

AN ESTIMATION OF THE CRITICAL LEVELS OF EXTERNAL DEBT ACCUMULATION: THE NIGERIAN EXPERIENCE

Obi Callistar Kidochukwu

Department of Economics, Delta State University, Abraka, Delta State, Nigeria
Corresponding author: obicallistar@gmail.com

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Abstract: There are inexhaustible literatures on the dichotomy between the support for and against borrowing as a means of driving the economy. While some were of the opinion that debt acquisition is good for growth others are of the opinion that debt retards growth. The implication of this is that there is no clear policy understanding on the impact of debt on growth. Consequently, the current study attempts to unify this dichotomy on debt and growth by empirically examining the critical levels of external debt accumulation for Nigeria's sustainable economic growth, that is, at what point will debt accumulation become growth augmenting or growth backtracking, and at what point will debt accumulation ensures a stable and sustainable growth that will help Nigeria to achieve its growth objective. The study used a quadratic hill-climbing technique, which allows us to obtain analytically, the critical levels of external borrowing that will either augment or retard economic growth in Nigeria. The study used two variant optimization algorithms namely Gauss-Newton/BHHH, and Marquardt algorithms, respectively, estimated with three variant estimators- Generalized Linear Method (GLM), Least Square (LS) and Maximum Linear-Autoregressive Conditional Heteroscedasticity (ML-ARCH). The Gauss, Berndt, Hall, Hall and Hausman commonly referred to as the Gauss-Newton/BHHH is specifically designed for maximum likelihood problems, while Marquardt algorithm modifies the Gauss-Newton algorithm by adding a correction matrix (or ridge factor) to the Hessian approximation. The ridge correction handles numerical problems when the outer product is near singular and may improve the convergence rate. Data ranges from 1965 to 2013 (48 years). The research findings showed that the maximum critical level of Nigeria's external debt threshold that ensures a steady state growth converges around 14% to 15%. The estimated growth-augmenting threshold showed that at the early stage of debt acquisition, its contribution to output growth is rising, but at a decreasing rate, hence the alternating signs between the linear (positive) and non-linear (negative) debt coefficients. That is, as time progresses a negative non-linear impact of debt stock on growth is experienced showing that there is a poor application of loan such that the earlier benefit derived is gradually eroded. At that point, the maximum attainable growth rate stagnated at 6.3% after which the attainable growth is not Pareto optimal because additional or reduction in debt becomes growth-backtracking – it is also observable that at debt-driven steady state, growth deficit is zero. Based on these findings the study therefore, concluded that both debt accumulation and non-debt acquisition are detrimental to the economy, hence debt is a necessary evil that should be guided. Therefore, the following policy recommendations were made: the country's external borrowing space is capable of generating higher output growth. Consequent upon this, the external loan contracted by Nigerian government can be increased to reduce or fill the growth gap, if the government will continue to channel the contracted loan into infrastructural development or/and productive activities which is strictly the purpose of venturing into external debt obligations. In order to achieve its growth objectives and at the same time service its debt obligations, the government should diversify its economy; create an enabling environment for domestic and foreign private investors so that income generated can be channeled into achieving the country's objectives. Efforts should be made by Nigerian Government in ensuring a reliable and vibrant capital market as income generated from the capital market can be used to augment funds from external borrowing to achieve its growth objectives.

Keywords: Critical levels; External- debt; Growth –augmenting; Growth –backtracking; Sustainable- growth.

Introduction

There are inexhaustible literatures on the dichotomy between the support for and against borrowing as a means of driving the economy. Some studies have shown that external debt contributes to economic growth (Sulaiman and Azeez, 2012; Kaisidi, 2013; Oke and sulaiman, 2012 Ogiemudia and Ajao, 2012), while others affirmed that debt deters growth (Uma, Eboh, Obidike 2013; Muritala; 2012 Ajayi and Oke, 2012, Hansen, 2001). As this intellectual war rages, there is what one could likened to the case of the third-man who wishes not to be identified with either of the school of thoughts, but aligns with what could be termed a conundrum of growth and debt – that is debt is bad, but a country should not avoid it. In this regard debt is rightly described as a necessary evil. That is, borrowing is good up to the point where it makes the economy worse-off. This type of analysis appears very relevant for current policy debates on assessing external debt accumulation and growth.

