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The Impact of External Debt on Nigeria's Economic Growth (1980 -2014): VAR, Cointegration and VECM Approach.

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Abstract
The research work aimed at determining the impact of external debt on economic growth in Nigeria. Time series data on real gross domestic product (RGDP) and external debt service payment (EDSP) were obtained from the World Bank International Debt Statistics, while data on exchange rate (EXCR) and inflation rate (INFR) were collected from Central Bank of Nigeria (CBN) statistical bulletin, 2014. The period of study was 1980-2014. Model was formulated and data were analyzed employing Augmented Dickey Fuller (ADF) unit root test, Johansen Co-integration and Error Correction (VECM) techniques. Estimation via the unrestricted VAR was conducted to enable appropriate lag length selection while OLS estimation of the main or target equations of the VECM using the HAC consistent covariance estimator was carried out. This enabled objective determination of the impact of external debt on Nigeria's economic growth. The dependent variable was RGDP, while the explanatory variables were EDSP, EXCR and INFR. Results indicate that external debt service payment had a longrun significant but negative relationship with real gross domestic product while Exchange Rate had a positive although insignificant, relationship with RGDP. The paper concludes that exchange rate fluctuation had positive impact on the Nigerian economy while external debt service payment had significant negative impact on the same economy. The study recommends amongst others, that the Debt Management Office should set mechanisms in motion to ensure that loans were utilized for purposes for which they were acquired as well as set a ceiling for borrowing for states and federal governments based on well-defined criteria.
Keywords: External debt, unrestricted VAR, vector error correction model, cointegrating equations, error correction term, external debt service payment.

1.0. Introduction

Sustainable economic growth is a major concern for any sovereign nation most especially the less developed countries (LDCs) which are characterized by low capital formation due to low levels of domestic savings and investment (Adepoju et.al, 2007). It is expected that these LDCs when facing a scarcity of capital would resort to borrowing from external sources so as to supplement domestic savings (Aluko and Arowolo, 2010; Safdari and Mehrizi, 2011; Sulaiman and Azeez, 2011). Soludo (2003) opined that countries borrow for two broad reasons: macroeconomic reason; to finance higher level of consumption and investment and to finance transitory balance of payment deficit and avoid budget constraint so as to boost economic growth and reduce poverty. The constant need for government to borrow in order to finance budget deficit has led to the creation of external debt (Osinubi and Olaleru, 2006).

External debt is a major source of public receipts and financing capital accumulation in any economy (Adepoju.2007). It is a medium used by countries to bridge their deficits and carry out economic projects that are able to increase the standard of living of the citizenry and promote sustainable growth and development. Hameed et.al, (2008) assert that external borrowing ought to accelerate economic growth especially when domestic financing is inadequate. External debt also improves total factor productivity through an increase in output which in turn enhances Real Gross Domestic Product (RGDP) growth of a nation. The importance of external debt cannot be overemphasized as it is an ardent booster of growth and thus improves living standards thereby alleviating poverty. However, Mutasa (2003) and Audu (2004) indicate that it is widely recognized in the international community that excessive foreign indebtedness in most developing countries is a major impediment to their economic growth and stability. Developing countries like Nigeria have often contracted large amount of external debts that has led to the mounting of trade debt arrears at highly cumulated interest rates. Gohar and Butt (2012) opined that accumulated debt service payments create a lot of problems for countries especially the developing nation because a debt is actually serviced for more than the amount it was acquired and this slows down the growth process in such nations.

The inability of the Nigerian economy to meet its debt service payment obligation in 2003 resulted in debt overhang or debt service burden that militated against her growth and development (Audu, 2004). The genesis of Nigeria's debt service burden dates back to 1978 after a fall in world oil prices. Prior to this occurrence Nigeria had incurred some minor debt from World Bank in 1958 with a loan of US$28 million dollars for railway construction and from the Italian government with a loan of US$13.1 million for the construction of the Niger dam. The first major borrowing of US$1 billion known as the "jumbo loan" was in 1978 from the International Capital Market (ICM) (Adesola, 2009).

