Nigeria's External Debt and Economic Growth: An Error Correction Approach

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Abstract

This study investigates the relationship between Nigeria's external debt and economic growth, between 1975 and 2006. The choice of period was guided by data availability and the the escalation of Nigeria's external debt. Econometric evidence revealed stationarity of the variables at their first difference while the Johansen cointegration approach also confirms the existence of one cointegrating relationship at the 1 percent and 5 percent level of significance. In addition, error correction estimates revealed that external debt has negative relationship with economic growth in Nigeria. For example, a one per cent increase in external debt resulted in a decrease of 0.027 per cent in Gross Domestic Product, while a 1 per cent increase in total debt service resulted to 0.034 per cent (decrease) in Gross Domestic Product. These relationships were both found to be significant at the ten per cent level. In addition, the pairwise Granger Causality test revealed that uni-directional causality exists between external debt service payment and economic growth at the 10 percent level of significance. Also, external debt was found to granger cause external debt service payment at the 1 percent level of significance. Statistical interdependence was however found between external debt and economic growth. In order to ameliorate the negative influence of external debt on economic growth, debt accumulation for projects must be matched with the timing of repayment. Nigeria must be concerned about the absorptive capacity. Consideration about low debt to GDP, low debt service/GDP capacity ratios should guide future debt negotiations. Finally the portfolio of debt must be diversified in terms of sources and types to avoid harmful concentration and a reoccurrence to the past.

Keywords: External debt, Debt servicing payment, Cointegration, Statistical significance, Causality, Economic growth

1. Introduction

Borrowing by countries occur as a result of their inability to generate enough domestic savings to carry out productive activities. Such external borrowings by countries are meant to supplement the domestic savings and allow such countries to carry out productive activities (Ezeabasili, 2006). A country can also borrow, in the short-term, from external sources to finance current account deficits arising from external disturbances in order

to shore up external reserves position and strengthen external liquidity position in the future. Gana, (2002) posits that foreign borrowing is desirable and necessary to accelerate economic growth, provided they are channeled to increase the productive capacity of the economy and promote economic growth and development.

Events in the past few years have led to increasing concerns about the possibly adverse consequences of the substantial accumulation of debt by Sub-Saharan African countries. The experiences of countries like Mexico and Argentina, with debt overhang in the early 1980s have heightened this fear. Fears are often expressed that excessive external debt burdens will threaten financial stability with adverse consequences for the real economy, or that increases in debt will create political pressures that will make acceleration of inflation inevitable (Summers, 1986). The view persists however, that the build-up in debt, particularly in the developing economies, could imperil the stability of the financial system, according to some analysts. They argue that the heavy debt burdens have reduced the ability of financial institutions, borrowers and the economy at large to withstand recessions and other types of adversity

Debt is a contract, and the holder is obliged to fulfill the stated obligations along with accruing interest. Because of this obligation, the risk of compounded and penal charges arising from debt-service defaults, and the income effect of debt service on economic growth, policy makers have been enjoined to thoroughly evaluate each tranche of external borrowing in order to mitigate the associated risks.

The criteria for evaluating external borrowing include necessity, value cost, tenor, source as well as the impact of the additional borrowing on the subsisting portfolio of debts. Also, informed priority ordering in applying the loan to projects, programmes and sectors that present higher prospects of income-generation, capacity building and multiplier effect have been variously advocated (NCEMA, 2002). However, most developing countries in Sub-Saharan Africa (SSA) have been trapped by hasty and distress borrowing which they are often unable to service. Worse still, they need to borrow more, and the inability to service existing obligation has often been caused by deteriorating world prices of their primary exports.

Nigeria, as a mono-product economy, found itself in this position in the 1980s when her external debt positioned worsened. As a result of this, Nigeria was unable to generate sufficient revenue from the sale of her crude oil to service the debt owed international creditors. However, various strategies were tried in mitigating the effects of the huge debt overhang. These include internal embargoes and limits on new loans, rescheduling, restructuring, debt servicing and plea for debt forgiveness. These strategies did not appear effective and the economy failed to achieve the desired rate of economic growth (DMO, 2004). Thus, the rapid growth of external debt stock and debt service payments became clogs on the wheel of national economic growth effort (Ezeabasili, 2006; NCEMA, 2002).

Between 1958 and 2004, Nigeria's external indebtedness rose from US$28million to over US$35billion. External debt as a percentage of the GDP was 100% in 1990, 66% in 2000 and 75.6% in 2004. However, some studies have attempted to investigate the relationship between external debt and economic growth. These studies include those of (Ajayi, 1991; Adam, 2004; Green and Villeneva, 1991; Savvides, Kumar and Maclambo, 1996; Deshpande, 1997; Iyoha, 1999). However, most of these studies were done in environments different from that of Nigeria. Again, the time frame considered in these studies were short, and, the results from them are conflicting. These shortcomings have somehow contributed to the knowledge gap in the literature, thus warranting a more systematic and comprehensive study of the relationship between external debt and Nigeria's economic growth.

This study seeks to improve on the past studies by making use of a broad data set spanning 1970 – 2006, such data set is far more than those used in the previous studies. Using recent developments in time series econometrics as provided by Engle and Granger (1987), Andrews (1991), etc, this work attempts to distinguish between long and short run effects of the variables in the model and determine the causalities among the variables used in the study. The rest of the paper is organized as follows: Section II deals with the literature, Section III contains the Model Specification and Estimation Techniques, Section IV is the Empirical analysis while Section V is Summary and Conclusion.