Most developing countries borrow for two reasons; macroeconomic reasons to either finance higher investment or higher consumption and to circumvent hard budget constraint, implying that countries borrow to boost economic growth and reduce poverty (Soludo, 2003; Sulaiman and Azeez, 2012). External borrowing thus creates an avenue to reduce the obstacles posed to economic growth and investment. Borrowing externally to finance projects selected for external loans financing appears promising in the estimation of both the borrower nation and her potential creditors.

Although, Nigeria is endowed with rich natural resource, modern statecraft and the process of development requires that it still needs foreign capital to augment its capital requirements for development. In a bid to augment for its capital requirements, Nigeria started contracting foreign loans in order to achieve economic growth and national development with the ultimate target of increasing the living standard of the generality of the citizenry (Muritala, 2012; Ovat, et al 2003). Most of these loans were from multilateral sources or institutions such as International Bank for Reconstruction and Development (IBRD), International Development Association (IDA), International Fund for Agricultural Development (IFA), International Monetary Fund (IMF) and the European Investment Bank (EIB); bilateral sources such as Paris Club, London Club and private creditors using promissory notes. Very importantly too is the fact that these periods were periods of excess loanable funds in the western world and international commercial banks seeking outlets, for such funds went wild, pushing loans to unsuspected developing countries in disguise of assisting economic development efforts and Nigeria accepted a good number of such loans (Obadan, 2004). The stock of debt had continued to grow in leaps and bounds up to N36.8 billion in 2004, and the rapid growth of debt service payments had become a wedge on national development and this led to the call for debt relief which was granted in 2006.

The underlining reason behind this study stems from the fact there is a growing awareness that high debt levels inhibit or augment the growth and development of most developing countries. In the process of development, low and middle income countries resort to external borrowing to bridge resource gaps. This implies that given the drive for development, developing countries had to borrow from external sources with the hope that these loans would put them at faster development. In this regard debt is seen to be inevitable. But over time, it has been observed that resources are diverted from investment and other productive uses into servicing the debt and this is not good for a growing economy. This has made these countries to experience debt overhang problem and crowding out effect of debt on economic growth. Therefore, it becomes pertinent to ascertain the particular threshold or tuning points where additional debt begins to have a negative impact on growth and also to determine that level of external debt that is growth sustaining especially for Nigeria and other developing countries.

2.0 Conceptual Issues on External Debt

The theoretical literature on the relationship between the stock of external debt and growth has largely focused first on the adverse effects of debt overhang. Krugman (1998) defines debt overhang as a situation in which the expected repayment on external debt falls short of the contractual value of debt. If a country's debt level is expected to exceed the country's repayment ability with some probability in the future, expected debt service is likely to be an increasing function of the country's output level. Thus some of the returns from investing in the domestic economy are effectively 'taxed away' by existing foreign creditors and investment by domestic and foreign investors and thus economic growth is discouraged. As noted by Clements, Nguya and Bhattacharya (2003), debt overhang theory in its original formulation, centered on the adverse effects of external debt on investment in physical capital. The scope of the theory is much broader: a high level of external debt can also reduce a government's incentive to carry out

structural and fiscal reforms, since any strengthening of the fiscal position (including that generated indirectly through structured reforms) could intensify pressures to repay foreign creditors. These disincentives for reform are of special concern in low-income countries, where an acceleration of structural reforms is needed to sustain higher growth to meet the millennium development goals.

Secondly, external debt is seen as a capital flow with a positive effect on domestic savings and investment and thus on growth, which implies that foreign savings complements domestic savings and investments (Easton, 1993; Maghyereh, et. al. 2002).

Thirdly, Pattilo, Poirson and Ricci (2002; 2003, 2011); found empirical support for a non-linear impact of foreign debt, on economic growth; at low levels, debt has positive effects on economic growth, but above particular thresholds or turning points, additional debt begins to have a negative impact on growth.

2.1 Empirical Reviews on External Debt: The issue of external debt with growth has been considered by different researchers who applied different methods of analysis to establish the relationship between external debt and debt service on economic growth.

