5), it can be inferred that a sizeable primary balance is required where real interest rates and the growth-rate gap in the economy are wide. This means that the real interest rates and economic growth rate relationship significantly affect debt-stabilizing primary balance and optimal public debt management policies.

Thus, the empirical model is gleaned from the public debt dynamics equation in (3.4), which implies that the changes in the public-deb-to-GDP ratio are a result of the primary balance (b_t), the automatic debt dynamics (ADD), which is determined by the real interest rates paid on public debt, the GDP growth rate and the stock-flow valuations. Following equation (3.3), we can state Equation (3.6) as:

$$d_t = \frac{(1 + r_t)}{(1 + \pi_t)(1 + g_t)} d_{t-1} - b_t + sf_t \quad \text{Equation 3.6}$$

However, for simplicity of the model, since automatic debt dynamics from Equation (3.5) and (3.6) is $(\varphi_t - 1) = \frac{(1+r_t)}{(1+\pi_t)(1+g_t)} = \frac{r_t - g_t}{1+g_t}$, we represent it in the subsequent relevant equations as:

$$(\varphi_t - 1) = \frac{r_t - g_t}{1 + g_t} = add_t \quad \text{Equation 3.7}$$

Thus, econometric expression is deduced from Equations (3.4) and (3.6), respectively and is given as:

$$\Delta d_t = \delta_0 + \delta_1 add_t + \delta_2 b_t + \delta_3 re_t + \delta_4 i_t + \delta_5 g_t + \delta' v_t + \omega_t \quad \text{Equation 3.8}$$

where Δd_t is the change in the total public debt as a percentage of GDP at time t; add_t is the automatic debt dynamics capturing the snowball effect on public debt dynamics; b_t is the primary fiscal balance as a percentage of GDP in time t, expected to gauge the stabilisation effect on public debt changes; re_t is the real exchange rate in time t, whose rate of volatility is expected to impact the dynamism of public debt; i_t is the real interest rate in the economy in time t. capturing the economy's interaction with both foreign and domestic debt adjustments; g_t is the GDP growth rate capturing the growth rate of the economy; v_t is the vector of other control variables that can cause changes in the debt stock and ω_t is the stochastic error component of the model. The variables in the vector include inflation, which is the outcome of market adjustments due to shocks and automatic stabilisers in the macroeconomy. Moreover, $\delta_{i=1}$ are the parameters to be estimated while δ' is the vector of the parameters of the control variables.

Estimation Technique 1

The Stock & Watson's (1993) Dynamic Ordinary Least Squares (DOLS) is a more recent and robust method, especially concerning small samples. DOLS, which also corrects for possible simultaneity bias amongst the regressors, involves the estimation of long-run equilibria. It was suggested by Stock & Watson (1993) as a parametric approach to estimating long-run equilibria in systems, which may involve variables integrated into different orders but still cointegrated. The technique is embedded with the capacity to forestall the potential for simultaneity bias, endogeneity bias and small-sample bias among the regressors by including lagged and led values of the change in the regressors. Thus, getting DOLS estimates involves estimating the following equation:

$$W_t = B'X_t + \sum_{j=-J}^{j=J} \partial_j \Delta P_{t-j} + \sum_{j=-K}^{j=K} \mu_j \Delta Y_{t-j} + \alpha_t \quad \text{Equation 3.9}$$

where W_t denotes the dependent variable, X is the vector of explanatory variables, B' is the cointegrating vector, representing the long-run cumulative multipliers, or put simply, the long-run effect of a change in X, on W (note that for Stock and Watson, (1993), J and K are the lags and leads incorporated into the model. In estimating the long-run parameters of the public debt dynamics equation, we adopt the DOLS procedure, which involves regressing any I(1) variables on other I(1) variables, any I(0) variables and leads and lags of the first differences of any I(1) variables. Inferring

from equation (3.8), we will estimate the following equation to obtain the long-run dynamic effects of public debt changes in Nigeria:

$$\Delta d_t = \delta_0 + \delta_1 \gamma_t + \delta_2 v_t + \sum_{i=-J}^{i=J} \beta_I \, \Delta \gamma_{t-J} + \sum_{i=-K}^{i=K} \psi_I \, \Delta \nu_{t-K} + \eta_t \qquad \text{Equation 3.10}$$

where Δd_t is the change in total public debt, γ_t is a vector of add_t - the automatic debt dynamics, b_t - the primary fiscal balance, re_t - the real exchange rate, i_t - real interest rate, and g_t - the GDP growth rate, all in time t, and are as earlier described. v_t is a vector of control variables, and are as were earlier described while J and K denote the lead and lag values, respectively. Equation (3.10) is our DOLS model. In practical analysis, the determination of optimal lag structure can be achieved by using information criteria such as Akaike and Schwarz or by using the value of $T^{\frac{1}{2}}$ recommended by Stock-Watson (1993) exclusively for the DOLS approach. Accordingly, in estimating the model, the lag values will be determined using the Akaike Information Criterion (AIC) and the Schwarz Bayesian Criteria (SBC).