2. Literature Review

There are several empirical works on the effect of external debt on economic growth in developed and developing countries. However, these studies show some conflicting results in their conclusions on the effect of external debt on economic growth. For instance, a study by the World Bank (1989) argue that the large debt service payments made by indebted Less Developed Countries (LDCs) retard their growth and adjustment. Adam (2004) posits that many LDCs large debt accumulations resulted to debt overhang. The debt overhang discourages investments and affects future output negatively. Again, the experience of Sub-Saharan African

countries conformed to the general picture of most LDCs. It is well known that one of the causes of low growth and economic difficulties of SSA countries is the large debt service payments (Adam, 2004). The SSA countries are thus susceptible to large foreign loans not only for the savings gap, but also the foreign exchange gap is widened because of the decline in export. Ajayi (1991) opined that size of the external debt relative to the size of the economy is enormous and besides leading to capital flight, also discourages private investments.

A significant number of countries in Sub-Saharan African (SSA) have in general adopted a development strategy which relies heavily on foreign financing, from both official and private sources. This, unfortunately, has meant that for many countries in the region, the shock of external debt has built-up over recent decades to a level that is viewed as unsustainable (Ajayi and Khan, 2000). The massive growth of external debt in SSA countries over the last two decades has given rise to the concerns about the deleterious effects of the debt on investment and growth, principally, the well-known "debt overhang effect".

One recalls that Nigeria is one of the severely indebted low income countries that is greatly afflicted by heavy external indebtedness, its acknowledged oil wealth notwithstanding. Although, Nigeria started borrowing externally in the 1970s, its external indebtedness in that period was relatively small. By 1976, Nigeria's external debt profile took its upward turn, rising from $1.3billion in 1976 to $3.2billion in 1977, a rise of about 146% in a single year. The external indebtedness rose thereafter in single and double digits till it reached a peak of about $34.0 billion in 1994 (Isu, 1987, 1988). The cases of debt accumulation in Nigeria have been attributed mainly to external and internal factors. The external factors include the impact of world oil price shocks, rising interest in rates, declining policies of trade and liberal lending policies of international commercial banks. The problems arising from the external sector were exacerbated in most cases by internal factors mostly attributable to macroeconomic policy errors. Two of such errors were those associated with fiscal irresponsibility and exchange rate misalignment in Nigeria during the period (Ajayi, 1991)

In addition, the burden of debt for a large number of SSA countries threatens the prospect of success of adjustment programme being embarked upon. According to the World Bank (1987-1988), the external indebtedness of African countries is an obstacle to the restoration of the countries needed growth. Also the empirical enquiry of Green and Villaneva (1991) covered twenty developing countries between 1975 and 1987. The authors observed that the ratio of debt to GDP and debt service ratio significantly and negatively affects private investment. On the contrary, Savvides, Kumar & McLambo (1996) found that, while debt service had a negative but insignificant coefficient, indicating that the hypothesis of debt overhang effects could not be rejected. Deshpande (1997) also came out with similar result from his study of the experience of 13 severely indebted countries for the period 1971 – 1991, although during the first half of the period (1975 – 1983), there were some favourable time factors that showed a strong positive effect of external debt on investment.

In Nigeria, a number of studies exist on the relations between external debt and economic growth. For example, Essien and Onwioduokit (1998) adopted the Zeller Reformulation Error (ZRE) in variable type model, with the conclusion that the high debt burden has been the root cause of Nigeria's sluggish growth. Oyejide (1985) asserts that rapid economic growth presumes that public investment may often be necessary at a rate well in excess of public savings. Hence it may become necessary for government to resort to borrowing to supplement public savings and thus fill the resource gap. Debt becomes a good finance option to facilitate economic development process. However, Iyoha (1999) argues that high stock of debt can depress investment and lower the rate of economic growth. Alfredo and Francisco (2004) investigated the relationship between external debt and economic growth for some Latin American and Caribbean countries and found that lower total external debt levels were associated with higher growth rates.

Another study by Ndung'u (1998) posits that the external debt problem in Africa has led to an investment pause and has reduced growth performance. Substantially, Audu (2004) found out that debt servicing has had significant adverse effect on the growth process in Nigeria. The study by Borensztein (1991) found for Philippines that the debt overhang had an adverse effect on private investment. Also, Osinubi, Dauda and Olaleru (2006) confirmed the existence of debt Laffer and Non-linear effect of external debt on economic growth in Nigeria. Thus, heavily indebted countries in sub-Saharan Africa need to evolve creative strategies for bringing about debt reduction so that the high debt stock and associated crushing debt service burden would not impact too negatively on economic growth.

3. Model Specification

The inter-relationships of various sectors of an economy is important for policy prescriptions and analyses. Therefore, policies set out to impact on one sector must take into account the countervailing effects on the other sectors.

The national income identity presents a framework for linking the various sectors of the economy, which is the starting point of this study. This can be presented through the standard national income identity as follows:

$$Y = C + I + G + (X - M) \quad \text{…….. (1)}$$

Where,

Y = National Income

C = Private Consumption

I = Private Investment

G = Government Expenditure

X = Exports

M = Imports

The inclusion of X and M, presumes that we are dealing with an open economy, where a country trades in goods and services with the rest of world, borrows from abroad and invests her savings in foreign assets. Thus, the total resources available to a country includes its domestic production (Y) and imports (M). Also, the residents of the country can satisfy their needs for consumption and investment by buying from the pool of goods and services. This equation implies that total expenditure is equal to consumption, investment and exports.

