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An Empirical Analysis of the Impact of Public Debt on Economic Growth: Evidence from Nigeria 1975-2005

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Abstract

This paper focuses on the impact of public debt on economic growth using Nigeria as a case study. An analysis of the long-run relationship and impact of debt from the perspective of the value impact and proportional impact was done. The value impact variables used herein include the external debt value, domestic debt value, total debt value and budget deficit figures. The proportional impact variables are ratios of the value impact to the gross domestic product (GDP). An augmented Cobb Douglas model was used and subsequently a dynamic version of the functional relationship was estimated using Co-integration technique to capture the long-run impact of debt variables on economic growth. The result showed that the joint impact of debt on economic growth is negative and quite significant in the long-run though in the short-run the impact of borrowed funds and coefficient of budget deficit is positive. In the study, the speed at which the short-run equation converges to equilibrium in the long-run as shown by the Error Correction Mechanism coefficient was found to be slow. The conclusion from this study is that though in the short-run the impact of borrowed fund on the Nigerian economy was positive, the impact of debt in the long-run depressed economic growth as a result of incompetent debt management.

Key words: Public debt; Economic growth; Empirical analysis; Nigeria

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INTRODUCTION

The debt structure of a country affects individual citizens, institutions of government, privately owned corporate organizations like banks and consequently the economy at large. The debt structure in this context is the magnitude of the domestic debt as well as the magnitude of the external debts.

The issue of Nigeria's public debt became important in recent times especially prior to the period of the debt forgiveness because of its magnitude and the amount which was required to service such debts as well as its attendant possible effects on different operating sectors of the economy especially the banking sector and the growth of the economy at large. As at the month of July 2005, Nigeria external debt was US$34 billion of which about $28 billion or 85% was owed to the Paris club of fifteen creditor nations.

Apart from external debts, Nigeria's domestic debt as at 31st December, 2003 was N1.329 trillion and as at July 2006 it was N1.5 trillion as at July 2005 as reported by the debt management office. Nigeria's domestic debt is defined mainly as debt instruments by the federal government and denominated in local currency. It consists mainly of Nigerian Treasury Bills, Nigerian Treasury Certificates, Treasury Bonds, Federal Government Development Stocks, Ways and Means and recently considered are Contractor debts. According to Alison (2003), three reasons have been advanced for the growing government domestic debt. The first of this is debt incurred from financing budget deficit. The second reason is debt arising from the implementation of monetary policy (the purchase and sale of treasury bills in the open market operations) and thirdly domestic debt incurred to develop the financial sector through the supply of tradable financial instruments so as to deepen financial markets.

Ola and Adeyemo (1998), while explaining the reasons for increasing public debt on the part of the Nigerian government came up with the following reasons:

(1) Government borrowed to finance emergencies such as natural disasters and economic depression.

(2) Government borrowed to finance important capital projects such as water dams, agricultural development projects, river basin development projects.

(3) Government borrowed to finance current expenditure in anticipation of reasonable revenue collection.

At a point in year 2003 it was estimated that Nigeria needed approximately US$3 billion yearly to fully service her external debt apart from her domestic debt and this is considered unthinkable to do as it will result in the economy getting almost grounded.

In Nigeria, the genesis of the present existing market for domestic government debt was the financial reforms introduced by the colonial government in 1958 which led to the creation of the Central Bank of Nigeria and the creation of marketable public securities to finance anticipated fiscal deficits. This is explicitly stated in the Central Bank of Nigeria ordinance 1958 thus:

"The Bank shall be entrusted with the issue and management of federal government loans publicly issued in Nigeria, upon such terms and conditions as may be agreed between the federal government and the Bank. To the ordinary man, public debt evidenced in budget deficit might not make sense however different governments have used both budget deficit and budget surplus as a means of fostering policy agenda as occasion demands."

In Nigeria like so many developing countries especially between the period covered by this study including the structural adjustment years to date, the government has assumed an active role in the development of the economy in trying to put in place the infrastructure and institutional superstructure necessary for economic growth and development. This necessitated borrowing from different sources with the aim of putting the funds on various projects believed to have the ability of driving the economy forward in which case they are supposed to be productive loans.