According to Ohlin (1966), for low-income developing countries, debt servicing competes with essential imports for foreign exchange earnings and also competes with the investment need of the country for savings (which are often deficient and inadequate). Besides, a high debt service ratio makes the country extremely vulnerable on its balance of payments, hampering development efforts. The deleterious effect of the escalating external debt has been aggravated by domestic macroeconomic policy deficiencies that have resulted in declining income per capita, uneven growth of real GDP and rising inflation in Nigeria.

Studies carried out on the impact of external debt on economic growth in Nigeria are not unanimous in their submissions. In addition, the impact of external debt on economic growth is more contentious in empirical than theoretical studies, hence the need to examine the relationship between external debt and the performance of the economy. We are challenged therefore, to carry out this study in order to precisely understand the nature, direction and objectives of external debt and its impact on Nigeria's economic growth. The research therefore seeks to investigate the impact of external debt on real gross domestic product (RGDP) in Nigeria from the period 1980 – 2014.

The main objective of the study is to determine whether external debt proxied by debt service significantly impacts economic growth in Nigeria while the specific objective is to establish the impact of changes in exchange rate and the inflation rate on the real gross domestic product in Nigeria.

2.0 Review of Related Literature

Review of related literature is done under the following sub-headings: Conceptual Framework, Theoretical Framework, and Empirical Review.

2.1 Conceptual Framework

The act of borrowing creates debts and this debt may be domestic or external. The focus of this study is on external debt which refers to that part of a nation's debt that is owed to creditors' outside the nation. Arnone et. al (2005) defines external debt as that portion of a country's debt that is acquired from foreign sources such as foreign corporations, government or financial institutions. According to (Ogbeifin, 2007), external debt arises as a result of the gap between domestic savings and investment. As the gap widens, debt accumulates and this makes the country to continually borrow increasing amount in order to stay afloat. Nigeria's external debts are the debt owed by the public and private sectors of the Nigerian economy to non-residents and citizens that is payable in foreign currency, goods and service (Ogbeifin, 2007).

External debt is made up of different types. The types of external debt reflect the purpose for which the debt was incurred. According to Audu (2004) some of these are trade arrears, loans or socio-economic needs, balance of payment support loans, project tied loans, short-term loans, medium and long-term debt, public and publicly guaranteed debt and private non-guaranteed external debt.

According to (Sogo-Temi, 1999), the explanation for the growing debt burden of developing economies is of two-fold. Firstly, developing countries have become over-depended on external borrowing. Secondly, the difficulties they experience in servicing external debt due to huge debt service payments. And Ahmed (1984) asserts that the causes of debt problem relate to both the nature of the economy and the economic policies put in place by the government. He opines that the developing economies are characterized by heavy dependence on one or few agricultural and mineral commodities and export trade is highly concentrated on the other. The manufacturing sector is mostly at the infant stage and relies heavily on imported inputs.

Aluko and Arowolo (2010) point out that the major cause of debt crisis situation in Nigeria is the fact that the country's foreign loans are not being used for developmental purposes. According to Debt Management Office of Nigeria, (DMO) (2012), the factors that led to Nigeria's external debt burden can be grouped into six areas which include; inefficient trade and exchange rate policies, adverse exchange rate movements, adverse interest rate movements, poor lending and inefficient loan utilization, poor debt management practices and accumulation of arrears and penalties.

Debt management strategy is a framework that the government intends to use over the medium term (5years) to ensure that debt levels stay affordable and sustainable, that any new borrowing is for a good purpose and that the costs and risks of borrowing are minimized.

The Central Bank of Nigeria (CBN) has the responsibility to manage Nigeria's external debt. This led to the establishment of a Department in the CBN to undertake the functions in collaboration with the Federal Ministry of finance and other agencies. In 2000, the Debt Management Office (DMO) was also established. Since Independence, Nigeria had attempted to manage her external debt through several measures which include; embargo on new loans, limitation on debt service payments, debt restructuring, refinancing of trade areas, debt rescheduling, debt buy-back, collateralization and new money options and debt swap/conversion options.

2.2 Theoretical Framework

The burden of external debt service has become a major impediment to the growth and stability of developing

countries. Economists have therefore chosen to explore the channels through which the effects of external debt burden are analyzed and have come up with two competing theories namely the debt overhang theory and the crowding-out effect theory.