Equation (1) can be further expressed as follows:

$$Y - C = S = I + G + (X - M) \quad \text{…….. (2)}$$

Consumption investment and government expenditure are referred to as domestic absorption and is expressed as

$$A = C + I + G \quad \text{……. (3)}$$

Thus, equation (1) can be written as

$$Y = A + X - M \quad \text{……. (4)}$$

The implication of equation (4) is that output is invariably dependent on the growth of domestic absorption, increase in exports, and imports. When imports exceed exports, it implies that additional resources have been brought from abroad to supplement the domestic resource shortfall. However, when exports exceed imports and resources are low, it is an indication that debt service payments have gone up. The message derived here is that high debt service payments lead to lowering of imports of manufacturing inputs. In order to quantify the influence of these factors on growth of national output in Nigeria there is need to develop credible models that can capture these economic relationships.

NCEMA (2002) and Gana (2002) used empirical models to explain the impact of external debt and debt servicing on one hand, and a country's growth performance on the other hand. In this case, the models postulate that economic growth is negatively affected by the accumulation and servicing of external debt. This hinges on the fact that the accumulation of foreign debt puts pressure on economic growth through withdrawal of foreign exchange earnings required for investment. The implication of high external debt on economic growth (GDP) can be captured from the above framework. The model for the analysis can be stated thus: $GDP_t = f(GDP_{t-1}$, EXTD, EXTDS, GEXP, CONS, TB, CAP). An appropriate log linear model (assuming intrinsic linearity) therefore considers logarithm of External Debt (EXTD), lagged real GDP one year, and external debt service (EXTDS), government expenditure (GEXP), Consumption (CONS), Trade Balance (TB) and Capital Formation (CAP) as the independent variables and logarithm of real GDP as dependent variable as in equation below.

3.1 Sources of Data

Data for the analysis is sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin and Statement of Accounts for the period, 1970 to 2006.

3.2 Empirical Specification of the Model

From the argument presented in the last section and following the NCEMA (2002) model, the regression equation is specified as:

$$GDP_t = a_0 + a_1 GDP_{t-1} + a_2 EXTD + a_3 EXTDS + a_4 GEXP + a_5 CONS + a_6 TB + a_7 CAP + U_t \ldots \quad (5)$$

Taking logarithms of both sides of the equation, we have

$$LogRGDP_t = a_o + a_1 logRGDP_{t-1} + a_2 logEXTD + a_3 log\ EXTDS + a_4 LGEXP + a_5 LCONS + a_6 LTB + a_7 LCAP + U_t \ldots \quad (6)$$

where a_0 = Constant and a_1 to a_3 = coefficients

$LogRGDP_t$ = log of real Gross Domestic Product (GDP) growth in time $_t$

$LogGDP_{t-1}$ = log of lagged RGDP one year

LogEXTD = log of Total External Debt

LogEXTDS = log of Total Debt Service

LogCONS = Log of Aggregate Consumption

LogGEXP = Log of aggregate Government Expenditure

LogTB = Log of Trade Balance (Export minus Import)

LogCAP = Log of gross fixed capital formation

U_t = Error term

A priori, it is expected that $a_1 > 0$, $a_2 < 0$, $a_3 > 0$, $a_4 > 0$, $a_5 > 0$ $a_6 > 0$ $a_7 > 0$

4. Estimation Technique – Cointegration and Error Correction Model (ECM)

We first investigated the time series characteristics of the data to test whether these variables are integrated. The augmented Dickey-Fuller (ADF) test (as specified in Dickey and Fuller, 1979), and Phillips-Perron test (Phillips and Peron, 1988) were employed. For the ADF, the null hypothesis is that the variable being considered has a unit root against an alternative that it does not. The model for the ADF is as specified below:

$$\Delta y_t = \alpha + \beta T + \gamma y_{t-1} + \sum_{i=1}^{P} d_t \Delta y_{t-1} + \varepsilon_t \quad \text{.....(7)}$$

Where y_t is the variable considered, T is the time trend (which is only allowed if significant), and ε_t is a random error term. The Akaike Information Criterion is used in selecting p (the lag-length) after testing for first and higher order serial correlation in the residuals. The lagged variables serve as correction mechanisms for possible serial correlation. The Phillips-Peron (PP) test uses models similar to the Dickey-Fuller tests but with Newey and West (1994) non-parametric correction for addressing possible serial correlation rather than the lagged variables method employed in ADF. Also Bartlett Kernel (Andrews, 1991) is used as an automated bandwidth estimator for lag truncation of the Newey and West non-parametric correction. The test statistics of the PP has the same distribution as that of Dickey-Fuller and critical levels provided by MacKinnon (1996) is used.

If the variables in the structural equations have unit roots, then we can capitalize on the likelihood of co-movements in their behaviour hence the possibilities that they trend together towards a stable long-run equilibrium. The multivariate maximum likelihood approach to cointegration developed by Johansen (1988, 1991) makes it possible to test for the cointegration rank, that is, the number of cointegrating vectors, to estimate these vectors and to test linear restrictions on the vectors using standard asymptotic inference. In addition, the small sample biases and normalization problems inherent in the OLS approach do not arise in the Johansen method.