2.1.1 External debt impedes growth: There is a widespread recognition in the international community that 'excessive' foreign indebtedness of many developing countries remains a major impediment to their growth and stability. Policymakers and citizens around the world have been increasingly concerned that high external indebtedness in many developing countries is limiting growth and development (Pattilo, et al 2011). External debt role in the growth process of developing countries has been questioned since these countries experience high incidence of default, low economic growth rate and high level of poverty, all associated with high stock of external debt (Mohd Daud, et al.,2013).

To buttress this point, Muritala (2012) empirically analyzed the impact of external debt on economic growth in Nigeria. OLS and ADF test for stationarity were used to test for the hypothesized negative relationship between external debt, debt servicing and economic growth. The result indicates a negative relationship between external debt and economic growth while debt servicing is positively related.

Ajayi and Oke (2012), in their study 'the effect of external debt on economic growth and development of Nigeria, observed that external debt burden has an adverse effect on the national income and per capital income of the nation. Ordinary Least Square Method of analysis was employed in this study and data was sourced CBN, Economical and Financial Reviews, etc.

Uma, Eboh and Obidike (2013) empirically investigated the influence of total external debt cum debt servicing using annual time series data ranging from 1970-2010 on economic growth. Battery tests of stationarity and establishment of a long-run relationship was carried out using ADF test and Johansen test for co-integration to analyze the data. It was observed that external debt stock adversely affects economic growth.

2.1.2 External debt enhances growth: There is another school of thought who opined that external debt influences growth positively.

Sulaiman and Azeez (2012) studied the effect of external debt on economic growth of Nigeria using annual time series data ranging from 1970 to 2010. Applying OLS, ADF unit root test, Johansen cointegration and Error Correction Mechanism, it was observed that external debt has contributed positively to the Nigerian economy.

Hansen (2001) finds that in a sample of 54 developing countries (including 14 HIPC's), the inclusions of three additional explanatory variables (the budget balance, inflation and openness) leads to rejection of any statistically significant negative effect of external debt on growth.

Oke and Sulaiman (2012) examined the impact of external debt on economic growth and investment in Nigeria, using annual time series ranging from 1980-2008. Multiple regression analysis was applied and the result showed that a positive relationship exist between growth and external debt.

Ogiemudia and Ajao (2012) studied the effect of foreign debt management on sustainable economic development in Nigeria. OLS and ECM method of analysis was employed in analyzing annual time series data. Their findings showed that a positive and significant relationship exist between external debt and economic development in Nigeria Zafar, et al (2008), carried out a study on trade liberalization and external debt burden. Using annual time series data ranging from 1992 to 2007 on Pakistan economy, and applying autoregressive distributed lag (ARDL) technique of co-integration to investigate the long run relationships and ECM for short run dynamics. The result showed that a significant long run positive relationship between external debt and trade liberalization exist in Pakistan economy.

2.1.3 Non-linear Relationship between External Debt and Growth

Pattilo, Poirson and Ricci (2002) observed that for a non-linear impact of debt on growth; at low levels, debt has a positive effect on growth; but above particular thresholds or turning points, additional debt begins to have a negative impact on growth. In a follow up paper, Pattillo and others (2003) apply a growth accounting framework to a group

of 61 developing countries in Sub-Saharan Africa, Asia, Latin America, and the Middle East over the period 1969-98. Their results suggest that on average, for high-debt countries, doubling debt will make output growth reduce by about 1% point and reduce both per capita physical capital and growth in total factor productivity by somewhat less than that. Moreover, the policy environment also affects the debt/growth relationship.

Using a large panel data of 93 developing countries over the period of 1969-1998, Pattilo, Poirson and Ricci (2011) supports a non-linear, hump-shaped relationship between debt and growth especially when debt is measure relative to GDP. Their findings also suggest that the average impact of external debt on GDP becomes negative, at about 160-170 percent of exports and 35-40 percent of GDP. These results are robust across different estimation methodologies and specifications, and suggest that doubling debt levels slows down annual per capita growth (GDP) by about half percentage point after controlling for endogeneity. High debt stocks appear to affect the growth through their dampening effects on both physical accumulation and total factor productivity growth.