The Solow growth model is built on a closed economy which makes use of labor and capital as its means of production. Under this scenario the implication of external debt on growth can be seen through its effect on domestic saving which in turn is used as investment in a closed model. The general effect of external debt on the Solow growth model can be analyzed by looking at the individual effect of the debt overhang and debt crowding theories on the Solow growth model.

2.2.1 The Debt Overhang Theory

Debt-overhang occurs when a nation's debt is more than its debt repayment ability. Krugman (1982) explains debt overhang as one whereby the expected repayment amount of debt exceeds the actual amount at which it was contracted. Borensztein (1990) also defined debt overhang as one where the debtor nation benefits very little from the returns on additional investment due to huge debt service obligations. The "debt overhang effect" comes into play when accumulated debt stock discourages investors from investing in the private sector for fear of heavy tax placed on them by government. This is known as tax disincentive. Tax disincentive here implies that because of the high debt and as such huge debt service payments, it is assumed that any future income accrued to potential investors would be taxed heavily by government so as to reduce the amount of debt service and this scares off the investors thereby leading to disinvestment in the overall economy and as such a fall in the rate of growth (Ayadi and Ayadi, 2008).

2.2.2 The Over-Crowding Out Effect Theory

Cohen (1993) and Clement et al (2003) observe that aside from the effect of high debt stock on investment, external debt can also affect growth through accumulated debt service payments which are likely to "crowd out" investment (private or public) in the economy. The crowding-out effect refers to a situation whereby a nation's revenue which is obtained from foreign exchange earnings is used to pay up debt service payment. This limits the resources available for use for the domestic economy as most of it is soaked up by external debt service burden which reduces the level of investment. Tayo (1993) opined that the impact of debt servicing on growth is damaging as a result of debt-induced liquidity constraints which reduces government expenditure in the economy. These liquidity constraints arise as a result of debt service requirements which shift the focus from developing the domestic economy to repayment of the debt. Public expenditure on social infrastructure is reduced substantially and this affects the level of public investment in the economy.

Furthermore, some researchers have come up with other ways through which external debt may affect economic growth. According to Borensztein (1990) external debt affects growths through the credit rationing effect which is a condition faced by countries that are unable to contract new loans based on their previous inability to pay.

Other theories, among others include the dual-gap theory and the dependency theory. The dual gap theory provides a framework that shows that the development of any nation is a function of investment and that such investment requires domestic savings which is not sufficient to ensure that development take place (Oloyede, 2002). The dual-gap theory is coined from a national income accounting identity which connotes that excess investment expenditure (investment-savings gap) is equivalent to the surplus of imports over exports (foreign exchange gap).

The dependency theory seeks to outline the factors that have

contributed to the development of the underdeveloped countries. This theory is based on the assumption that resource flow from a "periphery" of poor and underdeveloped states to a "core" of wealthy states thereby enriching the latter at the expense of the former. The phenomenon associated with the dependency theory is that poor states are impoverished while rich ones are enriched by the way poor state are integrated into the world system (Todaro, 2003; Amin, 1976).

2.3 Empirical Review

Amooteng and Amoako (1996) investigated the relationship between external debt and economic growth in thirty five (35) African countries. Granger causality test was applied. The result showed a unidirectional and positive causal relationship between economic growth and debt servicing.

Ogunmuyiwa (2011) examined whether external debt promotes economic growth in Nigeria using time-series data from 1970-2007. The regression equation was estimated using econometric techniques such as Augmented Dickey-Fuller test, Granger causality test, Johansen co-integration test and vector error correction method (VECM). The results revealed that causality does not exist between external debt and economic growth in Nigeria.

Suleiman et. al. (2012) in their study "the effect of external debt on the economic growth of Nigeria" utilized time series data covering the period from 1970-2010. Empirical analysis was carried out using econometrics techniques of Ordinary least squares (OLS), Augmented Dickey-fuller unit root test, Johansen Co-

integration test and error correlation method. The integration test shows long-run relationship amongst the variables and findings from the error correlation model revealed that external debt has contributed positively to the growth of Nigerian economy. The study concludes that Nigeria should ensure political and economic stability so as to ensure effective debt management.