If we assume that the vector X_t contain *k* time series variables with T observations each, the Johansen method is based on the following *p-lag* Vector-AutoRegressive (VAR) model for X_t with Gaussian errors:

$$X_t = X_t = \Pi X_{t-1} + \ldots + \Pi_p X_{t-p} + \varepsilon_t \quad \text{.....(8)}$$

The Π matrices are of order *(k x k)* and contain the VAR parameters. In addition, each and every variable is explained by p-lagged values of itself and all the other variables. By implication, all the variables are regarded as endogenous. We can then reparameterize equation (25) into the error correction model (ECM) formulation to yield:

$$\Delta X_t = \sum_{i-1}^{p-1} \Gamma_i \Delta X_{t-i} + \Pi X_{t-1} + \varepsilon_t \quad \text{.....(9)}$$

where $\Gamma_i = -(\Pi_{i+1} \ldots + \Pi_p)(i = 1, \ldots, p-1)$ and $\Pi = -I + \Pi_i + \ldots + \Pi_p$. As long as ΠX_{t-1} is stationary, the ECM is well defined, since ΔX_t is stationary. Stationarity of ΠX_{t-1} is equivalent to linear combinations of the X_t variables being stationary, that is, cointegration. Thus, the nature of the error-correction term, ΠX_{t-1} is what determines the nature of the cointegration relationships among the variables (Engsted and Bentzen, 1997).

Specifically, the number of independent stationary linear combinations is determined by the rank, *r*, of the *(k x k)* matrix Π:

(1) If r = 0, Π is just the null matrix, which implies that the model reduces to a Vector Auto Regression (VAR) in first differences. Hence, all the variables in X_t are I(1) but there is no cointegration, that is, no long –run relationships between the variables.

(2) If 0<r< k, such that Π has ***reduced rank*** greater than zero, then X_t is I(1) and there are *r* cointegrating vectors.

(3) If r = k, such that Π has full rank, X_t can be said to be trivially cointegrated because all the variables in X_t are stationary, I(0), and hence any linear combinations of the X_t variables is trivially stationary.

The number of non-zero eigen values from the cointegrating equations usually denotes the cointegration rank, that is, the number of cointegration relationships in the system. Two tests exist for the rank of Π, r, based on eigenvalues: the *maximal eigenvalue* test (L_{max}), and the *trace* test (L_{trace}). Having determined the cointegration rank, Π can then be partitioned as $\Pi=\alpha\beta'$, where β is a *(k x r)* matrix whose columns are the cointegration vectors, and α is the corresponding *(k x r)* matrix of so-called factor loadings. The interpretation of the factor loadings α is that they measure the speed with which the variables change in response to short-run deviations from the long-run equilibria given by the cointegration vectors in β.

The general form of the error correction model for the structural equations can therefore be expressed as:

$$LnY_t = \sum_{k=1}^{r} \alpha_{1,k} v_{k,t-p} + \sum_{s=1}^{p} \phi_{1,s} Ln\Delta X_{1t-s} + \sum_{s=1}^{p} \phi_{2,s} Ln\Delta X_{2t-s} + \sum_{s=1}^{p} \phi_{3,s} LnX_{3t-s} + \eta_{1,t} + \mu_t \quad \ldots(10)$$

where Y_t, is the dependent variable; X_1,X_2, and X_3 are the independent variables in the structural equations; $p=$ *l*-1(is the optimal lag length of the VAR); $\alpha_{i,k}$= the adjustment coefficients,

$v_{k,t-p}$= is the cointegrating vector and μ_i = intercepts.

Equations 10 describes the intertemporal interaction between the dependent variable and the independent variables highlighted in the last section. If the cointegrating relations (equilibrium conditions) are imposed, the error correction models describe the way aggregate dependent variable and the independent variables will adjust towards their equilibrium state in each time period. In the short-run, deviation of dependent variable and the independent variable from their long-run equilibrium path will feed back on their future changes in order to force their movement towards the long-run equilibrium state since the variables are supposed to be cointegrated. The cointegration term is known as the *error correction* term since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments. The cointegrating vectors from which the error-correction terms are derived are each indicating an independent direction where a stable, meaningful long-run equilibrium state exists. The coefficients of the error-correction terms, however, represent the proportion by which the long run disequilibrium in the dependent variables is corrected in each short-term period.

After establishing the unit root status of the variables and the existence of contegration, the ordinary least square (OLS) two stage approach suggested by Engle-Granger (1987) was utilized in deriving the short run coefficients. In the first stage, the long run OLS equation was conducted. The estimates from the OLS estimates therefore represent the long run coefficients. Thereafter, the general to specific approach was utilized to arrive at the parsimonious equation for each of the structural equation in the model. The redundant variables are deleted using the Akaike Information Criteria (AIC) and the Schwarz Criteria (SC).

3.6 Structural Analysis – Granger Causality and Forecast Error Variance Decomposition

In order to determine whether a specific variable or group of variables play any roles in the determination of other variables in the vector error correction (VEC) process, Granger Causality approach is employed. It tests whether an endogenous variable can be treated as exogenous and was done by examining the statistical significance of the lagged error-correction terms by applying separate t-tests on the adjustment coefficients.

A shock to any variable in the VEC model not only directly affects the variable but is also transmitted to all of the other endogenous variables through the dynamic (lag) structure of the VEC. Thus, the variance

decomposition provides information about the relative importance of each random innovation in affecting the variables in the VEC.

5. Empirical Analysis

The summary statistics for the empirical analysis is presented in Table 1 below. The mean value of the log of real GDP (LRGDP) is 10.981 while the mean value of the log of external debt (LEXTD) is 11.035. The income variable proxy by real GDP has the highest log mean value of 10.981. Figure 1 below depicts the graphical movements of the data used for the analysis. The figure shows that external debt, government expenditure and consumption was on the upward trend during the review period. Similarly, the debt service variable was on the upward trend until 2003 when it declined. However, the trade balance (export minus import) fluctuated significantly during the review period.

Insert Table 1 here

Insert Figure 1 here

6. Results of Integration Tests

The variables for our analysis are subjected to two types of unit roots test to determine whether they are unit roots or stationary series. The tests employed are the Augmented Dickey Fuller test (ADF) and the Phillips-Perron test (PP) test. For the ADF and PP tests, three models are considered namely:

- with constant,
- with time trend; and
- without constant and trend.

