

Causal Nexus between External Debt and Economic Growth: The Nigerian Case

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Abstract: This study investigates the relationship between economic growth, external debt stock and external debt service payments of Nigeria within the context of econometric exposition over the period 1970-2014. These variables were estimated using the vector error correction models (VECM) and Granger causality technique. The results reveals both short run and long run relationships. Findings from the results show that there exist bi-directional causality going from (i) external debt stock and economic growth (ii) external debt service payments and economic growth and (iii) unidirectional granger causality going from external debt stock and external debt service payments.

Keywords: Economic growth, External debt, Vector Error Correction, Granger Causality.

1. INTRODUCTION

The attainment of reasonable and sustainable level of growth remains the cardinal objective of every government. This objective, however, requires adequate mobilization of domestic resources, particularly saving for productive investment. In the developing countries, the rate of capital formation is practically low and inadequate to prosecute productive development. Less developed countries suffered from constant supply of investable funds. The financial institutions (both capital and money markets) are not fully developed for the supply of investable funds. In order to supplement saving-investment gap lacuna, many of these countries resorted to external sources for procuring financial resources to address the question of capital scarcity and epileptic domestic saving (Malik et al, 2010; Aluko and Arowolo, 2010).

Several positions were upheld in the literature on the desirability of external debt in developing countries. A number of studies have posited that "growth with debt" yielded positive externality if the borrowed money were channelled to productive segments rather than frivolous and "death weight" projects (projects that yield zero economic returns). The effectiveness of the borrowed capital requires that the expected rate of return should outweigh the cost incurred on its procurement. If external debts were efficiently utilized, it would create multiplier effects by opening the ailing sectors for development in terms of raising employment window, provision of infrastructure base, improved exchange rate and fostering better and favourable terms of trade. (Hameed et al., 2008; Pascal, 2010; Malik et al.,2010; Aluko and Arowolo, 2010). Nigeria and several other Sub-Saharan African countries (SSA) never utilized the external capital for productive purposes. Apart from the fact that the money borrowed were badly spent, the debt service obligation imposes hardship on macroeconomic performance as they were serviced in foreign currencies (Serieux and Yiagadeesen, 2001; Aluko and Arowolo, 2010). Study conducted by Were (2001) have shown that huge external debt does not necessarily result into stunted growth. The problem is that nations, often times failed to channel the contracted loans into productive projects and this constitute a growth drag. Moreover, the inability to regularly service the debt elongates the spectrum of the debt, thus imposes a number of constraints on domestic growth variables.

External debt first manifested in Nigeria in 1958 when a loan of US\$28 was contracted for railways construction from the World Bank. Also in 1964, a sum of US\$13.1 was contracted from the Paris Club for the construction of Niger dam. The first major borrowing came up in 1978 when a sum US1billion was collected from the International Capital Market (Adesola,2009). During early 1980's and up till 2009, Nigeria's external debt stock became so alarming and worrisome. Nigeria's debt stock stood at ₦99.6 million during 1960/1969. It increased sharply to ₦517.2 million during 1970/1979.

The increase was sustained up till the period 2000/2009. During the same period, GDP correspondingly increased from ₦2,828.5 million to ₦14,005,285.8 million during the period 1960/1969 and 2000/2009 respectively. Nigeria's debt grew from 20.9% to 79.1% during the period 1960/1969 and 1980/1989. Between 1990/1999 and 2010/2014, Nigeria's external debt growth declined sharply from 42.5% to a negative value of -7.1%. During the same period, the GDP grew from 6.1% to 19.4%. The growth was sustained up till 1990/1999 before it declined from 24.2% to 8.5% during the period 2000/2009 and 2010/2014 (see Table 1). Table 1 further show that the growth rate of external debt was more than that of GDP growth rate.