In the empirical research by Ishola et al (2013), on the effect of external debt on sustainable economic growth in Nigeria for the period of 1980-2010, using the ordinary least Square regression method, the study found that a 12.3 percent change in economic growth is as a result of external debt and prime lending rate in Nigeria. It therefore recommends that the government should through an act of its political will address the fundamental causes of external debt and also ensure adequate utilization of borrowed funds to develop the different sectors of the economy so as to enhance the economic growth of the nation.

Mbah et.al, (2016) in their work, the impact of external debt on economic growth in Nigeria: An ARDL Bound Testing approach, employed the ARDL bound testing approach to cointegration and error correction models for the period 1970 – 2013; in order to investigate the existence of long-run equilibrium relationship among the variables of study. The Granger causality test was also used to check for the direction of causality among the variables. The result of study indicates a long-run relationship among the variables. External debt impacts negatively significant on output while a unidirectional causality exists between external debt and economic growth. It was recommended that government should embark on prudent borrowing and encourage export-oriented growth.

3.0 Materials and Methods

3.1 Data and Source

Series data on the real gross domestic product (RGDP), external debt service payment (EDSP), official exchange rate (EXCR) and inflation rate (INFR) from 1980-2014 were obtained from Central Bank of Nigeria (CBN) statistical bulletin, 2014 version and the World Bank International Debt Statistics.

3.2 Measurement of Variables

Time series data covering (1980-2014) a period of thirty five (35) years was estimated using Unit root test, Vector autoregressive (VAR) method, Johansen co-integration technique, the Vector error correction model (VECM) and the Newey – West HAC Consistent Covariance OLS estimator.

3.2.1 Unit Root Test

This is the pre co-integration test. It is used to determine the order of integration of a variable that is how many times it has to be differenced or not to become stationary. It is to check for the presence of a unit root in the variable. i.e. whether the variable is stationary or not. The null hypothesis is that there is no unit root. This test is carried out using the Augmented Dickey Fuller (ADF) technique of estimation. The rule is that if the ADF test statistic is greater than the five percent (5%) critical value we accept the null hypothesis i.e. the variable is stationary. But if the ADF test statistic is less than the five percent critical value i.e. the variable is non-stationary, we reject the null hypothesis and go ahead to difference once. If the variable does not become stationary at first difference we difference twice. However it is expected that the variable becomes stationary at first difference. The order of integration of a series is given by the number of times the series must be differenced in order to produce a stationary series. A series generated by the first difference is integrated of order 1 denoted as I(1). Thus, if a time series, is I(0), it is stationary, if it is I(1) then its change is stationary and its level is non-stationary.

Decision Rule

Ho: δ = 0, ρ = 1 (presence of unit root, the data is non-stationary)

H_i: δ < 0, ρ ≠ 1 (the data is stationary and does not need to be differenced)

If the ADF test statistics value is greater than the critical value in absolute terms at all level of significance, we reject Ho and accept H1. This means that there is no unit root and the data is stationary.

In this study, the test is conducted by "augmenting" the preceding three equations by adding the lagged values of the dependent variable ————————————Yt. The ADF test here consists of estimating the following regression:

$$\Delta RGDP_t = \beta_1 + \beta_{2t} + \delta RGDP_{t-1} + \sum_{i=1}^{m} + \alpha i \Delta RGDP_{t-1} + \varepsilon_t \qquad \textbf{(i)}$$

Where εt is a pure white noise error term, t is the time or trend variable and where $\Delta Y_{t-1} = (Y_{t-1} - Y_{t-2})$, $\Delta Y_{t-2} = (Y_{t-2} - Y_{t-3})$, etc. The number of lagged difference terms to include is often determined empirically, the idea being to include enough terms so that the error term in Equation (i) is serially uncorrelated, so that we can obtain an unbiased estimate of δ, the coefficient of lagged Y_{t-1}.