The null in both the ADF and PP test is the presence of unit root. The ADF results in Table 2 show that real gross domestic product (LRGDP), government expenditure (LGEXP), gross consumption (LCONS), gross fixed capital formation (LCAP), external debt (LEXTD), external debt service payments (LETDS), trade balance (LTB) are all stationary at their first difference in both the two models. In addition, the PP test result in Table 3 supports the presence of unit roots in the series. All the series in our model are integrated of order one and hence in support of the ADF result.

Insert Table 2 here

Insert Table 3 here

Since the results of the unit root tests above confirm the non-stationarity of the variables in the VAR model, we can then apply Johansen methodologies in testing for cointegration (Johansen, 1988, 1991, 1992; and Johansen and Juselius, 1990). To determine the number of the cointegrating vectors, we make use of both the Trace test and the Maximum Eigenvalue test using the more recent critical values of MacKinon-Haug-Michelis (1999). In this case, both tests identify one cointegrating vector at the 5 %(1%) critical level for the growth model as presented in Table 4.

Insert Table 4 here

The resulting long run elasticties from the cointegrating regression for the growth model that includes both external debt and debt service payment is presented in Table 5. However, not all the elasticities have the expected sign. Consumption expenditure was expected to be positive but turned out negative. However, the long run external debt elasticity in the growth regression is -0.015 while the correspondingly long run debt service payment elasticity is -0.021.

Insert Table 5 here

Having obtained cointegration among the variables, we then estimated an error correction model for the growth. The ECM is written in such a way that the first difference of each variable is related to only lagged variables. In estimating the ECM, we start by setting the lag of all the variables to two and then successively delete the most insignificant parameters one after the other, until we obtained a parsimonious representation of the models containing only parameters that are statistically significant. The residuals from the cointegrating regressions lagged one period were used as error-correction mechanism in the dynamic equations. The Ordinary Least Square (OLS) estimation method was used as it is an essential component of most other estimation techniques. Furthermore, the OLS remains one of the most commonly used methods in econometric investigations involving large models. Estimates of the preferred specifications obtained using general-to-specific method are presented below. The results were evaluated using conventional diagnostic tests.

Insert Table 6 here

The results of the estimates in Table 7 are insightful. The empirical evidence shows that there is a negative short-run relationship between economic growth and the present level of external debt in Nigeria. In addition, there exists a negative short-run relationship between the two lag level of external debt service payment and economic growth. They were both found to be significant at the 10% level of significance. In addition, government expenditure, the trade balance, consumption expenditure and the past level of GDP affected economic growth significantly in Nigeria. On aggregate, a 10 per cent increase in external debt affects economic growth negatively by 2.7%, while a 10% increase in external debt service payment affects economic growth negatively by 3.4%. The implication of this result is that the accumulation of the external debt puts pressure on economic growth as external debt repayment and servicing reduces the foreign exchange earnings of the country. This will reduce the amount of foreign exchange resources available for investments. The error correction variable estimate of 0.719 indicates that 71.9 per cent of the preceding period's disequilibrium is eliminated in the current period, with immediate adjustments captured by the difference terms. However, all the variables in the equation except external debt service variable maintained the apriori expected signs. The value of the adjusted R2 shows that the model accounts for about 54 per cent changes in economic growth. The empirical result of our analysis is in agreement with the findings of Iyoha (1999), Essien and Onwuoduokit (1998), therefore explains that large stock of external debt lowers the rate of economic growth.

In addition, the pairwise Granger Causality test in Table 8 revealed that uni-directional causality exists between external debt service payment (LETDS) and economic growth at the 10 percent level of significance. Also, external debt was found to granger cause external debt service payment at the 1% level of significance. Statistical interdependence was found between external debt and economic growth.

Insert Table 7 here

Insert Table 8 here

Tables 9, 10 and 11 show the results of the variance decomposition of economic growth external debt and external debt service payment in Nigeria within a future 10-period horizon. The result of the variance decomposition estimates in Table 9 indicate that the external debt and the external debt service paymets explains about 3.79% and 0.61% of the variation in the real GDP in the tenth period. About 5.8% of future changes in the real GDP are due to changes in consumption while the external sector explains about 3.02% future impacts. Nevertheless, about 80.45% of future changes in the real GDP is due to real GDP itself. However, in the variance decomposition of the external debt, the real GDP explains about 33.57 changes in external debt while external debt itself explains about 44.17% of the variation in itself. Finally, the variance decomposition of external debt service reveals that external debt explains about 42.17% of the variation in the variable while real GDP explains about 32.28% of the variation in external debt service payment in the 10th year period horizon.

Insert Table 9 here

Insert Table 10 here

Insert Table 11 here

7. Summary and Conclusion

The results of the error correction estimates are quite insightful. Empirical results indicate that there is a negative short-run relationship between economic growth and the present level of external debt in Nigeria. In addition, there exists a negative short run relationship between two lag levels of external debt service payment and economic growth. The empirical result of external debt and debt service payment and economic growth is in agreement with the findings of Iyoha (1999), Essien and Onwuoduokit (1998), which confirms that large stocks of external debt tend to lower the rate of economic growth in the Nigerian economy.