Table 1: Average External Debt and GDP, 1960-2014

Year	1960/69	1970/79	1980/89	1990/99	2000-2009	2010-2014
External Debt(N'm)	99.6	517.2	57229.6	759379.9	2393566.0	311043.7
GDP(N'm)	2828.5	20273.9	85721.2	1603638.6	14005285.8	34215177.4
Debt growth (%)	20.9	35.6	79.1	42.5	-7.5	-7.1
GDP growth(%)	6.1	30.9	19.4	34.5	24.2	8.5

Source: Central Bank of Nigeria Statistical Bulletin, 2014

There are quite a number of approaches that have been used to explain the relationship between external debt and economic growth. Some studies used Granger Causality technique, while others have employed the combinations of Dynamic Arellano-Bond estimation and Vector Error Correction technique (Al-Zeaud and Al-awawdeh,2014; Hussain et.al 2015; Saad, 2012 and Korkmaz, 2015). Similar studies, in Nigeria are very scanty, limited in scope and fell short of standard estimation technique (Boboye and Ojo, 2012; Ogunmuyiwa, 2011). This current work extended the scope of previous studies in Nigeria with the help of high dimensional time series data for the period 1970-2014 within the context of Vector Error Correction Mechanism and Granger Causality framework.

2. LITERATURE REVIEW

The relationship between external debt and economic growth remains an unsettled issue. While some studies posited that external debt catalyzed economic growth (see Fayissa and El-Kaissy,1999;Moreir,2003; Javed and Sahinoz,2005; Baker and Hasan,2008), others contended that external debt exerted hardship on economic growth by constraining domestic investment(Chowdhury,2001;Were,2001;Karagol,2002;Pattilloet.al,2004;Schclarek,2004;

Maier,2005;Gebrekidan,2006;Dogruel,2007;Hameed,2008; Choong et al, 2010; Saad,2012).

The rationale behind external debt is to raise the quality economic growth and development of countries that are deficient in capital resources. Escalation in the debt size and inability to service it as at when due, poses serious threat to the economy. Policy makers and economists have intensified research machinery towards investigating the implication of external debt burden on the economies of debtor nations. This have generated divergent views.

The effect of external debt in Nigeria has generated mixed outcomes. Audu (2004) carried out an empirical investigation on the impact of external debt on economic growth in Nigeria using time series data covering the period 1970 to 2002. The study employed Johansen Cointegration technique and Vector Error correction method to estimate the model. Findings from the study showed that debt service burden had significant adverse effect on economic growth and at the same time constrained public investment. Ogunmuyiwa (2011) investigated whether external debt raises growth structure in Nigeria using time-series data from 1970 to 2007. The estimation technique employed include: Granger causality test, Johansen co-integration test and Vector Error Correction Method (VECM). Findings from the results revealed that causality does not exist between external debt and economic growth in Nigeria.

In another study carried out by Sulaiman et al.(2012) on the effect of external debt on economic growth in Nigeria, time series data which covered the period from 1970 to 2010 was employed. An econometric technique was used to estimate the model developed. The cointegration results showed a long run relationship among the variables. However, the ECM estimation confirmed a positive relationship between external debt and economic growth.

Systematic analysis of the impact of external debt with its servicing requirements on growth has assumed a cross country dimension. The empirical picture of countries would provide a yardstick for measuring economic performance of debtor countries. In that regard, Ayadi and Ayadi (2008) examined the impact of external debt along with its servicing

requirements on growth using Nigeria and South Africa as case study. The study employed the Neoclassical growth model for description of activities and was analyzed through Ordinary Least Square (OLS) and Generalized Least Square (GLS) techniques. Findings from the study revealed that debt and its servicing requirement has a negative impact on the economic growth both in Nigeria and South Africa. Faraji and Makame(2013) study on the nexus between external debt and growth in Tanzania showed a dramatic outcome. From the time series data which covered the period 1990 to 2010, the cointegration test showed no long run relationship between external debt and GDP. The parsimonious ECM results showed that external debt and debt service variables have significant impact on GDP growth.