So the rest regressors of the equation as follow;

$$\Delta EDSP_t = \beta_1 + \beta_{2t} + \delta EDSP_{t-1} + \sum_{i=1}^{m} + \alpha i \Delta EDSP_{t-1} + \varepsilon_t$$
$$\Delta EXCR_t = \beta_1 + \beta_{2t} + \delta EXCR_{t-1} + \sum_{i=1}^{m} + \alpha i \Delta EXCR_{t-1} + \varepsilon_t$$
$$\Delta INFR_t = \beta_1 + \beta_{2t} + \delta INFR_{t-1} + \sum_{i=1}^{m} + \alpha i \Delta INFR_{t-1} + \varepsilon_t \qquad \textbf{(ii)}$$

3.2.2 VAR - Lag Length Selection Criteria.

Determination or selection of the VAR order or lag length will be preceded by the estimation of differenced data through the unrestricted VAR. In order to avoid reporting unauthentic causal relations; for example to avoid reporting of spurious presence or absence of causal relations, it is important to determine the optimal lag length to be used for the estimation in the Johansen cointegration and the Vector error correction models. A combination of Akaike Information Criterion (AIC), Schwarz Bayesian Criterion (SC), Likelihood Ratio (LR), Hannan- Quinn (HQ), Final prediction error (FPE) were adopted and ran for the optimal lag length. VAR estimation enabled the determination of the optimal lag length selection while LM serial correlation test was conducted to determine the stability of the VAR equations and ensure that their residuals are not autocorrelated.

3.2.3 Johansen Co-integration Test

Cointegration is a statistical property possessed by some time series data that is defined by the concepts of stationarity and the order of integration of the series. A stationary series is one with a mean value which will not vary with the sampling period. For instance, the mean of a subset of a series does not differ significantly from the mean of any other subset of the same series. Further, the series will constantly return to its mean value as fluctuations occur. In contrast, a non-stationary series will exhibit a time varying mean.

Consider a VAR model of the order p:

$\mathbf{X_{t=} A_1 X_{t-1} +\dots+ A_p X_{t-p} + B_{Xt} + \varepsilon t}$ …… **(iii)**

Assume the vector: x = f($RGDP, EDSP, EXCR, INFR,$)

Where:

RGDP=Real Gross Domestics Product,

EDSP= External Debt Service Product,

EXCR=Official Exchange Rate

INFR=Inflation Rate

Assume that the vector has a VAR representation of the form:

$$X_t = z + \sum_{i=1}^{p} \Pi_i X_{t-1} + \varepsilon_t$$ …… **(iv)**

Where z is a (n×1) vector of deterministic variables, ε is a (n×1) vector of white noise error terms and Π is (n ×n) matrix of coefficients.

Where X_t is a vector of I(1) variables , ΔX_t are all I(0) variables, Δ indicates the first difference operator, B is a (n×n) coefficient matrix and Π is a (n×n) matrix whose rank determines the number of cointegrating relationships.

Decision Rule

Ho: = 0 (there is no co-integration among the variables)

H1: ≠ 0 (there is co-integration among the variables)

If the trace or max-eigen test statistics value is greater than its critical value in absolute terms at 5% level of significance, we reject Ho and accept H1. This means that there is co-integration among the variables of study.

Cointegration model/equation.

Johansen's methodology takes its starting point in the vector auto-regression (VAR) of order p given by

$$\Delta \boldsymbol{Y_t} = \boldsymbol{\mu + A_1 y_{t-1} + \cdots + A_P y_{t-P} + e_t}$$ …….. **(v)**

Where Y_t is an nx1 vector of variables that are integrated of order one – commonly denoted I(1) – and ε_t is an nx1 vector of innovations. This VAR can be re-written as

$$\Delta \boldsymbol{Y_t} = \boldsymbol{\mu + \prod y_{t-1} + \sum_{j-1}^{P-1} \Gamma j \, \Delta y_{t-j} + e_t}$$ **(vi)**

Now the equation of the study is written as:

$$\Delta \boldsymbol{RGDP_t} = \boldsymbol{\mu + \prod GDP_{t-1} + \sum_{j-1}^{P-1} \Gamma j \, \Delta GDP_{t-j} + e_t}$$

$$\Delta \boldsymbol{EDSP_t} = \boldsymbol{\mu + \prod EDSP_{t-1} + \sum_{j-1}^{P-1} \Gamma j \, \Delta EDSP_{t-j} + e_t}$$

$$\Delta \boldsymbol{EXCR_t} = \boldsymbol{\mu + \prod EXCR_{t-1} + \sum_{j-1}^{P-1} \Gamma j \, \Delta EXCR_{t-j} + e_t}$$

$$\Delta \boldsymbol{INFR} = \boldsymbol{\mu + \prod INFR + \sum_{j-1}^{P-1} \Gamma j \, \Delta INFR + e_t}$$ **(vii)**