Maghyereh, Omet and Kalaji (2002) empirically examined the impact of external debt on the performance of the Jordanian economy, determining its optimum level. Their result showed that the optimal level of external indebtedness is about 53% of GDP, implying that when the external debt exceeds this level; its impact on the performance of the Jordanian economy becomes negative. Ordinary least square method of analysis was used.

Cordella, Ricci, and Ruiz-Arranz (2010) find that the marginal effect of debt for non HIPC countries becomes negative when its face value reaches about 20% of GDP, or its Net Present Value reaches about 10% of GDP. Imbs and Ranciere (2005) confirm this result using non-parametric methods. Their result showed that the marginal effect of debt becomes negative when the face value of debt-to-GDP reaches 60%, or the NPV reaches 40%, but thresholds are higher for countries with good institutions.

Presbitero (2008) posited that a non-linear relationship exist between the Net Present Value of external debt and economic growth with a threshold at around 30% of GDP, using quadratic specification. This is applicable to countries with poor policies.

2.2. Two Gap Model theory of External Debt

The two gap model was propounded by Chenery and Strout (1966). The theory states that for a country to achieve a given target of growth rate, such growth may be limited to availability of domestic savings (investment limited growth) or foreign exchange (trade limited growth). The condition for national income equilibrium is that domestic investment plus export equal imports plus domestic savings i.e. $I + X = S + M$(1)

Ayadi and Ayadi (2008) in its analyses of the Dual-Gap theory noted that investment is a function of savings and that investment that requires domestic savings is not sufficient to ensure economic development, thereby necessitating complementary external goods and services. Any increase in investment without a corresponding increase in savings must be financed in part by borrowing from abroad. Nonetheless the impact of the accumulation of such debt is highly dependent on use and the purpose which such debt is undertaken. The Dual-Gap analysis therefore stresses the additional role of foreign borrowing in supplementing foreign exchange, without which a fraction of foreign exchange might to unutilized because actual growth would be constrained by the inability to import necessary inputs.

A country's borrowing requirement depends upon its total expenditure in relation to total domestic production. Therefore an increase in investment spending (I) over domestic savings (S) is equivalent to a surplus of imports (M) over exports (X).

Mathematically,

$$S - I \equiv X - M \dots\dots\dots(2)$$

Equation (2) shows that the savings gap (S-I) is identical with the foreign exchange gap (X-M). The identity between the two gaps follows from the nature of accounting procedures. An excess of import over exports implies a corresponding excess or investment over savings. Essentially, if the foreign exchange gap (X-M) is greater than savings gap (S-I), foreign borrowing to fill the X-M gap will also fill the S-I gap since investment goods can come from home or abroad. But if the S-I gap is greater than X-M gap, foreign borrowing will fill only a smaller portion of X-M gap. Therefore, the need for foreign borrowing overtime is determined by the rate of investment in relation to savings and the rate of export in relation to imports.

3.0 Research Method

The study used a quadratic hill-climbing technique of external debt which allows us to obtain analytically, by tinkering with the traditional Keynesian (1936) macroeconomic model, the critical levels of external borrowing that

will either augment or retard economic growth in Nigeria. However, to address the Lucas(1976) critique, we linked the aggregate demand to the real side of the economy by introducing capital and labour productivity. The critical levels of external debt here mean an amount of external debt accumulation that potentially, becomes either a hindrance or catalyst to economic growth.

The model is designed to address the following critical questions: (1) the growth rate of external debt that is growth-augmenting (2) growth rate of external debt that acts as a binding constraint,

3.1 The model: Let (g) be growth rate of real gross domestic product (GDP); (dx) is external debt stock-GDP ratio; while (λ) is constant. To model the growth-augmenting; growth-binding constraint, we evaluate the critical (minima-maxima) level of Nigeria’s external debt by estimating the quadratic function in case (1) below, where α_0 and β_0 are coefficients.

$$f(dx) = \beta_0 dx^2 + \alpha_0 dx + \lambda_0 \tag{1}$$

The maximum or minimum value of debt acquisition (dx) occurs at:

$$dx = f\left(-\frac{\alpha_0}{2\beta_0}\right) \tag{2}$$

3.1.1 Growth-maximising external debt: For external debt to maximise economic growth, the necessary condition for the external debt function in case (1) requires that the linear growth-augmenting external debt elasticity/parameter (β_0) be less than zero as in case (3) below.