Safdari and Mehrizi (2011) analyzed external debt and economic growth in Iran using five variables (GDP, private investment, public investment, external debt and imports).The study employed time series data which covered the period 1974 to 2007. The estimation was done using vector autoregressive (VAR) technique. The results showed that external debt has a negative effect on GDP while private investment and public investment has a positive relationship with GDP. Similarly, Ejigayehu (2013) investigated the effect of external debt on economic growth of eight selected heavily indebted African countries (Benin, Ethiopia, Mali, Madagascar, Mozambique, Senegal, Tanzania and Uganda) through the debt overhang and debt crowding out effect. The ratio of external debt to gross national income was used as proxy for debt overhang and debt service export ratio as proxy for debt crowding out. Employing a panel data which covered the period 1991 to 2010, the empirical findings showed that external debt affects economic growth through debt crowding out rather than debt overhang in all the countries selected for the study.

3. METHODOLOGY

This study employs cointegration analysis and error correction models to analyze the relationship the Real Gross Domestic Product (Rgdp), External debt stock (ExTDs) and External debt service payments (ExTDp). We therefore proceeded to investigate the causality between each pair of the variables using Granger causality approach. Most time series data are non-stationary at their levels. Using such series for estimation often results into spurious regression. For this reason, stationarity tests would be carried out to ascertain the validity of the data used. To that extent, two complementary tests shall be conducted: Augmented Dickey-Fuller test and Phillips-Perron tests. The ADF test is employed using the ordinary least square (OLS) estimation of model (1):

$$\Delta y_t = a_0 + a_1 y_{t-1} + \sum_{i=1}^p \theta_i \Delta y_{t-i} + u_t \quad (1)$$

where y_t is the time series, Δ is the first difference operator, u_t is the error term with zero mean and constant variance, and $a_0, a_1, \theta_i (i = 1, \dots, p)$ are parameters to be estimated. The non rejection of the null hypothesis $H_0 = a_1 = 0$ implies that y_t is nonstationary series. In this case differences are necessary to reach stationarity.

Having ascertained the order of integration of the series, we therefore proceeded to test for the long run co-movements among the variables using Johansen cointegration technique. The number of cointegrating vectors can be ascertained through maximum-likelihood and trace tests. If the variables were found cointegrated, two different kinds of equations can be set up: the long run equation and short run or vector error correction equation. In this study, we use Boboye and Ojo(2012) and Saad(2012) specification to analyze the relationship between external debt and economic growth in Nigeria. The model is given as specified in equation (2) below.

$$Rgdp_t = f(ExTDs_t, ExTDp_t) \quad (2)$$

The long run equation is specified as:

$$\ln Rgdp_t = \omega_1 + \omega_2 \ln ExTDs_t + \omega_3 \ln ExTDp_t + U_t \quad (3)$$

where $\ln Rgdp_t, \ln ExTDs_t$ and $\ln ExTDp_t$ denotes the natural logarithms of real gross domestic product, external debt stock and external debt service payment respectively. U_t represents the stochastic error term with zero mean value with constant variance.

The short run equations or vector error correction representation is specified as:

$$\Delta \ln Rgdp_t = \alpha_1 + \sum_{i=1}^p \theta_{1i} \Delta \ln ExTDs_{t-i} + \sum_{i=1}^p \lambda_{1i} \Delta \ln ExTDp_{t-i} + \beta_1 Etc_{t-1} + e_{1t} \quad (4)$$

$$\Delta \ln ExTDs_t = \alpha_2 + \sum_{i=1}^p \theta_{2i} \Delta \ln Rgdp_{t-i} + \sum_{i=1}^p \delta_{2i} \Delta \ln ExTDp_{t-i} + \beta_2 Etc_{t-1} + e_{2t} \quad (5)$$

$$\Delta \ln ExTDp_t = \alpha_3 + \sum_{i=1}^p \theta_{3i} \Delta \ln Rgdp_{t-i} + \sum_{i=1}^p \delta_{3i} \Delta \ln ExTDs_{t-i} + \beta_3 Etc_{t-1} + e_{3t} \quad (6)$$

Where Δ denotes the difference parameter, p is the number of lags, *Etc* is the error terms obtained from the long run relationship and e_{1t} ($i=1,2,3$) is the stochastic error term with zero mean value with constant variance.