3.2. Model 2: The Effect of Public Debt Dynamics on the Sustainability of Fiscal Policy in Nigeria

When there is a paucity of government revenues to sustain the financing of new public debt issuant costs, there is a sustainability problem. This justifies the argument of the link between the sustainability of fiscal policy and the financial solvency of the government in some scenarios. However, in practical terms, the emphasis in the empirical literature is basically on investigating the possibility of both public expenditures and government revenues continuing to hold, in the future, their historical growth patterns, but this must be adjustable to the present value of governments' budget constraint; hence the beginning is to derive the present value of the budget constraint. The flow budget constraint is written as:

$$E_t + (1 + r_t) D_{t,t-1} = R_t + D_t \qquad \text{Equation 3.11}$$

where E_t is the government expenditures in time t, less interest payments, R_t is the government revenues in time t, $D_{t,t-1}$ is the public debt in the present and past periods, $(1 + r_t)D_{t-1}$ is the interest payment on the debt and r_t is the real interest rate in time t. The budget constraint holds that the total government expenditure (the left-hand side of Equation 3.11) must equal the government revenue and new debt issuance in period t (the right-hand side of Equation 3.11). Rewriting Equation 3.11, the following equation can result:

$$D_t - D_{t-1} = E_t - R_t + r_t D_{t-1} \qquad \text{Equation 3.12}$$

Where $E_t - R_t$ represents the primary deficit. Supposing that the real interest rate is stationary, with mean r and defining $E'_t = E_t + (r_t - r)D_{t-1}$, Equation 3.12 can be presented as:

$$D_t = (1 + r)D_{t-1} + E'_t - R_t \qquad \text{Equation 3.13}$$

Alternatively, Equation 3.13 states as:

$$D_t = \left(\frac{1}{1+r}\right)(R_{t+1} - E_{t+1}) + \left(\frac{1}{1+r}\right)D_{t+1} \qquad \text{Equation 3.14}$$

The following present value budget constraint (PVBC) can be possibly obtained:

$$D_{t-1} = \sum_{\tau=0}^{\infty} \frac{1}{(1 + r)^{\tau+1}} (R_{t+\tau} - E_{t+\tau}) + \lim_{\tau \to \infty} \frac{D_{t+\tau}}{(1 + r)^{\tau+1}} \qquad \text{Equation 3.15}$$

A sustainable fiscal policy is expected to ensure that the present value of public debt stock - the second term on the right-hand side of (3.15) – tends to zero in infinity, constraining the debt from growing faster than the real interest rate. Simply, it implies imposing the absence of Ponzi schemes and fulfilling the intertemporal budget constraint. Confronted by this transversality condition, the government will have to achieve future primary surpluses whose present values add up to the current value of public debt stock. In other words, public debt in real terms cannot increase indefinitely at a growth rate beyond the real interest rate. The solvency condition can also be derived with all the variables defined as a percentage of GDP; thus, the PVBC condition is written as:

$$\frac{D_t}{Y_t} = \frac{(1+r_t)}{(1+y_t)}\frac{D_{t-1}}{Y_{t-1}} + \frac{E_t}{Y_t} - \frac{R_t}{Y_t} \quad \text{Equation 3.16}$$

With all variables being presented as ratios of GDP, y representing the real GDP growth rate, and seigniorage revenues being neglected for presentation purposes. Supposing the real interest rate to be stationary, with mean r. Moreover, also considering constant real growth, the budget constraint can, therefore, be stated as:

$$d_{t-1} = \sum_{s=0}^{\infty}\left(\frac{1+y_{s+1}}{1+r_{s+1}}\right)[\rho_{t+s} - e_{t+s}] + \lim_{s\to\infty} d_{t+s}\left(\frac{1+y_{s+1}}{1+r_{s+1}}\right) \quad \text{Equation 3.17}$$

With $d_t = {}^{D_t}/_{Y_t}$, $e_t = {}^{E_t}/_{Y_t}$, and $\rho_t = {}^{R_t}/_{Y_t}$, and $r > y$. It is essential to introduce a solvency condition, given by $\lim_{s\to\infty} b_{t+s}\left(\frac{1+y_{s+1}}{1+r_{s+1}}\right) = 0$, to bound public debt growth. This yields the familiar result that fiscal policy will be sustainable if the present value of the future stream of primary surpluses, as a percentage of GDP, matches the existing stock of government debt.

Moreover, following Hamilton (1989) and others, who, in testing fiscal sustainability, characterised different fiscal regime shifts for which fiscal policy is either sustainable or unsustainable, we will be tailoring this part of the study in line with that methodological path.