$$\text{if } \beta_0 < 0, \text{ then the maximum limit of (external debt) } dx = f\left(-\frac{\alpha_0}{2\beta_0}\right) \tag{3}$$

If the coefficient of the non-linear external debt acquisition (β_0) is negative, then external debt accumulation has a maximum within which it is growth-augmenting. Econometrically, this is obtained by taking the marginal change in growth rate of domestic output (g) resulting from one unit change in the accumulation of external debt stock (dx) as shown in case (4). The condition for growth-augmenting external debt accumulation is that a unit increase/decrease in external debt bring a proportionate increase/decrease in domestic output, with the limit being the point where the diminishing return to debt accumulation sets in, ceteris paribus.

$$\frac{\partial g}{\partial (dx^2)} < 0 \tag{4}$$

3.1.2 Debt as growth-binding constraint: For external debt to retard economic growth, the function in case (1) requires that the external debt elasticity/parameter (α_0) be less than zero as in case (5).

$$\text{if } \beta_0 > 0, \text{ then the minimum limit of external debt (dx) is } = f\left(-\frac{\alpha_0}{2\beta_0}\right) \tag{5}$$

Again, the condition for debt-growth-binding constraint is that a unit increase/decrease in external debt brings a proportionate decrease/increase in domestic output, with the limit factors being the point where the diminishing return to debt accumulation sets in, ceteris paribus as shown in case (6).

$$\frac{\partial g}{\partial (dx^2)} < 0 \tag{6}$$

3.1.3 Estimation technique: Econometrically, to achieve the stated objectives, real GDP growth rate (g) is estimated as a linear function of external debt stock (dx), square of external debt stock (dx^2), and random error (ϵ) as shown in case (8).

The estimation used two variant of optimization algorithms namely Gauss-Newton, Berndt, Hall, Hall and Hausman, and Marquardt algorithms, respectively. The Gauss, Berndt, Hall, Hall and Hausman commonly referred to as the Gauss-Newton/BHHH is specifically designed for maximum likelihood problems, while Marquardt algorithm modifies the Gauss-Newton algorithm by adding a correction matrix (or ridge factor) to the Hessian approximation.

The ridge correction handles numerical problems when the outer product is near singular and may improve the convergence rate.

These were estimated using the Generalized Linear Model (GLM) in E-views 8 platform. The general form of the model is shown in equation (8). In addition, we cross-matched the GLM with Least square and ML-ARCH estimators to see if we can trace any significant difference between them and our benchmark estimator (GLM).

$$\partial \ln(g) = [\alpha_0(\partial \ln(dx)) + \beta_0(\partial \ln(dx^2))] \pm \lambda_0 + \mu_0 \quad (8)$$

3.2 Evaluation of research objectives

3.2.1 Growth-augmenting: To address objective one, we estimate the model in equation (8) as a function of linear external debt and non-linear external debt. If the signs of parameters (α_0 and β_0) alternate – that is, if ($\alpha_0 > 0$) and ($\beta_0 < 0$), then the first-order condition of the equation in case (3) is maximized. When that condition obtains, debt is said to be growth-augmenting until it reaches its maximum where its growth starts declining. This is equivalent to saying that the economy is far from reaching its sustainability threshold and an additional unit of external borrowing is potentially growth-supporting, ceteris paribus. Thus the *a priori* first-order condition for growth-augmenting debt is specified as:

$$\partial \ln(g) = [\alpha_0(\partial \ln(dx)) - \beta_0(\partial \ln(dx^2))] \pm \lambda_0 + \mu_0 \quad (8.1)$$

3.2.2 Debt as a binding-constraint to growth: Also in objective 2, we estimated the model in equation (8). However, if ($\alpha_0 < 0$) and ($\beta_0 > 0$), then the first-order condition of the equation in case (3) is minimized – economic growth is constrained at the earlier period by an increasing debt accumulation up to a point where growth reaches minimum and start increasing. Thus the *a priori* first-order condition entails:

$$\partial \ln(g) = [-\alpha_0(\partial \ln(dx)) + \beta_0(\partial \ln(dx^2))] \pm \lambda_0 + \mu_0 \quad (8.2)$$

3.3 Assumptions of the model.

Because this is a partial equilibrium model, part of the ceteris paribus assumption presupposes that there is absence or declining rate of moral hazard. That is, the magnitude is incapable of imposing a significant challenge to the economy; and that the borrowed fund is not wrongly applied, but channelled into production activities and infrastructural development which is strictly the purpose for venturing into external debt obligations.