In order to ascertain the causal relationship between external debt and economic growth, we employ Granger causality test developed by Granger (1969). Granger (1988) posited that causality tests could only be useful and valid if cointegration exists among variables. Therefore, it becomes a necessary condition to first check for co integrating properties of variables before embarking on causality test. With this information, we apply the standard Granger causality test on equations (4), (5) and (6).

4. DATA SOURCE

All data used for estimation in this study were obtained from the World Bank Development Indicators CD-ROM (2014). The data spanned the period 1970 to 2014. The data were transformed into logarithm to reduce them to the same base.

5. EMPIRICAL RESULTS AND DISCUSSION

The objective of this study is to establish the causal relationship between external debt stock, external debt service payment and economic growth in Nigeria. Within the framework of econometric methodology presented in section 3, we examine the cointegration properties of the variables in our model. The variables used in the model were subjected to stationarity test using Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. The results of the unit root tests for individual time series are reported in Table 2. An inspection of the figures in table 2 reveals that each series were found to be stationary at first difference at the 5% level of significance. Based on this result, we proceed to test for cointegration among the stationary series of the same order.

Table 2: Results of ADF and PP Tests

Variables	Augmented Dickey Fuller Test		Phillips-Perron Test	
	Level	First Difference	Level	First Difference
Ln Rgdp	-2.6164	-6.4630**	-2.4913	-11.8833**
Ln ExTDs	-1.8369	-4.6814**	-1.8644	-4.4495**
Ln ExTDp	-1.7568	-6.5837**	-2.9926	-6.1542**

Note ** represent statistical significance at 5% level of significance.

Source: Computed from E-View 8.0

The optimal lag length for the model was found to be two (2) based on the information provided by Akaike Information Criterion (AIC) on the lag length. Cointegration test relies on two results: Trace test and Maximum Eigen-Value test. However, the Johansen methodology is a VAR based approach. The results based on VARs were found to be sensitive to lag length used. Moreover, the variables lag length were chosen by minimizing the Akaike information criterion. The cointegration test results are reported in Table 3. The table indicated that both the trace and max-eigen value statistic show the existence of one cointegrating equation for economic growth, external debt stock, external debt service payment and economic growth at 5% level of significance.

Table 3. Results of Cointegration tests

Hypothesised	Eigenvalue	Trace	0.05	Max-Eigen	0.05
No. of CE(s)		Statistic.	Critical Value	Statistic	Critical Value
None*	0.26775	29.797	20.872	21.1316	12.776
At most 1	0.15583	8.0955	15.495	6.9455	14.264
At most 2	0.02766	1.1499	3.8414	1.1499	3.8410
Normalized Cointegrating Equation					
$\ln Rgdp = -2.8695 \ln ExTds + 5.4074 \ln ExTDp$					
(1.2358) (1.6579)					

Trace and Max-eigen value test indicates one (1) cointegration at 0.05 level.

Figures in parenthesis are the t-statistics.

Source: Computed from E-View 8.0

From the result presented in table 3, the normalized cointegrating equation shows that in the long run, external debt service payments affects economic growth positively. Similarly, an examination of the result show that external debt stock influenced economic growth negatively. The cointegration tests indicated that a long-run relationship exists among external debt stock, external debt service payments and economic growth. However, the long run estimated coefficients are presented in Table 4 below. Although not statistically significant, the coefficient of external debt service payments positively influenced economic growth while that of external debt stock negatively influenced economic growth. This result corroborated the normalized cointegrating results. We therefore conclude that high debt stock tends to retard economic growth.