Estimation Technique 2

In the light of the work of Hamilton (1989), therefore, we will estimate the following Markov-switching fiscal rule:

$$s_t = \vartheta(z_t)d_{t-1} + A_t'\gamma(z_t) + \beta(z_t)\epsilon_t \quad \text{Equation 3.18}$$

where s_t represents the primary balance, d_{t-1} denotes the end-of-period debt and A_t' is a vector of control variables in time t, including output growth, real interest rates, revenue, and actual expenditure. The coefficients ϑ, γ *and* β are subject to recurring and persistent switches between two regimes in line with the hidden exogeneous two-state Markov process z_t that consists of transition probabilities ρii for the sustainable regime and unsustainable regime given as $\vartheta_S > 0$ and $\vartheta_{NS} \leq 0$ respectively. Theoretically, in a dynamic, efficient economy and given that $\alpha_t(z_t)$ is bounded, and as such, a sufficient condition for the transversal condition to hold is given as $\vartheta\pi > 0$, where $\vartheta\pi \equiv \vartheta_S\pi_S + \vartheta_{NS}\pi_{NS}$ is the unconditional expectation of $\vartheta(z_t)$, and thus the ergodic probabilities are given as follows:

$\pi_i = (1 - \rho ii)/(2 - \rho ii - \rho jj)$ and the expected duration is given as $d_i = {}^{1}/_{1-\rho ii}$, thus, we can express the preceding as:

$$\vartheta S > |\vartheta NS|\frac{d_{NS}}{d_S} \quad \text{Equation 3.19}$$

From the expressions so far, in a regime-switching fiscal policy and employing a government budget constraint, the debt aligns with a Markov-switching autoregressive process thus:

$$d_t = \theta(z_t)b_{t-1} + \mu_t(z_t) \quad \text{Equation 3.20}$$

where $\theta(z_t) = \frac{1-r_t}{1+y_t}(1 - (1+y_t)\theta(z_t)$ and $\mu_t(z_t) = -(1+r_t)\mu_t(z_t)$

We can, therefore, derive the debt-stabilising condition from the strict stationarity processes; thus, debt stationarity is given as:

$$\vartheta\pi > \frac{r-y}{1+y} \quad \text{Equation 3.21}$$

where r and y are real interest rates and growth rates, respectively. If the condition holds, the public debt will have an ergodic mean.

In line with Aldama and Creel (2018), therefore, we estimated the following fiscal policy rule:

$$s_t = \delta + \beta b_{t-1} + \psi A_t' + \upsilon_t \quad \text{Equation 3.22}$$

where A_t' represented the covariates that included the output, fiscal rules – captured as actual revenue and actual expenditure, and real interest rates. We accounted for the non-linearity in the relationship

between primary balance and debt by testing quadratic and cubic terms as primary balance reacts to lagged debt.

$$s_t = \delta + \lambda_1 b_{t-1} + \lambda_2 b_{t-1}^2 + \psi A_t' + \upsilon_t \quad \text{Equation 3.23}$$

$$s_t = \delta + \lambda_1 b_{t-1} + \lambda_2 b_{t-1}^2 + \lambda_3 b_{t-1}^3 + \psi A_t' + \upsilon_t \quad \text{Equation 3.24}$$

These polynomial specifications were included to account for the increasing or decreasing trend of the primary balance when the level of debt increases.

4. Presentation of Results and Analysis of Findings

4.1 Data Presentation and Analysis

The analysis begins with unit roots test and is reported in Table 4.1. The unit root test, using the Augmented Dicky-Fuller (ADF) test technique, shows that most of the variables were integrated of both order zero and one, that is, levels [I(0)] and first difference [I(1)].

Table 4.1: ADF and group unit root analysis

ADF Test with Intercept and Trend					
	Levels		First Difference		Order of
Variables	**T-Statistic**	**P-Value**	**T-Statistic**	**P-Value**	**Integration**
Real GDP ($rgdp_t$)	-1.4827(0)	0.8222	-6.3179(0)	0.0000*	I(1)
ΔDebt Stock (Δd_t)	-4.0532(0)	0.0151***	-7.5222(0)	0.0000*	I(0)/I(1)
Auto Debt Dynamics (add_t)	-5.7778(1)	0.0002*	-3.7024(9)	0.0389***	I(0)/I(1)
Primary Balance (b_t)	-2.0503(0)	0.5558	-6.5240(0)	0.0000*	I(1)
GDP Growth (g_t)	-3.9833(0)	0.0178***	-10.3119(0)	0.0000*	I(0)/I(1)
Real Interest Rate (i_t)	-7.4756(0)	0.0000*	-9.5889(0)	0.0000*	I(0)/I(1)
Real Exchange Rate (re_t)	-2.0798(1)	0.5396	-4.5045(0)	0.0049**	I(1)
Inflation Rate (inf_t)	-4.0198(1)	0.0166***	-5.6067(0)	0.0003*	I(0)/I(1)
Actual Revenue (r_t)	-4.3209(9)	0.0097**	-5.8253(0)	0.0001*	I(0)/I(1)
Actual Expenditure (e_t)	-2.1690(5)	1.0000	-3.0203(4)	0.0015**	I(1)
Group Unit Root Test Summary					
Levin, Lin & Chu t*	-5.3780	0.0000*	ADF – Fisher^i	155.766	0.0000*
Breitung t-stt	1.9865	0.9765	PP -Fisher^i	839.917	0.0008*
Im, Pesaran & Shin W-stat	-10.3108	0.0000*			

Source: Estimates from E-views

Note: ** P<0.01, ** P<0.05 and *** P<0.1. The optimal Lag Length and the order of integration of the ADF unit root test is presented in brackets.*

These orders of integration uphold the need to apply DOLS and other cointegration-based techniques used in this study to examine cointegration in the series. The results imply that long-run relationships could exist among the series, thereby corroborating the need for cointegration technique in estimating the model 3.8 and testing the envisaged relationships.