The implication of relaxing these assumptions is that if moral-hazard explains the absence of contingent debt, then the same reasoning tends to make nominal debt issue undesirable (Barro, 1997). Secondly, increase in external borrowing will push the economy to the level where every unit of debt accumulated increases the misfortune of the economy by pushing the economy to negative growth. The tendency is that external debt obligations will get to its optimal level rather faster than necessary.

3.3.1 Data handling: All the variables used in the model, apart from labour productivity, are from the demand-side of the economy, hence the gross domestic product used to capture the economy is aggregate demand. That is gross domestic product by expenditure classification given by the traditional Keynesian (1936) aggregate expenditure.

The necessary condition for the evaluation of minima-maxima requires that data be first-order stable (stationary). These conditions are satisfied in cases (4) and (5) for critical values.

The data used covers a period of 47 years (1965-2012). It was collected from the online database of the Central Bank of Nigeria (CBN); National Accounts archives of Federal Office of Statistics, FOS, 1965-2000 (now National Bureau of Statistics); and the Food and Agricultural Organisation statistics FAOstat (human resources data).

4.0 Result and Discussion

The three columns (eq01-eq03) of table 4.0.1 show the result of the critical debt-growth model (with three variant estimators).

Three variants of estimation techniques namely Generalized Linear Method (GLM); Least Square (LS); and Maximized Linear-Autoregressive Conditional Heteroskedasticity are used.

Standard errors (.) and t-statistics [.] are in parenthesis, while (NA) shows statistical evaluation criteria that are not applicable to the applied model/equation.

Table 4.0 1: Summary of Growth-Augmenting and Growth-Constraint of External Debt Accumulation

<i>Eq Name:</i>	EQ01	EQ02	EQ03
<i>Method:</i>	GLM	LS	ML-ARCH
<i>Dep. Var:</i>	D(LOG(G))	D(LOG(G))	D(LOG(G))
C	0.049703 (0.0456) [1.0910]	0.049703 (0.0456) [1.0910]	0.080151 (0.0335)* [2.3904]*
D(LOG(DX))	0.869555 (0.3292)** [2.6415]**	0.869555 (0.3292)* [2.6415]*	1.428495 (0.1871)** [7.6348]**
D(LOG(DX)^2)	-0.029987 (0.0136)* [-2.2079]*	-0.029987 (0.0136)* [-2.2079]*	-0.050772 (0.0073)** [-6.9373]**
R Squared	NA	0.1482	0.0463
F-Statistics	NA	4.2632	NA

4.1 Discussion of findings

Debt as growth-augmenting and debt as binding constraint are evaluated and analysed from table 4.0.1.

4.1.1 Debt as growth-augmenting: For proper conceptualisation of growth-augmenting threshold, we evaluated equations (3) and (4) and obtain the minimum or maximum value of external debt required for sustainable growth. This is obtained by substituting the parameters of linear and non-linear debt, respectively from table 4.0.1. Growth-augmenting external debt threshold is evaluated as:

$$-\frac{a_2}{(2\beta_2)} = -\frac{0.03}{(2 \times -0.005)} = 14.5 \tag{13.0}$$

The attainable growth associated with the 14.5% external debt composition of the country is given in case (13.1):

$$f(14.5) = -0.03 \cdot (14.5)^2 + 0.87 \cdot (14.5) + 0 = 6.3\% \tag{13.1}$$

Combining the result in table 4.0.1 with the estimated growth-augmenting threshold in case (13.0) shows that at the early stage of debt acquisition, its contribution to output growth is rising, but at a decreasing rate, hence the alternating signs between the linear (positive) and non-linear (negative) debt coefficients. That is, as time progresses a negative non-linear impact of debt stock on growth is experienced showing that there is a poor application of loan such that the earlier benefit derived is gradually eroded. This is consistent with the findings by (Ayadi & Ayadi, 2008) that after the initial condition that led to loan acquisition the subsequent indiscriminate borrowings and its cumulative impact takes effect when debt stock significantly depressed output growth.

