

Public Debt – Growth Dynamics: The Nigerian Experience (1980 – 2010)

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Abstract

The broad objective of this research is to investigate the debt – growth dynamics in Nigeria using time series data from 1980 – 2010. Based on co-integration and error correction setting, the relationship between economic growth and a set of economic fundamentals is estimated. The long run equilibrium values of the integrated and co-integrated variables are estimated as presented in the results of the study. The results of this study are consistent with existing empirical literature on the debt – growth relationship. Specifically, there is evidence of a significant negative relationship between public debt burden and economic growth. Secondly, the ratio of debt service to export was found to have negative and significant effect on economic growth. Against the above, it was recommended that embargo should be placed on new loan acquisition by state government and government parastatals unless where it is extremely important. In addition, concerted effort should be made towards timely loan repayment and servicing to melt down the negative effect or public debt on economic growth.

Keywords: Public debt, co-integration, debt overhang, economic growth, error correction.

Introduction

Empirical literature is replete with different studies which attempt to explore the validity of the debt overhang and the liquidity constraint hypothesis using different methodical approaches, and different data set. Different conclusions have evolved from such studies with some conforming while others contradict the existing position. This contribution is also an attempt to investigate the relationship between public debt and economic growth with Nigeria as a reference point.

There has been growing concern on the ever increasing fiscal imbalance in the economy of developing nations. The rising profile of fiscal deficit cannot sustain economic growth. It is against this problem of non-sustainability that several approaches have been fashioned to close the made gap in fiscal imbalance. External loan acquisition has become very handy in bridging this gap. In developing economies, the need to fast track economic growth has resulted in foreign debt acquisition at very high interest rate. There however seems to be a trade-off as debt repayment, debt servicing has become extremely problematic mainly due to the fact such loans were not used for the desired purpose.

Reliance on external debt for infrastructural development may not necessarily be counterproductive. It is the inability to channel the loan to developing long term infrastructural projects, problem of corruption and inappropriate documentation on the debt profile of the respective debtor countries that is the issue with external debt acquisition. The standard growth with debt hypothesis allows poor nations to acquire long term debt provided the cost of foreign borrowing is less than the expected return from the debt.

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However, even though the association between external debt and economic growth is a front burner in public discuss, it has not enjoyed robust empirical consideration with the few studies presenting mix results borne out of the different approaches, data set and methodology. The broad objective of this paper is to re-examine the public debt – growth dynamics against the backdrop of emerging explanatory variables and expensive macroeconomic data set. This study will help to bridge the knowledge gap by expanding the existing literature.

Statement of Research Problem

Nigeria has been generally agreed as a mono-product economy relying heavily on revenue from petroleum. Therefore, crisis in the oil market portends great danger for our domestic economy. In attempt to complement available domestic resources, successive governments have acquired huge sums of external debt to finance different national development plans.

It is a known fact that external debt repayment and debt servicing both have negative effect on economic growth. If the essence of debt acquisition is to finance development projects, it becomes worrisome why external debts will impact negatively on economic growth. The present situation run contrary to economic theory on the debt-growth dynamics which posits that due to deficit of capital in developing nations, a certain level of external leverage should have a positive effect on economic growth since countries at early stages of development are open to investment opportunities with huge return on capital which is however dependent on the stability of the country. It is in this vein that it has become justifiable to carry out empirical investigation into the relationship between public debt and economic growth in Nigeria. Against the above backdrop, this current study will help to address the following probing questions.

1. Does external debt have any significant relationship with economic growth in Nigeria?
2. Is there a relationship between debt servicing and economic growth in Nigeria?
3. Does openness affect economic growth in Nigeria?

The broad objective of this study is to investigate the relationship between external debt and economic growth in Nigeria. Other sub objectives are to (a) investigate the relationship between debt servicing and economic growth, (b) examine the relationship between openness and economic growth.

Review of Empirical Literature

The public debt – growth dynamics has enjoyed a robust empirical attention spanning a period of over three decades with a mixed empirical literature polarized along two distinct positions of negative debt – growth link and positive debt – growth relationship. On the studies which found a negative relationship between public debt and economic growth.