In addition, the Parwise Granger Causality test reveals that uni-directional causality exists between external debt service payment and economic growth at the 10 percent level of significance. Also, external debt was found to Granger cause external debt service payment at the 1 percent level of significance. Statistical inter-dependence was however found to exist between external debt and economic growth. Again, the result of the variance in decomposition estimates indicate that the external debts and the external debt service payments explain about 3.79% and 0.61% of the variation in the real GDP in the tenth period. In order to ameliorate the negative influence of external debt on economic growth, debt accumulation for projects must be matched with the timing of repayment. Nigeria must be concerned about the absorptive capacity of the economy before embarking on more external debt acquisition. Finally, the portfolio of debt must be diversified in terms of sources and types to avoid concentrations of debt service imperatives.

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Table 1. Summary of Statistics of the Variables used in the Regression Analysis

	LRGDP	LGEXP	LEXTD	LETDS	LCONS	LCAP	LTB
Mean	10.981	10.914	11.035	10.013	11.511	10.635	9.6072
Median	10.983	10.802	11.496	10.434	11.311	10.518	10.241
Maximum	11.163	12.241	12.689	11.454	12.789	11.66	12.581
Minimum	10.796	9.774	8.5439	7.9556	10.202	9.7007	0.0637
Std. Dev.	0.1056	0.8719	1.3303	1.1311	0.915	0.7157	3.2995
Observations	32	32	32	32	32	32	32

Source: Author's Computation with data derived from CBN Statistical bulletin using Econometric Views 6.0

Table 2. Augumented Dickey Fuller test (ADF)*

Variables	Levels		First Difference	
LRGDP	-0.29167	-1.54683	**-5.2669**	**-5.45135**
LGEXP	-1.12775	-1.88102	**-7.01849**	-1.27064
LEXTD	-1.90845	-1.46016	**-6.49642**	**-7.08364**
LETDS	-0.97205	-1.94274	**-5.73354**	**-5.666377**
LCONS	-0.49526	-1.81949	**-3.54777**	**-3.48826**
LCAP	-0.182886	-1.282249	**-3.334795**	**-3.334701**
LTB	-1.9065	-1.20687	**-8.94461**	**-7.89756**

Source: Author's Computation with data derived from CBN Statistical bulletin using Econometric Views 6.0

*The Null Hypothesis is the presence of unit root. Model 1 includes a constant while Model 2 includes a constant and a linear time trend. Lags were selected based on Schwarz Information Criterion. Figures in bold are significant at either 1% or 5%.

Table 3. Phillips-Perron Test (PP)*

Variables	Levels		First Difference	
LRGDP	-1.54683	-1.68468	**-5.31906**	**-5.44842**
LGEXP	-0.04732	-1.95932	**-6.87348**	**-6.84963**
LEXTD	-1.22609	-1.01627	**-6.54706**	**-10.2389**
LETDS	-1.04523	-1.99695	**-5.80387**	**-6.11814**
LCONS	-0.51216	-1.51918	**-3.60633**	**-3.5469**
LCAP	-0.34107	-1.58393	**-3.38141**	**-3.37395**
LTB	-4.9642	-6.23084	**-17.2121**	**-16.5578**

Source: Author's Computation with data derived from CBN Statistical bulletin using Econometric Views 6.0

*The Null Hypothesis is the presence of unit root. Model 1 includes a constant, while Model 2 includes a constant and a linear time trend. Lags were selected based on Schwarz Information Criterion. Figures in bold are significant at either 1% or 5%.

Table 4. Johansen Cointegration Test

Trend assumption: Linear deterministic trend (restricted)				
Series: LRGDP LGEXP LEXTD LETDS LCONS LCAP LTB				
Unrestricted Cointegration Rank Test				
Hypothesized		Trace	5 Percent	1 Percent
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Critical Value
None **	0.901208	184.0619	146.76	158.49
At most 1	0.692862	112.3051	114.9	124.75
At most 2	0.663385	75.71084	87.31	96.58
At most 3	0.501052	41.95756	62.99	70.05
At most 4	0.335285	20.40468	42.44	48.45
At most 5	0.134955	7.744366	25.32	30.45
At most 6	0.099536	3.250192	12.25	16.26
*(**) denotes rejection of the hypothesis at the 5%(1%) level				
Trace test indicates 1 cointegrating equation(s) at both 5% and 1% levels				
Hypothesized		Max-Eigen	5 Percent	1 Percent

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No. of CE(s)	Eigenvalue	Statistic	Critical Value	Critical Value
None **	0.901208	71.75688	49.42	54.71
At most 1	0.692862	36.59423	43.97	49.51
At most 2	0.663385	33.75328	37.52	42.36
At most 3	0.501052	21.55288	31.46	36.65
At most 4	0.335285	12.66032	25.54	30.34
At most 5	0.134955	4.494174	18.96	23.65
At most 6	0.099536	3.250192	12.25	16.26
*(**) denotes rejection of the hypothesis at the 5%(1%) level				
Max-eigenvalue test indicates 1 cointegrating equation(s) at both 5% and 1% levels				

Source: Author's Computation with data derived from CBN Statistical bulletin using Econometric Views 6.0

Table 5. Long run Static Regression

Dependent Variable: LRGDP				
Method: Least Squares				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.612584	2.108233	2.662222	0.0139
LGEXP	0.119653	0.06269	1.908635	0.0689
LEXTD	-0.01519	0.016035	-0.94741	0.3533
LETDS	-0.02103	0.021973	-0.95701	0.3485
LCONS	-0.08145	0.054152	-1.50408	0.1462
LCAP	0.085829	0.076417	1.123175	0.273
LTB	0.004534	0.001965	2.307931	0.0303
LRGDP(-1)	0.403028	0.226206	1.781683	0.088
R-squared	0.952116	Mean dependent var		10.98385
Adjusted R-squared	0.937542	S.D. dependent var		0.106367
S.E. of regression	0.026583	Akaike info criterion		-4.19947
Sum squared resid	0.016253	Schwarz criterion		-3.82941
Log likelihood	73.09184	F-statistic		65.3318
Durbin-Watson stat	1.575324	Prob(F-statistic)		0