Furthermore, case (13.1) shows that the maximum attainable growth rate when external debt composition of the economy approaches a maximum limit of 14.5% is 6.3%. Beyond this point the aforementioned depressed output growth rate is set in motion by any addition or reduction in external debt.

4.1.2 Debt as binding constraint: Debt become a binding constraint when debt acquisition pushes to backtrack as shown in cases (13.4).

$$f(13.0) = -0.08 \cdot (13.0)^2 + 0.87 \cdot (13.0) + 0 = 6.2 \quad (13.4)$$

The implication of the foregoing is that external debt accumulation has maximum limit that is consistent with Nigeria's economic growth which is estimated to be in the neighbourhood of about 14.5% of the gross domestic output. It is also worthy of note that the estimated maximum threshold converges around 14% to 15% irrespective of the chosen estimation techniques as shown in table 4.0.1.

Table 4.0 2: Critical Levels of External Debt and the Maximum Attainable Output Growth Rate

External debt-GDP ratio %	Attainable Real economic growth rate	Growth gap	External debt-GDP ratio %	Attainable Real economic growth rate	Growth gap
0.5	0.4	-5.9	15.5*	6.3	0.0
1.0	0.8	-5.5	16.0	6.2	-0.1
1.5	1.2	-5.1	16.5	6.2	-0.1
2.0	1.6	-4.7	17.0	6.1	-0.2
2.5	2.0	-4.3	17.5	6.0	-0.3
3.0	2.3	-4.0	18.0	5.9	-0.4
3.5	2.7	-3.6	18.5	5.8	-0.5
4.0	3.0	-3.3	19.0	5.7	-0.6
4.5	3.3	-3.0	19.5	5.6	-0.7
5.0	3.6	-2.7	20.0	5.4	-0.9
5.5	3.9	-2.4	20.5	5.2	-1.1
6.0	4.1	-2.2	21.0	5.0	-1.3
6.5	4.4	-1.9	21.5	4.8	-1.5
7.0	4.6	-1.7	22.0	4.6	-1.7
7.5	4.8	-1.5	22.5	4.4	-1.9
8.0	5.0	-1.3	23.0	4.1	-2.2
8.5	5.2	-1.1	23.5	3.9	-2.4
9.0	5.4	-0.9	24.0	3.6	-2.7
9.5	5.6	-0.7	24.5	3.3	-3.0
10.0	5.7	-0.6	25.0	3.0	-3.3
10.5	5.8	-0.5	25.5	2.7	-3.6
11.0	5.9	-0.4	26.0	2.3	-4.0
11.5	6.0	-0.3	26.5	2.0	-4.3
12.0	6.1	-0.2	27.0	1.6	-4.7
12.5	6.2	-0.1	27.5	1.2	-5.1

External debt-GDP ratio %	Attainable Real economic growth rate	Growth gap	External debt-GDP ratio %	Attainable Real economic growth rate	Growth gap
13.0	6.2	-0.1	28.0	0.8	-5.5
13.5*	6.3	0.0	28.5	0.4	-5.9
14.0*	6.3	0.0			
14.5*	6.3	0.0			
15.0*	6.3	0.0			

/*/ shows the critical levels of external debt that generates steady state growth rate of 6.3%
 Source: Author based on regression estimates

4.1.3 Growth Deficit and External Debt-driven steady state: Another interesting aspect of the analysis is that our approach is able to generate a steady state growth rate for Nigeria, given its debt acquisition capacity. In Figure 2 and table 4.0.2 we show growth deficit in the country’s borrowing space, as well as the debt-driven steady state of the economy. The growth gap is calculated as the distance or difference between the highest attainable output growth rate associated with the maximum debt and various growth rates associated with other critical debt level. The gap mirrors the deviation of various growth levels from the maximum growth which corresponds to the country’s steady state. Table 4.0.2 shows that the debt-driven state occurs at the region 13.5% to 15.5% of the country’s external debt stock-GDP ratio. At that point, the maximum attainable growth rate stagnated at 6.3% after which the attainable growth is not Pareto optimal because additional or reduction in debt becomes growth-backtracking – it is also observable that at debt-driven steady state, growth deficit is zero, also see figure 2.