Also, over the years, the ever increasing Nigerian population has put some pressure on the government to spend more on public goods and merit goods. The contribution or provision of infrastructural facilities which is termed total factor productivity and often the responsibility of the nation state has made borrowing on the part of government also inevitable.

Since most of these infrastructures cannot be left in the hands of the private sector judging from the experience of market failures in different countries where this has been experimented, the public sector is then seen as the one better at handling issues of social overheads or infrastructural facilities.

Essentially, the argument for the public sector activity is not because of its ability to run systems assigned to it efficiently but that the social marginal benefit derivable from state functions usually far exceeds their social marginal cost even if the ventures are run at a commercial loss.

This study is divided into five distinct sections as Introduction, Literature review and theoretical framework, methodology, estimation techniques and result analysis while the conclusion and forms the fifth section

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Many scholars in Africa and Nigeria have conducted researches into public debt and its impact on the economy of different countries. Iyiola and Iyare (1994) examined the causes of Africa's debt problems and Nigeria in particular and grouped them into four categories as

(a) those arising from fundamental or structural causes
(b) those due to cyclical causes
(c) those arising from a hostile economic and political environment
(d) those due to inappropriate domestic policy

They affirmed that structural weakness in the typical African economy like Nigeria assume a commanding position in causing the debt problem because it made the economy extremely vulnerable to cyclical shocks such as oil price shocks, instability of primary commodity prices and declining terms of trade. Taking a good look at Nigeria's debt problem in the years considered in this study in relation to the existing theories of growth in literature like the Big Push Theory, The doctrine of balanced growth, Solow's growth model, Rostow's stages of economic growth, the new endogenous growth theory, some insight can be gotten into Nigeria's predicament.

Considering the amount needed to service Nigeria's debt as it relate to the big push theory it is obvious that Nigeria had a serious problem to contend with. The Big Push Theory hinges on the fact that a large comprehensive programme is needed in the form of high minimum amount of investment to overcome the obstacles to development in an underdeveloped economy and to launch it on the path of steady progress. Consequently, resources have to be freed to achieve this. The scenario however is such that the debt overhang over the years did limit the amount of resources required to achieve enviable growth.

In Nigeria where budget deficit and financial gaps have existed between savings and investment, it becomes absolutely necessary to contract debt either from external sources or domestically when one considers the thinking of Rosenstein-Rodan who postulated the Big Push Theory of growth and development. The main thrust of this theory is that there is a minimum level of resources that must be devoted to a government development programme if it is to have any chance of success. This is more relevant when one considers one of the indivisibilities and external economies articulated by Rosenstein-Rodan as necessary

for kick-starting and sustaining economic growth and development which is the indivisibility of the supply of social overhead capital.

As earlier mentioned, increasing population growth and the creation of states have necessitated the provision of services of social overhead capital comprising good transportation facilities, communications, power generation etc to drive the economy. For this to be done, there is always the need for a sizeable initial lump-sum of investment that leads to government borrowing money from many sources.

Also looking at it from the perspective of the Balanced Growth Theory, in designing an economic agenda for the desired growth of the Nigerian economy, government has on different occasions employed the theory of balanced growth popularized by Ragnar Nurkse as deemed fit from the viewpoint that all sectors of the economy i.e., education, agriculture, health, housing, power generation etc. has to grow in their productive capacity simultaneously.

Expectedly, this approach has its cost implications that have often resulted in government borrowing and thereby contracting more debts. Though this approach to economic growth is commendable, in Nigeria, there has been a problem with balancing the demand side and supply side to make balanced growth benefit the economy on a sustainable basis.

Ordinarily, the theory of balanced growth states that there should be a simultaneous and harmonious development of different sectors of the economy so that all sectors grow together. However, for this to be achieved, a balance is required between the demand and supply sides. The supply side has to do with the simultaneous development of all inter-related sectors which help in increasing the supply of goods which comprises of issues such as investment in power, agriculture, irrigation, transport while the demand side concerns the provision of employment opportunities and increasing incomes so that the demand for goods and services may rise on the part of the consumers. The balanced growth theory has a similar focus with the Solow's model of long run growth but it is instructive to say that they cannot be simply substituted for one another.