Geiger (1990) used a lag distributional model to assess the impact of external debt on economic growth for none South American countries for a period of 12 years (1974 – 1986). The result of the study found a statistically significant, inverse relationship between debt and economic growth. In the same vain, Iyoha (1990) used a simulation approach to investigate the impact of external debt on economic growth in sub-Saharan African countries using small macroeconomic model estimate for 1970 to 1994. It was found that mounting external debt depresses investment through a crowding out effect and disincentive effect. He tested the effect of 5%, 10% 20% and 30% reduction in debt stock on investment and economic growth one year after. It was found that debt reduction will have a significant positive effect on growth. To be specific, it was observed that a 20% debt stock reduction will increase investment and GDP by 18% and 1% respectively.

Cunningham (1993) examined the association between debt burden and economic growth for sixteen heavily indebted countries from 1971 to 1987. The study concluded that the growth of a nation's debt burden had a negative effect on economic growth during 1971 to 1979. In addition to the effect of debt burden on economic growth, it was observed that countries with culture of debt servicing tends to experience growth in GDP compared to others without the culture of debt servicing. Amoako – Audu (1996) have investigated the relationship between external debt servicing and economic growth and exports for 35 African countries. Granger causality was used to analyse the interrelationship between exports, GDP growth and foreign debt servicing during the period 1971 to 1990. It was revealed that there exists a unidirectional and positive relationship between debt service and GDP growth after excluding export revenue growth.

Deshpande (1997) attempted to explain the debt overhang hypothesis by investigating the investment expendable of 13 highly invested nations e.g. Nigeria, Argentina, Ivory Coast, Egypt, Honduras, Kenya, Sierra Leone, Venezuela, Zambia, Mexico, Morocco, Perle and Phillipines between 1971 to 1991 broken down into two periods of 1975 to 1983, 1984 to 1991. Ordinary Least Square (OLS) estimated of panel data was employed in the analysis. It was found that external debt exercises a negative effect on investment. Norisset (1991) examined the effect of debt reduction within a macroeconomic framework and tested various direct and indirect relationships between external debt, investment and economic growth using data from Argentina during 1962 – 1986 and employed the three stage least square regression analysis. The result shows that the effect of 30% debt relief was 2.43% and 5.40% on GDP for the first and fifth year respectively. Chowdbury (1994) using a system of simultaneous equations, investigated the direct and indirect and full effect of external debt on GDP using a panel data from 1970 to 1988 on selected Asia and Pacific countries. The result of the structural model revealed a small relationship between public and private external debt on the GDP level. The result negates the debt overhang argument.

Meturally and Tamaschke (1994) investigated the effect of debt servicing on capital flows and growth for three North African nations using two stage ordinary least square technique. They argued that the one way relationship cannot fully capture the effect of debt servicing and capital flow on economic growth. The result of the study revealed that the increase in debt servicing ratio affects economic growth negatively. It was discovered that debt servicing reduces potential for economic growth thereby worsening the debt problem in highly indebted countries. The result also revealed a positive relationship between capital inflows and debt-growth link.

Palttilo *et al* (2001) using panel data from 1969 to 1998 for 93 developing countries, found a negative relationship between external debt and economic growth for a net present value of debt levels above 35.48% of GDP. The direction of this finding is that at a certain level, external debt impacts positively on economic growth in this case, below 35 and once, the level extends beyond this threshold, it produces a negative impact. In the same vain, Clements *et al* (2003) found a turning point of 20-25% of GDP, while investigating the external debt – growth dynamics for 55 low income countries over the period 1970 to 1999.

Schlareek (2004) found a linear negative impact of external debt on per capital growth in a panel data of 59 developing countries over a period of 1972 to 2002. Karagol (2002) investigated the long and short run relationship between economic growth and external debt service for Turkey from 1956 to 1996. The study employed multivariable co-integration technique and also used a standard production function mode. The vector auto-regression estimates of the system revealed a co-integrating relationship. In the long run, debt service was found to be negatively related to economic growth. The study found a unidirectional causality running from debt service to economic growth. Were (2001) using time services data from 1970 to 1995, analysed the debt overhang problem in Kenya and tried to examine

its impact on economic growth. The result of the study did not find any adverse impact of debt servicing on economic growth. However, it confirmed some crowding-out-effect on private investment.