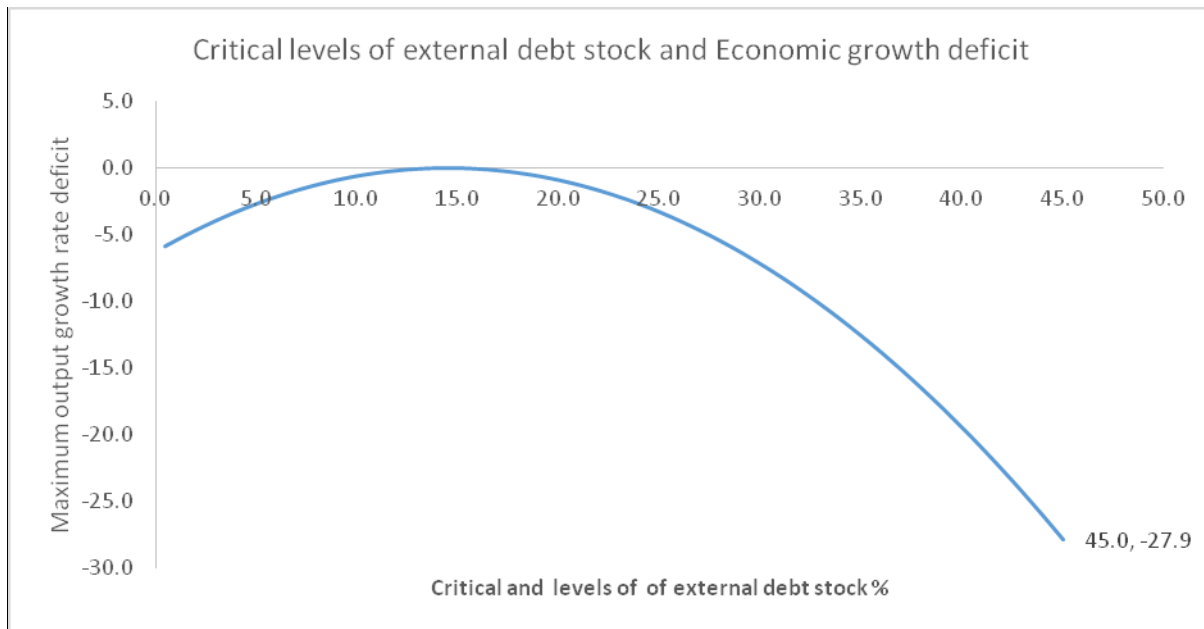


Figure 1: Critical Levels of External Debt and Economic Growth Deficit

Source: Author based on regression estimates

5.0 Summary and Concluding Remarks

The study determines the critical levels of external debt accumulation for Nigeria’s sustainable growth. From the findings, the study revealed that the critical levels of Nigeria’s external debt threshold that is growth-augmenting converges around 14% to 15% and the maximum attainable growth at this threshold is estimated at 6.3% which is the This implies that at the early stage of debt acquisition, its contribution to output growth rises, but at a decreasing rate. Beyond this threshold, debt begins to depress, that is external debt begins to backtrack output. Based on these

findings, it is concluded that both debt accumulation and non-debt acquisition are detrimental to the economy, hence debt is a necessary evil that should be guided.

5.1 Policy Recommendations

Based on the research findings above, the following policy recommendations are made.

1. The country's external borrowing space is capable of generating higher output growth. Consequent upon this, the external loan contracted by Nigerian government can be increased to reduce or fill the growth gap, if the government will continue to channel the contracted loan into infrastructural development or/and productive activities which is strictly the purpose of venturing into external debt obligations.
2. In order to achieve its growth objectives and at the same time service its debt obligations, the government should diversify its economy; create an enabling environment for domestic and foreign private investors so that income generated can be channeled into achieving the country's objectives.

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