3.2.4. Vector Error Correction Model

Yule (1936) and Granger and Newbold (1974) were the first to draw attention to the problem of spurious correlation and find solutions on how to address it in time series analysis. A vector error correction (VEC) model

is a restricted VAR designed for use with non-stationary series that are known to be co-integrated. The VEC has co-integration relations built into the specification so that it restricts the long- run behavior of the endogenous variables to converge to their co-integrating relationships while allowing for short-run adjustment dynamics. The co-integration 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.

3.2.5. Newey-West, Heteroskedasticity and Autocorrelation Consistent Covariance Estimator

Newey-West Hetroskedascity and Autocorrelation Consistent Covariance Estimator (HAC Newey-West method) under the OLS estimate produces Newey–West standard errors for coefficients estimated by OLS regression. The error structure is assumed to be heteroskedastic and possibly autocorrelated up to some lag.

The Newey-West standard error correction is commonly used for heteroscedasticity and autocorrelation correction. The formula for the Newey-West covariance matrix estimator can be found in Greene (2000). The Newey-West estimator corresponds to the Bartlett kernel with bandwidth parameter L+1, where L is the maximum lag length. To specify the Newey-West kernel with lag length L, specify KERNEL=(BART, L+1, 0), which produces bandwidth parameter:

l(n) = (L+1)n0 = L+1…… (viii)

The methodology to compute what are often termed heteroskedasticity and autocorrelation consistent covariance (HAC) standard errors was developed by Newey and West; they are often referred to as Newey-West standard errors.

The main or target equations from the VECM estimates were converted to systems of equation and analyzed via the Newey- HAC consistent covariance OLS estimation method and the result used to explain the effect of external debt on economic growth.

4.0 Data Analysis and Interpretation of Results

This section deals with the analysis of data and interpretation of findings. The method of data analysis employed is Augmented Dickey-Fuller (ADF) Unit Root Test, VAR Lag Order Selection Criteria, Johansen Co-integration Test, Error Correction Method and Newey-West HAC Consistent Covariance OLS Estimation method.

Augmented Dickey–Fuller unit root test result is presented on table 4.1.

Table 4.1: Unit Root Test Result

	Augmented Dickey Fuller Test					
Variables	**Order of integration**	**Critical values 1%**	**5%**	**10%**	**ADF Statistics**	**Prob.**
ΔRGDP	I(1)	2.636901	1.951332	1.610747	3.330993	0.0016
ΔEDSP	I(1)	3.646342	2.954021	2.615817	5.561905	0.0001
ΔEXCR	I(1)	3.646342	2.954021	2.615817	5.446799	0.0001
ΔINFR	I(1)	3.646342	2.954021	2.615817	9.324113	0.0000

Source: (Computed by authors using E-views 9)

Note:

1. Δ = difference operator
2. I (d) = No of times of integration
3. Level = 1%, 5%, 10% levels of significance

The result on table 4.1 above shows that all the variables were found to be stationary at first difference, at all levels of significance, i.e. RGDP, EDSP, EXCR and INFR are integrated of order 1(1).

The VAR estimation and the LM serial correlation test results are reported on tables 4.2 and 4.3 respectively.