Adegbite, Ayadi and Ayadi (2008) investigated the impact of external debt on economic development in Nigeria based on neoclassical growth model and employed the ordinary least square (OLS) regression technique. The study found a negative impact of external debt and debt servicing requirement on economic growth. They also established the non-linearity of the relationship because at certain level of inflation, the negative impact became positive. El-Mahdy and Torayeh (2009) investigated the public debt – growth dynamics in Egypt between 1980 – 2006 using co-integration. The effect of the study revealed a robust, negative impact on growth in Egypt. They also employed algebraic analysis to examine the issue of sustainability and discovered that the path recently shows some level of sustainability.

Qureshi and Ali (2006) investigated the relationship between public debt and economic growth in Pakistan over the period 1981 to 2008. They discovered that a robust negative relationship exists between public debt and economic growth in Pakistan. In the same vein, Checherita and Rother (2010) using a sample of 112 euro area countries over 1970 to 2008, found a non-linear impact of debt on per capital real GDP growth with a turning point at 90-100% of GDP, beyond which the relationship has a deleterious impact on long run growth.

Remhert and Rogolf (2010) in a sample of 20 developed countries between 1990 – 2009, using a simple correlation statistics, found a weak relationship between government debt and economic growth for debt to GDP ratio below a threshold of 90% and above 90%, the median growth rate decreased by 1% and the average by considerably more. Ugo and Presbitero (2012) focused on OECD countries and used instrumental variable approach to investigate the relationship between public debt and economic growth. The result was consistent with the existing negative relationship in empirical literature. The study reported that the relationship broke down when the instrument debt with a variable that captures valuable effects caused by the interaction between foreign currency debt and exchange rate volatility.

Research Methodology

Data used in this study is basically secondary in nature were obtained from Central Bank of Nigeria publications for the respective years, Debt Management Office (MDO), National Bureau of Statistics and other related Journals. Time Series data from 1980 to 2010 were sourced on the variables of interest.

Estimation Procedure

Time series data have unit root and this can lead to spurious result when the ordinary least square econometric technique is used to estimate a model in the levels of the respective variable. To circumvent this problem, we adopted a combination of co-integration and error correction model. The Dickey Fuller Augmented Dickey Fuller test, were employed to test the stationarity or otherwise of each of the variables to test for the existence a co-integration between the regressors and the regressand we employed the Engle – Granger two step procedure.

Model specification

The model by Schclareek (2004) was adapted with slight modification, to explore the relationship between public debt and economic growth. The basic regression equation for the study is given as:

$$Y_{i,t} = \alpha X_{i,t} + \gamma D_{i,t} + \varepsilon_{i,t} \quad (i)$$

Where:

$Y_{i,t}$ = dependent variable

$\alpha X_{i,t}$ =explanatory variables

$YD_{i,t}$ =The debt variables

$\varepsilon_{i,t}$ =error term

$$GDPGR_t = B_0 + B_1 SXR_t + B_2 SYR_t + B_3 TXR_t + B_4 TYR_t + B_5 INFL_t + B_6 GCYR_t + E_t \quad (ii)$$

Where:

$GDPGR$ = Growth rate in real GDP

SXR = Debt service to export ratio

SYR = Debt service to income ratio

TXR = Total debt to export ratio

TYR = Total debt to income ratio

$INFL$ = Inflation

$GCYR$ = Gross fixed capital formation to income ratio

E = Error term.

Estimation Results

The dynamic effect of external debt accumulation on the growth of Nigeria's economy is the focus of this empirical study. Thus, the short run or temporary economic growth as well as the long run pattern of its behaviour are examined. The nature of the research therefore requires that the time series properties of the data used in the study be investigated. This implies that the stationarity and long run properties of the data are examined in order to ensure that the estimates are representative of the time series being studied. In this direction, the processes of cointegration and error correction modeling techniques are rigorously pursued. The procedure for this analysis involves the testing for unit roots among the time series in the analysis; the cointegration analysis which involves the investigation of the long run relationships among the variables; the estimation of the short run dynamic model; and then, the estimation of a long run behavioural relationship.