The interest in the Solow's theory of long run growth is the savings component. Solow takes output as a whole and as the only commodity in the economy with the annual rate of production designated as Yt which represents the real income of the economy of which part of it is consumed and the remaining is saved or invested. That portion that is saved represented as Kt i.e. the stock of capital is often less than what is required for investment in the larger economy due to demographic and structural changes in the country that were not anticipated and as a result government has to borrow to make up for the shortfall.

Looking at it again from the perspective of the growth theory propounded by Rostow popularly known as the Rostow's stages of economic growth, in the periods between 1970-1980 before the structural adjustment years, Nigeria was making steady progress and it could be said that we had conveniently consolidated our position on the Rostow's precondition for take-off stage of economic growth and moving into the next stage of what is known as the take-off stage with the peculiar characteristics of the need for an increase in the rate of productive investment. Thus the Nigerian government tried to do by investing in capital projects like the Ajaokuta Steel Project and other projects that required much money to prosecute that the government did not have readily. It then meant that financial assistance had to be sought.

Over the years until recently when Nigeria was granted some debt relief, the nation has been accumulating debts through successive governments. These debts have to a large extent affected economic growth with its attendant effects on the retrogressive standard of living of Nigerians. Talking about public debt and Nigeria's economic growth and performance, another area of interest is the impact of debts on foreign investment. In a study carried out by Borenstein in 1989 as well as Froot and Kringman in 1990, they asserted that the presence of large external debt burden plays a vital role in reducing investment activities because the higher debt service payments associated with large external debt reduce the funds available for investment.

They also pointed out that the existence of a large debt overhang in the form of high ratio of external debt to GDP can reduce the incentive for investment because much of the returns from investment must be used to pay existing debt. Another angle to it is that external debts lead to difficulties in meeting debt-service obligations which may strain relations with external creditors and make it harder or more costly to finance or attract private investments. Essien and Onwioduokit (1999) also confirmed in their study the existence of relationships between the foreign direct investment inflow to Nigeria and variables such as credit rating, debt service, interest rate differential, nominal effective exchange rate and real income. This they expressed in a functional form and analyzed using the ordinary least square technique.

Though there have been some studies on Nigeria's debt and other economic variables such as that of Egwaikhide (1996) who appraised the implication of Nigeria's debt profile on inflation and current account balance, this study though seeks to do a similar thing with the whole economy in mind.

Egwaikhide (1996) appraised the implication of Nigeria's budget deficit profile on inflation and current account balance and the findings of the study indicated that fiscal indiscipline in terms of lack of control over expenditure is the major determinant of budget deficits in Nigeria while its mode of financing has aggravated

inflation. The study also showed that budget deficits correlate highly with current account deficits implying that the external equilibrium is partly attributable to endogenous factors.

This study looks at the impact of domestic and external debts not only in isolation but also together and examines how they affect economic growth before the debt relief and their magnitude in relational terms.

METHODOLOGY

In this study, an analysis of the long-run equilibrium relationship and impact of Nigeria's debt on economic growth was done from the perspective of national debt value-impact variables and the proportional impact variable. The value impact variable used herein includes the external debt value, domestic debt value, total debt value and budget deficit. The proportional impact variables are the ratios of the value impact variable to the gross domestic product. These include the external debt as a percentage of GDP, domestic debt as a percentage of GDP, total debt as a percentage of GDP. The economic growth for this study is proxied by the real growth rate. According to literature, public debt has been found to have both impact and incidence, the incidence is felt as the rate of servicing and this is why herein the debt service ratio is included as one of the impact variables.