Source: Author's Computation with data derived from CBN Statistical bulletin using Econometric Views 6.0

Table 6. Overparametrized Growth Model

Dependent Variable: D(LRGDP)				
Method: Least Squares				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001927	0.021857	0.088168	0.9322
D(LGEXP)	0.049449	0.103508	0.477734	0.6474
D(LGEXP(-1))	-0.24854	0.113632	-2.18721	0.0649
D(LGEXP(-2))	-0.12857	0.100265	-1.28234	0.2406
D(LEXTD)	-0.03594	0.029254	-1.22865	0.2589
D(LEXTD(-1))	-0.01586	0.043769	-0.36226	0.7278
D(LEXTD(-2))	-0.00163	0.03622	-0.04513	0.9653

D(LETDS)	0.015292	0.052998	0.288546	0.7813
D(LETDS(-1))	0.033631	0.047122	0.713715	0.4985
D(LETDS(-2))	0.039705	0.055507	0.71532	0.4976
D(LCONS)	0.01333	0.132107	0.100901	0.9225
D(LCONS(-1))	-0.03233	0.136189	-0.23739	0.8192
D(LCONS(-2))	0.14103	0.10523	1.340209	0.222
D(LCAP)	0.12655	0.167721	0.754526	0.4751
D(LCAP(-1))	0.08982	0.180969	0.49633	0.6349
D(LCAP(-2))	-0.06299	0.126948	-0.49622	0.6349
D(LTB)	0.001837	0.002824	0.650388	0.5362
D(LTB(-1))	-0.00488	0.00592	-0.824	0.4371
D(LTB(-2))	-0.00665	0.004974	-1.33691	0.2231
D(LRGDP(-1))	0.715415	0.379925	1.883046	0.1017
D(LRGDP(-2))	0.622181	0.522988	1.189666	0.273
ECM(-1)	-1.09058	0.40477	-2.69431	0.0309
R-squared	0.816913	Mean dependent var		0.005621
Adjusted R-squared	0.267652	S.D. dependent var		0.032908
S.E. of regression	0.028162	Akaike info criterion		-4.20586
Sum squared resid	0.005552	Schwarz criterion		-3.1686
Log likelihood	82.9849	F-statistic		1.487294
Durbin-Watson stat	2.0554	Prob(F-statistic)		0.306826

Source: Author's Computation with data derived from CBN Statistical bulletin using Econometric Views 6.0

Table 7. Error Correction (Model) Estimates

Dependent Variable: D(LRGDP)				
Method: Least Squares				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.0115	0.007908	-1.4544	0.1631
D(LGEXP)	0.134385	0.046087	2.915882	0.0092
D(LGEXP(-1))	-0.09242	0.051325	-1.80062	0.0885
D(LEXTD)	-0.0272	0.014087	-1.93118	0.0694
D(LETDS(-2))	-0.034269	0.026134	1.911284	0.1062
D(LCONS(-2))	0.073849	0.054442	1.356477	0.1917
D(LTB)	0.003231	0.001222	2.644361	0.0165
D(LTB(-2))	-0.004	0.001275	-3.1354	0.0057
D(LRGDP(-1))	0.39533	0.23698	1.668201	0.1126
D(LRGDP(-2))	0.580133	0.179209	3.237189	0.0046
ECM(-1)	-0.71968	0.25958	-2.77249	0.0126
R-squared	0.70929	Mean dependent var		0.005621
Adjusted R-squared	0.547784	S.D. dependent var		0.032908
S.E. of regression	0.02213	Akaike info criterion		-4.50211
Sum squared resid	0.008815	Schwarz criterion		-3.98348
Log likelihood	76.28061	F-statistic		4.391734
Durbin-Watson stat	1.974465	Prob(F-statistic)		0.003176

Source: Author's Computation with data derived from CBN Statistical bulletin using Econometric Views 6.0

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Table 8. Pairwise Granger Causality Tests

Sample: 1975 2006			
Null Hypothesis:	Obs	F-Statistic	Probability
LEXTD does not Granger Cause LRGDP	30	2.29712	0.12138
LRGDP does not Granger Cause LEXTD		2.18921	0.13301
LETDS does not Granger Cause LRGDP	30	2.81664	0.07886
LRGDP does not Granger Cause LETDS		1.1665	0.32784
LETDS does not Granger Cause LEXTD	30	0.82031	0.4518
LEXTD does not Granger Cause LETDS		8.97173	0.00116

Source: Author's Computation with data derived from CBN Statistical bulletin using Econometric Views 6.0

Table 9. Variance Decomposition of LRGDP

Period	S.E.	LRGDP	LGEXP	LEXTD	LETDS	LCONS	LCAP	LTB
1	0.033192	100	0	0	0	0	0	0
2	0.049418	91.11665	0.915511	0.342866	0.427933	5.291198	0.065617	1.840224
3	0.057041	88.26876	2.540939	0.816846	0.486743	4.450459	0.87805	2.558204
4	0.064054	87.15613	2.337762	2.861194	0.477087	3.579416	1.100926	2.487487
5	0.066874	86.79044	2.544406	3.09134	0.471247	3.309603	1.365353	2.427616
6	0.067957	85.94199	2.856667	3.162126	0.492201	3.512856	1.422578	2.611583
7	0.068487	84.9885	3.484503	3.114774	0.509978	3.813367	1.449634	2.639248
8	0.069032	83.72844	3.855264	3.116031	0.538715	4.61804	1.433682	2.709822
9	0.069728	82.06674	4.445931	3.417101	0.561664	5.26737	1.434987	2.806206
10	0.070449	80.4045	4.902608	3.792673	0.61739	5.828963	1.425857	3.02801