5.2 The Effect of Changes in Fiscal Policy on Debt Dynamics in Nigeria

The effect of fiscal adjustments on changing debt structure in Nigeria was assessed using the Dynamic Ordinary Least Squares (DOLS) technique. The results are presented in Table 4.2. From the table, the first variable interacting with debt dynamics is the automatic debt dynamics (add). The negative coefficient of add (-0.0048) indicates that a percentage change in add would have depleted or at least stabilised debt to the tune of about 0.48 per cent. This would have been a massive adjustment in the country's debt dynamics, agreeing with the $\emptyset < 1$ condition, but that estimate was insignificant, as reflected in the Table. The outcome is connected to several issues like interest rate volatility, regressive output growth, and exchange rate instability, which may have truncated the possibility of such a significant adjustment.

Next is the primary fiscal balance (primary balance). According to Blanchard (1990), the primary balance required to stabilise the debt-to-GDP ratio at its current value is equal to the interest

rate growth differential ($i_t - g_t$) times the initial debt-to-GDP ratio (d_t) This means a sizeable primary balance is needed if the gap between real interest and growth rates is significant. This implies that the relationship between real interest rates and the economy's growth rate has essential implications on debt stabilising primary balance and optimal public debt management policies. In Table 4.2, the coefficient of primary balance stood at (-0.0129), interacting negatively and significantly with debt dynamics. This outcome follows theoretical expectations showing that a robust size of the primary balance curbs radical changes or an explosion in the country's debt stock.

Table 4.2: DOLS estimates underlining debt dynamic interactions

Dependent Variable: Changes in Public Debt Stock				
Variables	**Coefficient**	**Std. Error**	**T-statistic**	**Prob. Value**
Automatic Debt Dynamics (add_t)	-0.0048	1.5257	-0.3129	0.1507
Primary Balance (b_t)	-0.0129	8.4502	-0.1522	0.0797***
Real GDP Growth ($rgdp_t$)	-0.0009	0.0360	-2.6325	0.0188***
Real Interest Rate (i_t)	0.0030	9.9635	0.0302	0.1524
Real Exchange Rate (re_t)	0.0059	4.8835	0.1198	0.9061
Actual Revenue (r_t)	0.0019	0.2788	0.6645	0.5165
Actual Expenditure (e_t)	0.0093	0.2968	3.1187	0.0070**
Inflation Rate (inf_t)	0.0042	4.8333	0.0873	0.0123***
Adjusted R-squared	0.6978	J-B	8.3722	0.2152
Wald Test: F-stat	5.44			0.0024**
Chi-square	44.56			0.0000*
Long-run Variance	1664.20			
Phillips-Quliaris Cointegration Test:	P-QTau-stat	-4.68		0.0672^
	P-Q Z-stat	-29.27		0.0270^

Source: Estimates from E-views

*Note: * P<0.01, ** P<0.05 and *** P<0.1. ^ The null hypothesis of no cointegration among the series is rejected at a 10% significance level. All estimations are done using E-views 10. Thus, a priori, the impact of adjustment in this variable (ADD) should be that of a 'snowball' effect,*

The outcome shows that given robust primary balance growth, changes in debt will see a drop in debt stock by about 1.29 percent. This outcome corroborates Bohn's (1998) argument that any significant increase in public debt due to a significant negative shock is reversed through primary surpluses. In terms of output growth, the a priori signs also held. The negative coefficient of (-0.0009) shows that a percentage improvement in the national output suppresses the adverse shocks occasioned by changes in the nation's debt, thereby depleting the debt stock by about 0.09 percent. The implication is that, the condition $i_t < g_t$ holds, showing that with the significance at a 10 percent level, a growth of output over and above the interest rate guarantees a stable and sustainable debt structure for Nigeria, other factors held constant. Other variables in the model included Real Interest Rate, Real Exchange Rate, Actual Revenue, Actual Expenditure and Inflation Rate, with coefficients of about 0.0030, 0.0059, 0.0019, 0.0093 and 0.0042 respectively. Most of these estimates were not statistically significant except for actual expenditure and inflation rate. Apart from the statistically insignificant status, all the variables, except interest rate and actual expenditure, negate a priori signs. The positive coefficient of 0.0093 for actual expenditure implies a potential rise in public debt stock (by that amount) as government actual spending, especially on unsustainable ventures that do not boost output, continues to grow. This could be attributed to most of the politically motivated spending on projects that do not, most of the time, convey short- and medium-term gains, thereby not promoting revenue accumulation, which should have, in turn, promoted positive primary fiscal balance.