Model Specification and Estimation

Following the objectives of this study, two models are specified. The first estimates the impact of debt variables on economic growth while the second model estimates the proportional impact of debt variables on the growth rate of the GDP and the isolated impact of debt service on economic growth. For the models, an augmented Cobb Douglas model was used. However, in attempting to arrive at the most suitable functional model many models which have been used for similar studies were considered. For example the simultaneous equation model which was used by Mjema (1996) to analyze the impact of foreign debt on the economy of Tanzania was considered. The weakness of the model is that it used a two stage least square technique because the model was over-identified. This might not sufficiently capture all the variables to be examined in this study.

Following Yekini (2002) the Cobb Douglas production function was considered as appropriate for this study. The model is thus specified as follows;

Model 1

GDP = f (EXD, DDB, TDB,BDF, U) 3.1

Where GDP = Gross Domestic Product
EXD = External Debt Value
DDB = Domestic Debt Value
TDB = Total Debt Value
BDF = Budget Deficit

The model is specified in augmented Cobb-Douglas functional form as follows:

GDP = αo (EXD) α1 (DDB) α 2 (TDB) α 3 (BDF) α 4. …… (3.2)

The augmented Cobb- Douglas model in equation (3.2) captures both the direct impact of the two types of debts on growth and their respective elasticity. The parameters α are equally the elasticity coefficient of economic growth with respect to the individual debt variable. For easy estimation of equation (3.2), the linear form is presented in equation (3.3)

In GDP = ln α0 + α 1 ln EXD + α2 ln DDB + α3 ln DB + α4 ln BDF + U) …… (3.3)

Model 2

This model differs from model 1 only in proportional measurement. While model 1 capture the impact in total value term, model 2 captures the proportional impact. This is specified as follows:

GRGDP = β0 + β1 EXP + β2DBP + β3 TDP + β3EXS + β4DBS + u …… (3.4)

Where GR GDP = Growth rate of GDP
EXP= External Debt Percentage of GDP
DBP = Domestic Debt Percentage of GDP
TDP = Total Debt Percentage of GDP
EXS = External Debt Service
DBS = Domestic Debt Service
U = Error Term

Estimation Techniques

A dynamic version of Equation (3.3) and (3.4) are estimated using the co- integration technique. This is so to capture the long run impact of the debt variables on economic growth. The co-integration technique is based on primarily on Engle and Granger (1989) and Yoo (1987). It is called the 3 stage co-integration analysis. The first stage is to determine the level stationarity of the variable, by so doing the levels of integration of the variables are determined. The essence of determining this is to avoid spurious regression which can arise if the variables do not actually exhibit a long run relationship with economic growth, but are forced to due to the interference of another variable, say time. The implication of stationarity and non stationarity are discussed below.

Time Series Properties of Variables

A time series is said to be stationary, if it has a constant mean independent of time and constant variance independent of time. A non-stationary variable is one in which one or all of these conditions do not hold. A non-stationary variable may belong to the pure random walk, random walk with drift or a random walk. To ascertain this, the unit root test is conducted to test for the level is stationarity of each variable. The unit root test can be according to the augmented Dickey Fuller (ADF) Philip Peron (PP) etc. For this study, Phillip Peron Unit root is adopted due to its superiority over all other unit root tests.

The Philip Peron test is used to test for the presence of a unit root in a series. For example GDP= α0 + α1GDPt – 1 + €1

By taking the first difference, we have

GDPt – GDP t-1 = α0 + α1GDPt-1 –GDP t-1 + €t

△GDP t = α0 + (α1-1) GDPt -1 + €T

△GDP t = α0 + γGDP t-1 + €t

Where γ= (α1- 1)

If α = 1 so that there is unit root then γ =0. But the presence of the error term €t does not allow γ to be identifiably equal to zero. The procedure is to estimate γ using simple regression and then compare with the critical value of the t-statistic following Fuller (1974). This is called the critical value and a different from the conventional t-statistics tables. The hypotheses are:

H0: γ = 0. Unit root

Ha: γ ≠ 0. No unit root

The critical values are negative. If the sample values are more negative (for example, -403217 is more negative than -24318), the null hypothesis is rejected in the direction of the sided alternative which is accepted. This means there is no unit root in variables, hence, the variable is stationary. A sample value less negative than the critical value implies non-rejection of the null hypothesis, meaning that there is unit root in the variable. The series is then said to be integrated of order one denoted as 1(1) because, the variables need to be differentiated once to achieve stationarity. A positive sample value also implies the non-rejection of the null hypothesis. This test is conducted for all the variables in the model specified in Equation (3.3).