Unit root analysis

A time series is said to be non-stationary if mean and variance of the time series is time dependent. On the other hand, a time series is stated as stationary if the mean and variance is constant over time. Most economic time series are non-stationary and only achieve stationarity at the first difference level or at a higher level.

Generally, unit root test involves the test of stationarity for variables used in regression analysis. The importance of stationarity of time series used in regression borders on the fact that with a non-stationary time series it is not possible to generalize to other time periods apart from the present. This makes forecasting based on such time series to be of little practical value. Moreover, regression of a non-stationary time series on another non-stationary time series may produce spurious result.

The Augmented dickey Fuller (ADF) test is employed in order to analyse unit roots. The results are presented in levels and first differences in order to enable us determine in

comparative terms, the unit root among the time series and also to obtain more robust results (see table 1 below).

Table 1: Unit Root Test for Variables in Levels

Variables	Level form		Difference form		Integration	Inference
	ADF test statistic	95% Critical value	ADF test statistics	95% Critical value		
GDPGR	-3.955	-2.9400	-6.340	-2.959	1 (1)	Stationary
DSXR	-1.342	-2.9400	-4.152	-2.959	1 (1)	Stationary
DSYR	-2.065	-2.9400	-4.826	-2.959	1 (1)	Stationary
TDXR	-1.687	-2.9400	-3.929	-2.959	1 (1)	Stationary
TDYR	-2.117	-2.9400	-5.591	-2.959	1 (1)	Stationary
INFL	-2.780	-2.9400	-5.775	-2.959	1 (1)	Stationary
GCYR	-1.615	-2.9400	-6.258	-2.959	1 (1)	Stationary

Source: Author's computation 2012

The ADF test statistic for the variable GDPGR is greater than the 95 percent critical ADF value, thus showing that the variable is stationary in levels and is therefore not time dependent. The test for each of the other variables indicates that all the variables have ADF values that are less than the 95 percent critical ADF value of 2.9400. The implication of this is that the time series are non stationary in their levels.

Box and Jenkins (1978) have argued that non stationary time series in levels may be made stationary by taking their first differences. A given series is said to be integrated of order d (denoted $I(d)$) if it attains stationarity after differencing d times. If the series is $I(1)$ it is deemed to have a unit root. This situation arises if the first difference of the series is $I(0)$. We take the first differences of the respective variables and perform the unit root test on each of the resultant time series. The result of the unit root test on these variables in first differences is reported in table 1 above. From the result, it is seen that the ADF test statistic for each of the variables is greater than the 95 percent critical ADF values (in absolute terms). With these result, these variables are adjudged to be stationary. This implies that the variables are actually difference-stationary (i.e., they attain stationarity after taking the first differences). Thus, we accepted the hypothesis that the variables possess unit roots. Indeed, the variables are integrated of order one (i.e. $I(1)$).

Co-integration Analysis

Co-integration has become relevant in econometrics analysis in aspects where long run relationships affect presently observed values. The Engle and Granger two-step method is employed for the test of cointegration. This method follows a simple procedure. The dependent variable is regressed on all the independent variables and the residuals are obtained. If the variables are cointegrated, then, the residual from the cointegrating equation must be integrated to order zero (stationary). In this analysis, the cointegration tests are performed on the basis of the model specified above. The result of the cointegration tests are summarized in Table 2 below.

Table 2: Results of Engle and Granger Residual Based Cointegration Tests

ADF Lag	ADF Test Statistic	95% Critical ADF Value	Remark
1	-4.317	-4.179	Stationary

Source: Author's computation 2012

Using the Engle and Granger cointegration procedure, the model has an ADF test statistic of (-4.317) which is greater than the 95 percent critical ADF value (-4.179). Thus, the null hypothesis of no cointegration among the variables at the 5 percent level cannot be accepted. This implies that the residuals are stationary and indicates that the GDP growth rate equation is cointegrated. Therefore, a long run relationship exists between the growth rate of real GDP and the selected independent variables. An intertemporal model can therefore be estimated for the relationship.