Also, the outcome for inflation estimates reflects the true position of the Nigerian economy. The positive coefficient of 0.0042 implies a considerable possibility for debt stock to keep rising (by that amount) as a continuous rise in inflation impacts the country's debt dynamics. This situation has

the potential to impact the size of revenue, thereby weakening the potential for fiscal cum debt sustainability. However, though statistically insignificant, a positive coefficient of 0.0030 for interest rate indicates that volatility in interest rate has the potential to impact the changes in the country's debt, leading to an increase in debt stock by about 0.30 percent. Also, the exchange rate shows a potential to increase debt stock by 0.0059 as exchange rate volatility continues, impacting the dynamics of the country's debt structure. On the other hand, the positive sign for actual revenue (as opposed to theoretical expectation) implies increases in total debt stock as adjustment in actual revenue (fiscal policy) impacts changes in the country's debt basket. Moreover, the insignificant status of the estimate may be attributed to the dwindling revenue (negative changes in revenue) stock, which places the country in a situation of running persistent deficits, thereby resorting to continuous debt issuance.

The auxiliary statistics are also expected to establish the status of the estimates of the regressions. The adjusted R-squared of 0.6978 implies that approximately 70 percent of the changes in Nigeria's debt stock are jointly explained by the explanatory variables in the model. This high explanatory power of the independent variables indicates a depth of analysis, implying a reasonable level of precision in the model specification. The Wald test was significant at a 1 percent level, leading to the rejection of the null hypothesis of no significant impact of the explanatory variables on the explained variable. This means that the explanatory variables jointly influence the changes in the dependent variable. The long-run variance of the estimates and the Phillips-Quliaris Cointegration Test is significant, indicating the presence of a long relationship between debt dynamics, primary fiscal balance, and the rest of the explanatory variables.

5.3 Fiscal Sustainability and the Stabilising Effect of Fiscal Policy on Public Debt

It was necessary to check how sustainable fiscal policy can be in the face of growing debt stock and the capacity of fiscal policy to stabilise the changing effects of debt in the economy. The regime-switching model was employed to do these, specifically focusing on a two-state Markov-Switching estimation technique. This approach was chosen to evaluate the situation in two different regimes and to examine if there were peculiar indicators in the different regimes that influenced unique changes. The first regime (pre-debt forgiveness period [1980 – 2006]) considered the dynamics of debt in Nigeria and the sustainability trajectory before debt forgiveness by the Paris Club (PC), while the second regime (post-debt forgiveness period [2007 – 2022]) evaluated the dynamism in Nigeria's debt structure and the sustainability trajectory after the large chunk of debt overhang was written off by the large part of the country's foreign creditors. The estimates of the two-state Markov-Switching regression are presented in Table 4.3. From the estimates in Regime 1, the indication is that, before the debt forgiveness agreement that started in 2005 and was consummated in 2006, a 1 percent increase in debt stock depressed the primary balance by about 0.05 percent due to enormous demands on revenue for debt service.

However, this effect was cushioned by the steady improvement in the national output and the nation's actual revenue, which was boosted by the continuous rise in the price of crude oil in the international oil market. For instance, the results show that an improvement in real GDP improved the sustainability of fiscal policy by about 0.013 percent, while a rise in actual revenue of the country within the period reflected the sustainability of fiscal policy to the tune of about 0.25 percent. This also implies an improvement in the economy by about 0.013 percent, a reflection of a robust and promising economy. However, the actual expenditure shows a 0.21 percent drop in fiscal sustainability, probably due to non-targeted expenditure occasioned by corruption and impropriety.

Table 5.3: Markov switching regression estimates

Dependent Variable: Primary Balance				
Variable	**Coefficient**	**Std. Error**	**z-Statistic**	**Prob.**
Regime 1: Pre-debt forgiveness period (1970 – 2006)				
C	0.288691*	0.024922	9.183560	0.0000
ΔDebt Stock (lag) (Δd_t)	-0.000495*	0.000107	4.612290	0.0000
Real GDP ($rgdp_t$)	0.000131*	0.000187	7.018961	0.0000
Actual Revenue (r_t)	0.002471*	0.000188	13.11022	0.0000
Actual Expenditure (e_t)	-0.002063*	0.000412	-5.003220	0.0000
Interest Rate (i_t)	0.005882	0.008769	0.670749	0.5024
LOG(SIGMA)	-0.532270*	0.140252	-3.795095	0.0001
Regime 2: Post-Debt forgiveness period (2007 – 2019)				
C	0.67705*	0.213675	54.64861	0.0000
ΔDebt Stock (lag) (Δd_t)	-0.000557	0.000582	-0.958513	0.3378
Real GDP ($rgdp_t$)	-0.000173*	0.000086	-20.16346	0.0000
Actual Revenue (r_t)	0.001353*	0.000441	30.64673	0.0000
Actual Expenditure (e_t)	-0.001167*	0.000183	-6.376473	0.0000
Interest Rate (i_t)	0.013128	0.011551	1.136600	0.2557
LOG(SIGMA)	-1.845711*	0.260548	-7.083958	0.0000
Transition Matrix Parameters				
P11-C	2.485405**	0.763279	3.256222	0.0011
P21-C	-1.209029**	0.903395	-1.338318	0.0086
Durbin-Watson stat	2.138816		R1	R2
Constant Transition	R1		0.923112	0.076888
Probabilities	R2		0.229873	0.770127
Expected Duration			13.00598	4.350229