The next stage of the 3-stage Engle Granger co-integration analysis is the test for the co-integration. Having established the levels of integration of individual variables in the model, variables that are integrated of the same order already the condition for a long run relationship exist between them. These variables are therefore said to co-integrate. Since the model in Equation (3.3) involve a multiple regression, the vector-co-integration test is therefore applicable. The vector co-integration, test commenced will a test for the number of co-integration relations or rank (r) of λ using Johansen maximal Engen value of the stochastic matrix and the likelihood ratio (LR) test based on the true of the stochastic matrix λ. This matrix is the long run multiplier matrix of m X n, that is the matrix of the co-efficients.

The Engen value of λ, are the roots of the Kth order characteristic polynomial | π1 – VI|

Obtained by solving the charanteriste equation | π1 – VI| = 0

The number of non-zero Eiguen value is the rank of the matrix λ. This is the relevant test for the nill hypothesis

$$r \leq r_0$$

Against the alternative $r \geq r_0 + 1$

The Johansen co integration in therefore used to test for the number of co- integration relations among the integrated series. Co-integration implies a long run equilibrium relationship among the variables. In this study it also implies the sustenance of the impact of debt variables on economic growth.

Error- Correction Mechanism (Ecm)

This the third stage of the 3-stage Engle Granger co-integration analysis. The error correction model is the short- run dynamic adjustment to the co-integration equation. If a long run equilibrium relationship exist among the variables then there must be an associated adjustment model. For this study, the Vector error correction model (VECM) is applicable due to the vector autoregressive (VAR) nature of the model. The interpretation of the VECM is as follows. There is a change in economic growth. (i. e., DGDPt ≠ 0) if either there was a disequilibrium last period (ECM ≠ 0) in which case some change in the debt structure is necessary to restore equilibrium, or there was a change in the exogenous variables in the current period, which because of the equilibrium condition implies that economic growth should also change.

The anticipated sign and magnitude of the co-efficient are as follows: The co-efficient of ECM is the errors correction or disequilibrium correction co-efficient. If the ECM co-efficient is greater than zero, it means there is a "surplus" of economic growth hence a reduction in manufacture exports required to restore equilibrium. If the co-efficient of ECM is less than zero, there is "deficiency" of economic growth due to debt burden and increase in economic growth or a reduction in the debt burden is required to restore equilibrium.

As regards the magnitudes of the ECM, we anticipate $-1 \leq ECM \leq 0$. If ECM = -1, it implies that all of lasts periods disequilibrium is removed, otherwise $-1 < ECM < 0$ implies that only a proportion is removed. The magnitude of ECM is the speed of adjustment to equilibrium.

Two models are estimated and results reported here. The first model shows the long run relationship between the economic growth and the debt values while the second shows the relationship between the growth rate of the economy and proportional composition of the debt values, all for the period 1975 - 2005. The variables in the first model include the Gross Domestic Product (GDP) External Debt value (EXD), Domestic Debt Value (DDB), Total Debt Value (TDB) and Budget Deficit (BDF). The variables of the second model include Real GDP growth rate (RGDPG), External Debt as Proportion of GDP (EXGDP), Total Debt as proportion of GDP (TDGDP), Domestic Debt as Proportion of GDP (DBGDP) and External Debt Service (EXS).

The models estimated are dynamic. The methodology used therefore requires that the time series properties of the model be studied to avoid spurious relationship. The result of the time series properties in form of Philip Peron

unit root tests for stationarity, non-stationarity of variable are presented in Tables 4.3 and 4.4.

Time Series Properties of Variables

The Philip Peron (PP) test for unit root was conducted for all the time series variables used in the two models. The unit root were first conducted at levels and then at first difference. The unit root regression assumes an intercept but not trend, that is a random walk with drift. The null hypothesis applicable here is that there is no unit root in all the variables, that is the variables are assumed stationary at their levels.