The Error Correction Mechanism (ECM) (short-run analysis)

The short-run dynamics of the behavior of economic growth rate in the context of short term movements in debt accumulation as well as the other variables in Nigeria is captured within an error correction model (ECM). The autoregressive distributed lags (ARDL) approach was used for the estimation of the ECM. The error correction representation for the selected ARDL model is presented in Table 3.

Table 3 The Short-run Dynamic Model for Real Growth Rate of the Economy

Variable	Coefficient	T-Ratio
Constant	13.62	5.988
$\Delta\text{GDPGR}(-1)$	-0.178	-3.325
ΔDSXR	-0.267	-0.829
$\Delta\text{DSXR}(-1)$	0.254	1.907
ΔDSYR	0.641	0.989
ΔTDXR	0.039	2.296
$\Delta\text{TDXR}(-1)$	-0.030	-2.557
TDYR	-0.179	-2.740
INFL	-0.175	-3.492
$\Delta\text{INFL}(-1)$	0.077	1.734
ΔGCYR	0.445	2.691
$\text{ECM}(-1)$	-1.200	-6.820
$R^2 = 0.830$	F = 8.0	D.W. = 2.33

Source: Author's computation 2012

The R-Bar squared criterion was used for the selection of the parsimonious equation.

The model reports quite impressive diagnostic statistics. The R-squared value of 0.83 is quite high and indicates that the model has a strong explanatory ability. The explanatory variables together with the ECM successfully explain over 83 percent of any systematic changes in economic growth rate at any given time over the estimation period. This impressive coefficient of determination result is corroborated by the highly significant F-value which passes the significance test at the 1 percent level. Hence, we cannot reject the hypothesis of the existence of a significant linear relationship between real GDP growth rate and all the independent variables combined.

In order to determine the pattern and extent of contribution from each of the explanatory variables, the coefficients and their respective significance levels are observed. A close examination of the results of the estimates reveals that all the coefficients of debt

service variables fail the significance test in the ECM model. This suggests a very strong point in the analysis, namely, that debt service payment does not have any short term effects on economic growth in Nigeria. This result is quite plausible because the debt servicing actually tends to relieve the economy of debt overhang burden in the short run and helps to improve the credit worthiness of the country in the eyes of international partners. Indeed, the purported crowding out effects of debt servicing may not be felt in the short run.

On the other hand, all the total debt burden variables are significant. This shows that in the short run, debt accumulation tends to exert significant effects on the economy. In the result, the debt overhang effect (as measured by debt to total export ratio), is not felt in the economy till after a delayed period of time. In fact, the ratio tends to boost economic growth initially since the impact coefficient is positive. However, after the delay, the ratio becomes negative and significantly reduces the rate of growth of the economy. In the same vein, the overall debt service to income ratio has a negative impact on the economy in the short run. As external debt takes a larger portion of the GDP, macroeconomic variables become distorted due to efforts by government to mobilise resources to retire the debt. This begins to act as a disincentive to foreign investors who will gradually reduce their extent of investment in the country.

The coefficient of the ECM is significant and it has the correct and expected negative sign. It is also highly significant at the 1 percent level. This indicates that any short run deviation from equilibrium will be restored in the long run. The coefficient value of approximately -1.2 suggests that adjustment to long run equilibrium may not be asymptotic in the economy. Rather, the movement to long run equilibrium is oscillatory in nature. The D.W. statistic value of 2.33 is not too far from two and indicates that autocorrelation is not a strong problem in the results. Thus, the estimates are reliable for structural analysis and policy directions.

The long-run relationships

The results of the estimated long run relations are based on the ARDL estimation. The coefficients of the model along with their respective asymptotic t-ratios are shown in table 4 below.