Source: Estimates from E-views

Note: *Number of states: 2; Initial probabilities obtained from ergodic solution; Standard errors and covariance computed using observed Hessian; Random search: 25 starting values with 10 iterations using 1 standard deviation (rng=kn, seed=378458100); Convergence achieved after 39 iterations. Method: Markov Switching Regression (BFGS / Marquardt steps). The asterisk (* and **) denotes 1% and 5% level of significance. R1 and R2 represent regimes 1 and 2.*

On the other hand, the events in the economy since 2015 seem to completely negate the a priori expectation in the debt forgiveness era. In Regime 2, presented in Table 4.3., the estimates show that a 0.056 percent decrease in primary balance would have been caused by changes in public debt stock. Though statistically insignificant, it is a considerable reduction, which may be detrimental to the sustainability of the country's fiscal policy. It, in effect, reflects a reasonable level of volatility in public debt stock in Nigeria within the period under review. Moreover, a 0.017 percent depletion in the primary balance is also caused by a percentage fall in national output. Though a slight improvement in actual revenue improved the primary balance by about 0.13 percent, the 0.12 percent fall in primary balance due to changes in actual expenditure shows that the improvement was eroded within the period under analysis. This situation shows that the no-Ponzi scheme hypothesis cannot hold for Nigeria in the Regime 2 period, as Nigeria may need to stay in the vicious circle of debt issuance to stay afloat.

The transition matrix parameters for the origin state (Regime 1) and the transition state (Regime 2) are all statistically significant at a 5 percent (P<0.05) level. The coefficients, $P_{11} - C$ = 2.49 and $P_{21} - C$ = -1.21, indicate a higher possibility for a delay in the transition from the origin state (Regime 1) to the next state (Regime 2). This situation typifies what Hamilton (1990) termed the "fast and slow" debt-fiscal sustainability and growth dynamics (for Nigeria in this case). It establishes that the origin state is more convenient than the transition state.

The foregoing is further corroborated by the time-varying probabilities showing considerable state dependence in the transition probabilities with a relatively higher probability of remaining in the origin P($S_t = 1 \ / \ S_{=1} = 1$) being 0.923112 for the state with a higher probability of being fiscally sustainable (Regime 1), and P($S_t = 2 \ / \ S_{=1} = 2$) being 0.770127 for the state with the lower probability of being fiscally sustainable (Regime 2). Also, the corresponding expected durations for transition between the two regimes are approximately 13.01 and 4.35 quarters, respectively, which underlines the fact that fiscal policy was sustainable in stabilising debt dynamics over a considerably more extended period in Regime 1 and may take a longer period in the future for that level of sustainability to transit to the second Regime. The value of the Durbin-Watson (D-W) statistic of approximately 2.1 shows that the model is devoid of serial correlation. Thus, in general, the model was adequately specified and is stable.

4.3.1 Polynomial Regression Analysis

To further check for the sustainability or otherwise of fiscal policy in Nigeria and its capacity to stabilise debt dynamics, we estimated polynomial equations consisting of three models. While the first model of the set was linear, both in variables and parameters, the last two counterparts were only linear in parameters, with the dynamics targeted at examining whether there could be a significant difference in outcome from the results of the Markov-switching model and the outcome is presented in Table 4.4. From model 1, it is clear that changes in debt stock did not significantly affect the sustainability of the nation's fiscal policy, indicating the unsustainability of fiscal policy in the face of increasing debt stock and falling national output, as seen in Table 4.5.

Table 4.4: Polynomial regression estimates

Dependent Variable: Primary Balance						
	Model 1		**Model 2**		**Model 3**	
Variables	**Coefficient**	**P-value**	**Coefficient**	**P-value**	**Coefficient**	**P-value**
C	3.62134*	0.0000	3.90061*	0.0000	3.84621*	0.0000
ΔDebt Stock	0.00022	0.3142	0.00074***	0.0251	0.00088***	0.0747
ΔDebt Stock^2			-0.00031***	0.0376	-0.00056	0.3354
ΔDebt Stock^3					0.00063	0.6909
Real GDP	-0.00016*	0.0003	-0.00022*	0.0000	-0.00023*	0.0000
Actual Revenue	0.00241*	0.0000	0.00205*	0.0000	0.00201*	0.0000
Actual Expenditure	-0.00203**	0.0087	-0.00086	0.3428	-0.00079	0.3980
Interest Rate	-0.01402	0.5672	-0.02472	0.3068	-0.02582	0.2940
Adjusted R-squared	0.66195		0.68669		0.68045	
F-stat	20.11237*	0.0000	18.89902*	0.0000	15.90573*	0.0000
D-W Stat	2.01577		2.15620		2.16651	