Table 4.1
Philip Peron Unit Root Tests at Levels

Variable	PP statistics	5% Critical values	1% Critical value	Remark
GDP	2.4398	-2.9665	-3.6752	Non Stationary at 5%
RGDPG	-4.4053	-2.9850	-3. 7204	Stationaryat 1%
EXD	-4.3971	-2.9705	-3.6852	Stationary at 5%
DDB	5.8419	-2.9705	-3.6852	Stationary at 5%
TDB	3.3117	-2.9705	-3.6852	Stationary at 5%
DGGDP	-2.3179	-2.9705	-3.6852	Non Stationary
TDGDP	-1.7867	-2.9705	-3.6852	Non Stationary
BDF	-5.6623	-2.9665	-3.6752	Non Stationary
EXS	-1.6621	-2.9665	-3.6752	Non Stationary

Source: Computed from data.

The PP test for the Unit root in Table 4.1 indicates that RGDPG, EXD, DDB and TDB and BDF are all stationary at their levels and therefore integrated of order zero (I(0)). This is so because their PP statistics are all more negative than the critical values at the chosen levels of either 1% or 5%. The null hypothesis of unit root test is therefore rejected for these variables at their levels. The economic implication of this result is that, if there is any disturbance that creates a shock or an impact on this stationary variable which are debt and economic variables, such shocks or impact will not be sustained or remembered for a long time.

On the other hand, DBGDP, TDGDP and EXS are all non stationary at their levels as their PP-statistic are all less negative less than the critical values at the chosen levels. The economic implications of non-stationarity of these variables is that the proportional effect of debt on economic growth may generate a persistence shock. That is if there is any disturbance or problem that creates a shock or impact will on these variables, such shock or impact will be sustained or remembered for a longer time. How long the shock be will remembered is confirmed by the PP-unit root at the first difference on these variables. This is presented in Table 4.2.

Table 4.2
Philip Peron Unit Root Test at First Difference

Variables	PP. statistic	Critical value	1% C.V	Order of integration
DBGDP	-4.4812	-2.9750	-3.6959	I(1)
TDGD	-4.0163	-2.9750	-3.6959	I(1)
EXS	-5.1932	-2.9750	-3.6852	I(1)

Source: Computed from data.

The results in Table 4.2 confirms that the non-stationary variables at levels are made stationary at first difference and therefore integrated of order one I(1). This also confirms that the persistence shock is not an infinite memory. The results in Tables 4.1 and 4.2 set the pace for the likelihood of co-integration among the variables. This is so as some of these variables are integrated of the same order therefore meeting the first order condition for co-integration. The results of the co-integration test for the two models are presented as follows:

Joahansen's Co-Integration Test for Model 1

The static regression for the model of the impact of debt variables on economic growth is presented in table 4.3. The result however only shows the short run static relationship between economic growth (GDP) and the debt variables.

Table 4.3
Results of Static Regression Analysis of Model 1

Variables	Co-efficient	Std. error	E. statistic	Probably
C	-10290. 71	66866.31	-0.15390	0.8792
EXD	19439. 36	23907.35	0.813112	0.4257
DDB	32095. 59	24180.34	1.327342	0.1993
TDB	-21419. 03	23971.24	-0.89353	0.3822
BDF	12.38677	2.532813	4.890518	0.0001

Source: Computed from data.

The result is Table 4.3 show that the budget deficit has significantly affected the economic growth (GDP) in the short run. The rest are not significant at the 5% level. The point impact of all the debt variables on economic growth is also significant as shown by the high R2 (0.95) and probability of the F- statistics. This implies that 95 percent of the changes in total variables in economic growth can be explained by changes in the debt variables that is external debt, domestic debt, total debt and budget deficit. The co-efficient of budget deficit (BDF) is positive in this short run signifying that budget deficit tends to increase the economic growth in the short run. The dynamic analysis of the static result in Table 4.3 is presented in Table 4.4. This is the long run equilibrium relationship among the variables in the model.