Table 4: Long run Model Estimation

Dependent Variable: <i>lnRgdp</i>			
Variable	Coefficient	Standard Error	t-value
<i>Constant</i>	12.12026	1.976938	6.130825**
<i>lnExTDs</i>	-0.370361	0.226380	-1.636015
<i>lnExTDp</i>	0.132248	0.230801	0.572997

Note : ** indicate the rejection of the null hypothesis at 5% level of significance.

Source: Computed from E-View 8.0

Although, the cointegration test reported one cointegrating vector. We find it imperative to carry out multivariate Granger causality tests based on vector error correction models (VECM). All variables in the cointegrating equation are assumed endogenous in a VAR structure. The VECM extends this by making use of differenced data and lagged differenced data of the chosen variables in a VAR structure. The VECM contains vital information on the causal relationship and the dynamic interaction among the cointegrating variables. The error correction term (Etc) which captures the short run dynamics of the model was included in the estimation. The granger causality test results built on VECM is presented in Table 5 below.

Table 5: Granger Causality Test Results built on VECM

Dependent Variable	Short run lagged differences			
	$\Delta \ln Rgdp$	$\Delta \ln ExTDs$	$\Delta \ln ExTDp$	Etc_{t-1}
$\Delta \ln Rgdp$	-	-0.380643 (0.359069)	0.261559 (0.181517)	-0.015074** (0.010697)
$\Delta \ln ExTDs$	0.107477 (0.071885)	-	-0.038421 (0.054117)	-0.004352*** (0.005164)
$\Delta \ln ExTDp$	-0.107421** (0.004432)	0.740102** (0.289561)	-	-0.004015*** (0.009102)

Notes: values presented in the last column are the *ECT* estimated coefficients and values in parenthesis the t-values. All other values are the asymptotic Granger χ^2 -statistics. *, **, and *** indicate the statistical significance at the 10%, 5%, and 1% level of significance respectively and values in parentheses are the *p*-values.

Source: Computed from E-View 8.0

The granger causality tests shows that there exist bidirectional causality going from (i) external debt stock and economic growth (ii) external debt service payments and economic growth and unidirectional granger causality going from external debt stock and external debt service payments. The statistical significance of the *Etc* (error terms obtained from the long run relationship) for economic growth and external debt stock and external debt service payments implies that the obtained causalities have short run dynamic counterparts. From the results, we observed that a large proportion of foreign capital employed to boost domestic economy could raise domestic investment and catalyzed economic growth. However, a higher debt service payments could exert adverse effects on long term economic growth.

6. CONCLUSION

This study analyses empirically the causal relations among economic growth, debt stock and debt service payments, over a period of 44 years from 1970 to 2014. External debt has become an increasingly serious problem for Nigeria due mainly to its crowding out public finances because of the huge debt-service charges. In the early 1980's and up till 2009, Nigeria's debt stock amounted to ₦99.6 million during 1960/1969. It increased to ₦517.2 million during 1970/1979. The increase was sustained up till the period 2000/2009. During the same period, GDP also increased from ₦2,828.5 million to ₦14,005,285.8 million during the period 1960/1969 and 2000/2009 respectively. The debt grew in magnitude from 20.9% to 79.1% during the period 1960/1969 and 1980/1989. Between 1990/1999 and 2010/2014, the debt growth declined sharply from 42.5% to a negative value of -7.1%. During the same period, the GDP grew from 6.1% to 19.4%. The growth was sustained up till 1990/1999 before it declined from 24.2% to 8.5% during the period 2000/2009 and 2010/2014.

In order to clarify whether external debt stock, external debt service payment cause economic growth or vice versa, a vector autoregressive model is developed. Moreover, Granger causality technique is used to assess the direction of causation. The results showed bidirectional causality going from (i) external debt stock and economic growth (ii) external debt service payments and economic growth and unidirectional granger causality going from external debt stock and external debt service payments.

In summary, we observed that a large proportion of foreign capital employed to boost domestic economy could raise economic growth. However, a higher debt service payments could exert adverse effects on economic growth.

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