Source: Estimates from E-views

Note: ** P<0.01, ** P<0.05 and *** P<0.1. All estimations are done using E-views 12.*

The model 1 results show, contrary to a priori expectation, that a unit rise in national output will reduce the possibility of fiscal policy being sustainable to about 0.016 percent and was significant at a 1 percent level. This outcome may be attributed to the regressive growth in real output over time in the Nigerian economy. Not all output may result in short-term and long-term contributions to national income due to possible militating factors such as wrong government policy, the 'act of god' and so on. However, the result showed that an improvement in the country's actual revenue might improve the country's fiscal sustainability by about 0.241 percent, at a 1 percent level of significance, in line with theoretical expectations. Furthermore, the result indicated a drop in fiscal sustainability to the tune of about 0.203 percent, at a 5 percent significance level, at a unit rise in actual public expenditure. This outcome is in line with theoretical expectations. These outcomes imply that a volatile debt structure, with rapid growth in the face of a deteriorating real output and disproportionate revenue flows, will weaken fiscal policy, hence its inability to stabilise the dynamics in debt stock.

Moreover, the results from models 2 and 3 were not significantly different from model 1, except that in model 2, debt dynamics (in its polynomial form) followed the proper sign and was statistically significant, but was not statistically significant in model 3, though the sign followed a priori expectation. It is important to stress here that the positive and statistically significant response of fiscal sustainability to changes in debt stock (especially in models 2 and 3) aligns with the literature, as argued by some scholars (Mohammed, 2009; Ezike & Mojekwu, 2011 and Onyeiwu, 2012) that, in the short-run, increase in debt (or issuance of new debt) may strengthen fiscal policy as it would mean more revenue in the economy. However, over the medium- to long-term, it will deplete the potency of fiscal policy than it strengthened it, thereby dampening the possibility of stabilising debt dynamics. The negatively signed interest rate in the three models, though not statistically significant, agrees with theoretical expectation, pointing to the fact that continuous rise in interest rate erodes resources and diverts same from the debtor nation through debt services, thereby eroding the sustainability of fiscal policy and its capacity to stabilise the debt dynamics.

The auxiliary parameters estimated indicate that the models were adequately specified and generally stable. The adjusted R-squared (Adj. R^2) of 0.66, 0.69 and 0.68 for models 1 to 3, respectively, indicate that more than 60 percent of the adjustments in the dependent variable (primary balance) in the three models were driven by the independent variables. The F-statistics of 20.11, 18.90 and 15.91, for models 1 to 3, respectively, all at a 1 percent level of significance, point to the fact that the models enjoyed the goodness of fit and the dependent variable was jointly explained by the explanatory variables in the models. Similarly, the Durbin-Watson statistics of 2.0, 2.1 and 2.1 for models 1 to 3, respectively, stress that the regressions were free of serial correlation among the variables. These outcomes, on the whole, present the models as good and stable models. Therefore, the outstanding fact from these models is that their outcomes corroborate - though with some negligible departure in some areas – the findings from the Markov-Switching Two-State model that was first used to test objective 2 of this study.

5.1. Conclusion and Recommendations

This study investigated the impact of changes in debt stock (debt dynamics) on fiscal sustainability as well as the effect of sustainable fiscal policy in stabilizing debt dynamics. To achieve this objective, the study attempted to answer two fundamental questions: (i) does public debt dynamics affect fiscal sustainability? (ii) does fiscal sustainability result in the stability of public debt? Building on some unique fiscal and macroeconomic variables (automatic debt dynamics, primary fiscal balance, real GDP, actual revenue, actual public expenditure, and inflation), the study used annual time series spanning 42 years (1980 – 2022) to investigate the process. Aside from using ADF and other test statistics to examine the time series properties of the variables, two relevant techniques (DOLS and Markov-Switching model) were used to estimate the different models formulated in line with the research objectives. Based on the outcomes of the models' estimates, the following significant findings emerged:

i. For the first objective, the study showed that first, automatic debt dynamics (add) can influence debt dynamics negatively; second, the primary balance – measuring fiscal sustainability – can influence changes in debt stock (debt dynamics), along with other macroeconomic variables negatively. Third, the study affirmed the inverse relationship between public debt dynamics and output growth. Fourth, the study revealed that the country's public debt dynamics may adjust positively as the government's actual expenditure rises. Fifth, it was also discovered that debt stock may continue to rise as inflation rises. Sixth, interest rate and exchange rate volatility positively impacted debt dynamics. The study revealed that debt stock rises as the volatility in the two variables causes a surge in debt dynamics. This complexity may be assumed to make debt servicing difficult, leading to debt accumulation through debt rescheduling and outright issuance of new debt to cater to existing debt obligations.

ii. For the second objective, the study revealed that fiscal policy may be sustainable even in the face of growing debt stock, provided the growth in national output and actual revenue of the country is over and above what is required to meet debt obligations. It was also found that fiscal policy would be unsustainable and unable to stabilise debt dynamics (especially in the medium- and long-term) in the face of dwindling actual revenue, less than proportional growth in actual government expenditure and regressive growth in national output.