Table 4.4
Results of Johansen Co- integration Test from Model 1

Ho	Eigen value	Trace statistic	5% Critical value	1% C.V
r ≤ 0	0.9977	341.55	76.07	84.45
r ≤ 1	0.9888	201.1174	53.12	60.16
r ≤ 2	0.9198	97.780	34.91	41.07
r ≤ 3	0.8047	39.7415	19.96	24.60
r ≤ 4	0.0900	2.1715	9.24	12.97
R2= 0.95,		R2 = 0.94,	LL= -344.76	
F –Statistic= 100.1736,		Prob (F- statistics)= 0.00000		

Source: Computed from data.

The Johansen co-integration test in Table 4.4 is based on the Likelihood Ratio (trace statisitcs) test. The LR test request the null hypothesis of no co-integration among the variables. The rejection of the null hypothesis up to r<3 implies that there are at least 4 co-integration equations among the integrated variables at both 1% and 5% level of significance. This is so because at r≤0, r <1, r<2 and r<3, the trace statistics are greater than the critical values respectively at the 1% and 5% levels.

The normalized co-integration equation to GDP is presented in the Equation (4.1). It shows that both the external and domestic debt have negative impact on the economy in terms of borrowing but the debt in the light of budget financing improved the economy in terms of meeting the immediate needs of the economy with the borrowed money.

GDPt= 88060 - 24562.7 EXDt –33610.3 DDBt + 30343 1TDB +24. 84BDF …… (4.1)

The Vector Error Correction Model for Model 1

The co-integration result equation of Equation (4.1) implies that there exists a long run equilibrium relationship among the variables. The speed at which the short run Equation (4.1) converges to equilibrium in the long run is shown by the ECM Co-efficient. The result for model 1 is shown in Table 4.5. The vector of interest is the GDP equation. The result shows that the co-efficient of ECM (-1) is -0.1426. It is properly signed and highly significant indicating that the adjustment is in the right direction to restore the long run relationship.

The result shown in Table 4.5 is the over parametized form. That is the model is written in its auto regressive distributed lag (ADL) form. The estimate of the ECM co-efficient shows that the speed of adjustment is quite slow. The estimate also shows that the total debt and budget deficit has a negative impact on economic growth in the long run, even though they meet the short run needs. This is so because the co-efficient of the ADL for TDB and BDF are all negatively signed. This also suggests that as the burden of debt and deficit budget increases, its impacts is sustained beyond the year the money was borrowed.

Table 4.5
VECM (Over Paramatized) for Model 1

Variables	Co-efficient	Std. error	T- statistics	Other analysis
Const	-6502.2	1121.3	-0.5846	
△(GDP(-1)	0.3456	0.1873	1.8449	R2 = 0.92
△(GDP(-2)	0.7347	0.16451	4.4665	Adj. R2 = 0.87
△EXD (-1)	-760.785	1236.28	-0.6153	
△EXD (-2)	4850.83	8821.06	0.5499	f.stat. 19.77
△DDB (-1)	2504.38	2353.05	1.0643	
△DDB (-2)	13544.5	9219.44	1.4691	
△TDB (-1)	402.37	1265.43	0.31797	
△TDB (-2)	-5440.65	8837.25	-0.6156	
△BDF (-1)	-5.8522	1.52315	-3.8422	
△BDF (-2)	-7.7453	1.6975	-4. 5627	
△ECM (-1)	-0.1426	0.02500	-5.7062	

Source: Computed from data.

Table 4.6
Results of Static Regression Analysis of Model 2

Variables	Co-efficient	Std. error	T. statistic	Prob.
EXGDP	0.014361	0.1225	0.1171	0.9077
DBGDP	-0.13393	0.1986	-0.6740	0.5067
TDGDP	0.00142	0.13709	0.01036	0.9918
EXS	-0.00233	0.0022	-1.0456	0.0061
EXT	0.8056	1.2749	0.6318	0.5334
C	-77.2958	129.1067	-0.5986	0.555
R2 = 0.27		F= STATISTIC 1.56		
Adj. R2 = 0.09		prob. (F- statistic= 0.219)		

The result in Table 4.6 is the static regression analysis of the proportional impact of debt on the real growth rate of GDP (RGDPG). Looking at the R2 (0.27), it can be inferred that the proportional impact of debt is not significant on economic growth in the short run. Also the individual proportion variable which are proportions of the GDP that represent the individual debt value do not significantly affect the growth of the economy in the short run. Only the debt service has a significant negative impact on the growth rate of the economy at the short run having a probability of less than 0.1 at 5% level of significance. These results support that of model 1. The impact of debt burden may not be immediate, but the immediate impact is felt from the service of debt (EXS) which always hinder the growth of the economy.