Source: Author's Computation with data derived from CBN Statistical bulletin using Econometric Views 6.0

Table 10. Variance Decomposition of LEXTD

Period	S.E.	LRGDP	LGEXP	LEXTD	LETDS	LCONS	LCAP	LTB
1	0.294953	12.10787	0.127241	87.76489	0	0	0	0
2	0.469326	22.15759	1.339929	49.76596	4.636274	4.765601	0.172923	17.16173
3	0.526626	20.71932	5.09759	48.95243	5.024113	4.489415	0.689835	15.0273
4	0.546476	19.41981	5.892314	48.41018	5.196043	5.433335	0.644626	15.00369
5	0.592059	22.58715	5.362493	48.68731	4.458503	4.859786	0.889559	13.15519
6	0.619798	26.12915	4.968975	46.64368	4.210935	4.719201	0.813197	12.51486
7	0.65223	29.28998	4.859003	45.45946	3.993507	4.27385	0.73825	11.38594
8	0.678458	31.1861	4.512834	44.59789	3.865389	4.213662	0.687167	10.93695
9	0.705105	32.58322	4.312149	44.52982	3.658639	3.94121	0.643232	10.33174
10	0.723186	33.57024	4.104732	44.17619	3.589093	3.875534	0.616167	10.06804

Source: Author's Computation with data derived from CBN Statistical bulletin using Econometric Views 6.0

Table 11. Variance Decomposition of LETDS

Period	S.E.	LRGDP	LGEXP	LEXTD	LETDS	LCONS	LCAP	LTB
1	0.133329	0.005638	5.750424	0.2797	93.96424	0	0	0
2	0.231081	4.376371	5.984459	30.5609	33.95153	1.46645	6.040532	17.61976
3	0.324266	7.30512	3.387716	47.19837	18.58574	2.411609	3.312391	17.79905
4	0.377636	13.7366	2.524872	45.23245	16.81915	2.298928	2.722593	16.66541
5	0.414515	18.22489	2.295364	44.83286	14.69141	3.186003	2.3068	14.46267
6	0.442396	21.13681	2.015254	44.92472	12.90061	3.998435	2.095221	12.92895
7	0.475366	25.90898	1.970052	43.82844	11.21831	3.822031	1.824113	11.42807
8	0.50485	29.67888	2.157558	42.14701	10.26927	3.513301	1.618398	10.61558
9	0.52823	31.3819	2.19775	41.91553	9.658401	3.23884	1.481631	10.12595
10	0.547255	32.28136	2.067126	42.17342	9.152939	3.104631	1.381428	9.839099

Source: Author's Computation with data derived from CBN Statistical bulletin using Econometric Views 6.0

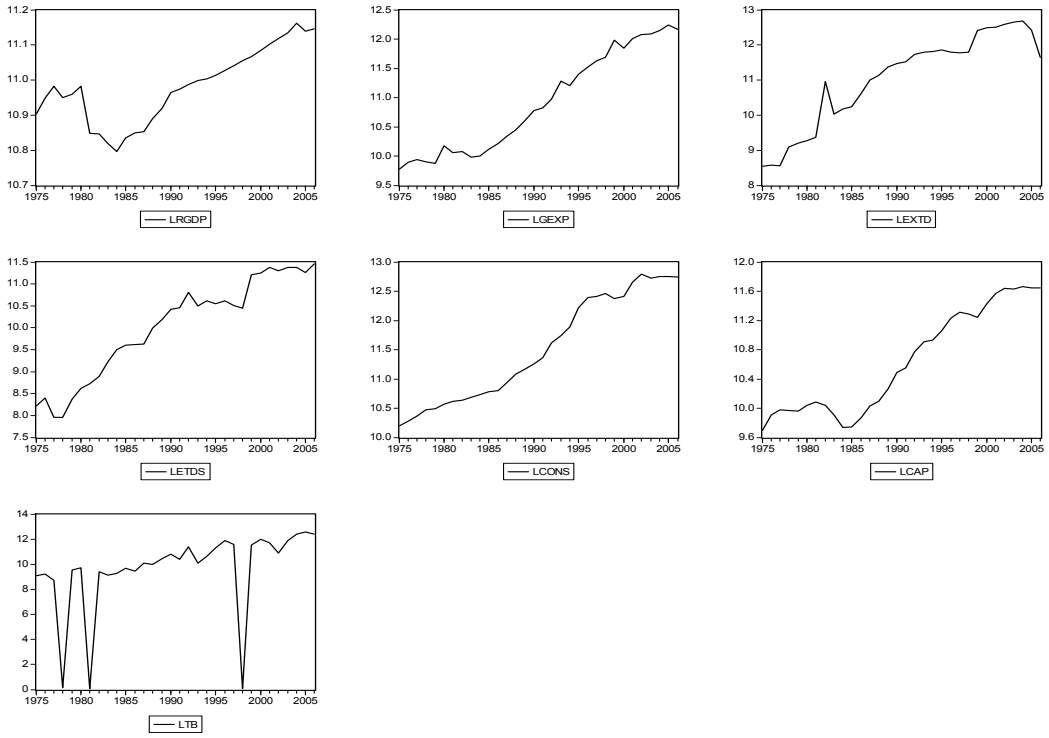

Figure 1.