5.2. Recommendations

Given the findings generated from the study, the following recommendations are made for assessment and use by policymakers in Nigeria in particular, Sub-Saharan Africa and developing economies in general:

i. Since automatic debt dynamics and the size of the primary fiscal balance exert significant influences on debt dynamics (changes in public debt), there is a need for concerted efforts at stabilising automatic debt dynamics and maintaining a robust primary fiscal surplus to stabilise public debt dynamics. As indicated in the findings, the robustness of national output suppresses the growth in the total debt stock. It is, therefore, pertinent for the nation to grow its national output consistently, to suppress growth in public debt stock. Again, as found in the study, a rise in actual expenditure fuels debt stock, therefore, the nation must be more target-oriented in its public expenditure to ensure that the most available resources are channelled into ventures and projects that would create an enabling environment for economic activities and boost revenue generation. Since the rise in the rate of inflation leads to an increase in debt stock, fiscal and monetary authorities should make adjustments that will moderate the growth in inflation to depress the rate of growth in debt stock. Furthermore, as the study revealed, interest and exchange rate volatility positively impacted debt dynamics. The authorities are, therefore, expected to make efforts to stabilise interest rates and exchange rates, stabilise public debt dynamics and promote fiscal sustainability.

ii. The study also revealed that fiscal policy may be sustainable even in the face of growing debt stock, provided the growth in national output and actual revenue of the country is over and above what is required to meet debt obligations. It is recommended that to promote fiscal sustainability, the government should strategically stimulate and encourage consumption and investment, leading to growth in national output and actual revenue stock, as this would lead to fiscal sustainability despite growing debt stock.

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Table 4.1: Descriptive statistics and correlation matrix

Descriptive Statistics									
	Real GDP	**Primary Balance**	**Debt Stock**	**Auto Debt Dynamics**	**Actual Revenue**	**Actual Expenditure**	**Exchange Rate**	**Interest Rate**	**Inflation Rate**
Mean	27062.99	3.330381	3567.851	-1.426079	2700.322	1593.121	73.57282	-1.394516	18.29492
Median	20166.16	1.863990	1046.846	-0.151318	330.9491	219.9985	21.88603	1.318497	12.77549
Maximum	71387.83	11.70596	23295.07	17.30873	11116.85	9714.843	306.9210	18.18000	72.83550
Minimum	4.219000	0.000942	1.252900	-47.20605	0.634000	0.903900	0.546781	-65.85715	3.457650
Std. Dev.	22980.71	3.755835	5516.739	8.945747	3708.833	2397.103	90.62339	14.21432	15.61761
Skewness	0.620633	0.955226	2.079173	-3.571434	1.060552	1.592690	1.124063	-2.182151	1.938259
Kurtosis	2.204298	2.545018	6.873382	18.35904	2.600298	4.743583	3.394842	10.03608	5.954505
Jarque-Bera	4.528928	8.035080***	67.28111*	597.7511*	9.705931**	27.47236*	10.85411**	142.8200*	49.49269*
Probability	0.103886	0.017997	0.000000	0.000000	0.007805	0.000001	0.004396	0.000000	0.000000
Sum	1353150.	166.5190	178392.5	-71.30393	135016.1	79656.03	3678.641	-69.72582	914.7461
Sum Sq. Dev.	2.59E+10	691.2083	1.49E+09	3921.293	6.74E+08	2.82E+08	402417.3	9900.297	11951.58
Observations	50	50	50	50	50	50	50	50	50
Variables	**Correlation Matrix**								
Real GDP	1								
Primary Bal.	0.2563	1							
Debt Stock	0.8450	0.1034	1						
Auto Debt Dynamics	0.0739	0.0735	0.0737	1					
Actual Revenue	0.9179	0.5226	0.7799	0.1043	1				
Actual Expenditure	0.9188	0.2513	0.9426	0.0831	0.9122	1			
Exchange Rate	0.9203	0.2714	0.9459	0.0935	0.8689	0.9430	1		
Interest Rate	0.4257	0.0810	0.3368	0.0868	0.3940	0.3799	-0.3803	1	
Inflation Rate	-0.1927	-0.3100	-0.2028	-0.1810	-0.2965	-0.2563	-0.3261	0.8989	1

Source: Researcher's fieldwork (2020).

*Note: * P<0.01, ** P<0.05 and *** P<0.1. The Table is constructed from estimations by the author, using E-views (version 12).*