The dynamic analysis of the relationship in Table 4.6 is presented in Table 4.7, which is the co-integration test.

The LR test in Table 4.7 rejects the hypothesis up to r=0 signifying that there is one co-integration equation at 5% significance level. The long run relationship, that is the normalized co-integration equation normalised to RGDPG is presented in Equation (4.2). This is the dynamic impact of the proportional debt ratios on the growth rate

of the economy. It is an equilibrium relationship since some of the variables are found to co-integrate.

RGDPG = -6.046 – 0.3217 EXGDP -0.1667 DBGBP + 0 54.959 TDGP + 0.0137EXS

(3.237) (0.1348) (0.1944) (0.1860)

Log likelihood = -611.7964

The result is Equation (4.2) depicts the long run proportional impact of debt on the growth of the economy in Nigeria. External debt as percentage of GDP (EXGDP) and domestic debt as percentage of GDP (DBGDP)and the external debt service (EXS) all have negative impact on the growth rate of GDP in the long run. This also is a follow up of the static result in Equation (4.1). The burden of debt on the GDP may not be felt immediately but remembered for long. The dynamic adjustment of this disequilibrium in the short run is explained by the error correction model presented in Table 4.8.

Table 4.7
Results of Johansen Co-Integration Test on Model 2

Ho	Eigen value	5% Critical value	1% C.V	Trace statistic
r = 0	0.6820	76.07	84.45	79.6683
r ≤ 1	0.5044	53.12	60.16	46.4409
r ≤ 2	0.3647	34.91	41.07	26.083
r ≤ 3	0.2484	19.96	24.60	12.9254
r <≤ 4	0.1478	9.24	12.97	4.6407

Source: Computed from data.

Table 4.8
The Vector Error Correction Model for Model 2

Variables	Co-Efficient	Std. error	T- statistic	Other analysis
Const	-6.7852	1.9981	-3.3958	R2 = 0.46
△RGDPG(-1)	-0.8742	0.3304	-2.6459	Adj. R2 = 0.15
△RGDPG(-2)	-0.41592	0.2680	-1.5515	f.stat. 1.49
△EXGDP (-1)	0.10415	0.2308	0.4511	
△EXGDP (-2)	-0.0094	0.21858	-0.0434	
△DBGDP (-1)	-0.0752	0.3333	-0.2257	
△DBGDP (-2)	0.2173	0.3425	0.6345	
△TDGDP (-1)	-0.0377	0.17476	-0.2161	
△TDGDP (-2)	-0.0042	0.1478	-0.0288	
△EXS (-1)	0.00236	0.00376	0.62805	
△EX (-2)	-0.00192	0.00374	-0.51176	
△ ECM (-1)	-0.0484	0.3153	- 0.1568	

Source: Computed from data.

The result in Table 4.8 is the over-parametised VECM for model 2. The direction of the adjustment in the right direction to restore the equilibrium as the ECM is negative. (10.0484). But the adjustment is slow that is the magnitude of the ECM co-efficient. Also the result confirms the negative impact of the proportional debt ratio variables on the growth rate of GDP as most of the lagged variables are negative.

CONCLUSION

Borrowed money has a positive effect on growth in the short run but debt and budget deficit has a negative impact on growth in the long run. The impact of huge debt on economic growth may not be immediate but could be devastating in the long run.

On the whole, in managing public debt, efforts must be made at ensuring fiscal sustainability with adequate consideration to ensuring that the debt profile does not exceed the discounted value of its future net revenue.

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