Table 4: The Long run Model

Variable	Coefficient	T-ratio
Intercept	11.35	7.456
DSXR	-0.556	-1.918
DSYR	0.534	0.999
TDXR	0.076	3.701
TDYR	-0.149	-2.913
INFL	-0.164	-3.433
GCYR	0.265	3.496

Source: Author's computation 2012

The coefficient of the debt service ratio (-0.149) and the overall debt burden ratio (-0.556) are both negative and significant at the 10% and 5% respectively. This suggests that sustained increases in debt burden as well as the servicing obligations have negative impact on the steady state growth of the economy having reported negative t-values of (-1.918) and (-2.913) respectively.

This finding is in line with the previous studies of (Greiger, 1990; Iyoha, 1990; Cunningham, 1993; Qureshi & Ali, 2006; El-Nahdy & Torayeh 2009; Ugo and Presbitero, 2011; Karago, 2002) which found a negative relationship between total debt burden and debt and debt service to economic growth in Nigeria.

Interestingly, however, the total debt export ratio is positive in the long run. This is a rather pervasive outcome. Since, the ratio of total debt and export does not provide any additional insight into the nature of debt effects on the economy, the behaviour of this variable may not be viewed with rapt regard. Indeed, since export revenues are more appropriately related to debt servicing, the role of servicing in relation to overall debt burden may not be perspicuous.

Summary Recommendation and Conclusion

Summary of Findings

The main trust of this study is to investigate the relationship between public debt and economic growth in Nigeria. The study combine two econometric techniques of co-integration and error correction to test the debt – growth link using time series data from 1980 – 2010. The research findings are presented below.

1. The R-squared value of 0.83 indicates that the ECM and explanatory variables successfully explained over 83% of any systematic variation in economic growth.
2. It was found that the debt service ratio has a significant and negative effect on economic growth in Nigeria. The debt service to export ratio reported a t-value of (-1.918) and a coefficient of (-0.556) at the 1% level of significance.
3. The ratio of total debt to income was found to have a negative and significant impact on economic growth with a t-value of -2.913 and a coefficient of -0.149 at the 5% level of significance.
4. As expected, inflation had a t-value of (-3.433) and a coefficient of (-0.164) which revealed a negative and significant impact on economic growth.
5. The ratio of total debt to export presented a pervasive significant positive effect on economic growth and may not be viewed with rapt regard.

Against the backdrop of the above findings, it is recommended that:

1. There should be strategies that exercise tight controls on new loan. While efforts should be geared towards debt reduction and elimination through debt buy back, cancellation or where justifiable, outright repudiation.
2. Export enhancing policies should be formulated to generate foreign exchange earnings which may help to close the fiscal deficit.
3. There should be a more superior method to negotiate for fixed interest payment and varying amortization schemes as well as seek for a multi-year rescheduling rather than year by year.
4. Place embargo on acquisition of new loans by state governments and other government parastatals except for unavoidable economic reasons which are self floating and self sustaining.
5. The debt management office should come out with appropriate debt management strategy other than the SAP debt management strategies which postponed the evil days and encouraged globalization of poverty in less developed countries. Also an economic culture of transparency in the issue of debt management should be cultivated.
6. Nigeria needs to consolidate on the gain of the debt relief recently granted her and the consequent reduction in its debt stock. One way to do this is through consistent debt management strategies, prudential borrowing, persistent servicing of debt and possible liquidation of all outstanding external debt.

Conclusion

This study investigated the relationship between public debt and economic growth in Nigeria. The study was motivated by the mix result of few existing indigenous studies in this direction. The study found a negative and significant relationship between debt service to export ratio, total debt to income ratio and economic growth in Nigeria. As expected the study also found a negative relationship between inflation and economic growth in Nigeria.

The contribution of the present study is the expansion of the body of knowledge on the debt – growth dynamics with reference to Nigeria. In addition, the study employed a combination of co-integration and error correction econometric technique instead of the usual ordinary least square analysis which is limited by the non-stationarity of time series data. The study is a country-specific study, which can also be considered a deviation from the usual cross-country approach which is limited by variable, productivity and country differentials. No doubt, the outcome of this study may be used to develop targeted practical policies aimed at reducing the debt burden of Nigeria.

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