Table 4.2: Vector Autoregressive Estimates

	RGDP	EDSP	EXCR	INFR
RGDP(-1)	1.076413 (0.02582) [41.6961]	15.19704 (33.7187) [0.45070]	-3.92E-08 (1.8E-07) [-0.21263]	7.88E-08 (3.9E-07) [0.20100]
EDSP(-1)	-0.000113 (0.00014) [0.79923]	-0.265206 (0.18428) [-1.43911]	5.60E-10 (1.0E-09) [0.55670]	-205E-10 (2.1E-09) [-0.09546]
EXCR(-1)	27696.87 (9271.90) [2.98718]	-7225321 (1.2E+07) [0.59663]	0.993488 (0.06615) [15.0196]	-0.092891 (0.14081) [-0.65970]
INFR(-1)	-850.6636 (12812.5) [-0.06639]	-20779417 (1.7E+07) [-1.24169]	0.090763 (0.09140) [-0.99298]	-0.062649 (0.19458) [-0.32198]
C	-138744.2 (802120.) [-0.17297]	4.85E+09 (1.0E+09) [4.62618]	6.409470 (5.72236) [1.12007]	31.12672 (12.1814) [2.55527]
R-squared	0.994742	0.110449	0.956776	0.026878
Adj. R-squared	0.993963	-0.021336	0.950372	-0.117288

Table 4.3: Serial Correlation LM test

Lags	LM-Stat	Prob
1	7.074426	0.9718

Prob from chi-square with 16 df.

Diagnostic check for serial correlation was further applied and appropriate lags levels determined to ensure a better model. Result from the test shows that the estimated VAR system is generally free from serial correlation. In other words the residuals are not autocorrelated.

Given the diagnostic test results indicating absence of autocorrelation i.e. that the residuals of the VAR estimates were uncorrelated, VAR lag length of lag 1 as the optimal lag was chosen and presented on table 4.4 below.

Table 4.4: Lag Order Selection Criteria

Lag	Logl	LR	FPE	AIC	SC	HQ
0	-1541.289	NA	6.47e+39	103.0192	103.2061	103.0790
1	-1424.872	194.0278*	8.11e+36*	96.32479*	97.25892*	96.62363*
2	-1419.721	7.211524	1.78e+37	97.04805	98.72949	97.58596

* indicates lag order selected by the criterion

From table 4.4 above, LR, FPE, AIC, SC, and HQ selected lag 1 as the optimal lag. Thus, lag 1 was selected for the estimation procedure as presented in the table.

We therefore, proceed to conduct Johansen test of co-integration between the variables to determine existence of long-run equilibrium between the series.

Results of the Johasen cointegration test are reported on tables 4.5.1 and 4.5.2 respectively.

Table 4.5.1: Johansen Co-integration Test Unrestricted Co-integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5% Critical Value	Prob.**
None *	0.543551	54.80407	47.85613	0.0097
At most 1 *	0.499658	31.27569	29.79707	0.0335
At most 2 *	0.295096	10.50179	15.49471	0.2441
At most 3 *	0.000366	0.010992	3.841466	0.9163

Source: (Computed by authors using E-views 9)

Trace test indicates 2 co-integrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

4.5.2: Unrestricted Co-integration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5% Critical Value	Prob.**
None *	0.543551	23.52837	27.58434	0.1520
At most 1 *	0.499658	20.77390	21.13162	0.0560
At most 2 *	0.295096	10.49080	14.26460	0.1817
At most 3 *	0.000366	0.010992	3.841466	0.9163

Source: (Computed by authors using E-views 9)
Max-eigenvalue test indicates no cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 4.5.2 above compares unrestricted co-integration rank test obtained from the trace and maximum eigen value test with the corresponding critical values due to Mackinnon. The result of the two tables above (table 4.5.1 and 4.5.2) indicates that trace statistics shows an evidence of two (2) co-integration equation at 5% critical value, and maximum eigen statistics show an evidence of no (0) co-integration equation at 5% critical value, Lutkepohl et.al, (2000) assert that considering different deterministic terms, show that powers of the two tests are similar. However, with small sample sizes, the trace test power performance is higher. As a result of these likelihood ratio tests, Johansen test depends only on completely specified autoregressive process for levels of data series. As a result of this we will proceed with the result of trace statistics given its superiority, which implies an existence of unique long-run relationship between (RGDP) and other variables of study in the model.

Since we found two co-integrating vectors, the economic interpretation of the long-run impact of external debt on economic growth (RGDP) in Nigeria can only be obtained by normalizing the estimates of the unrestricted co-integrating vector on the economic growth (RGDP). The co-integrating equations identified, can then be used as an error correction term in the error correction model (ECM).
The result of the VECM estimation is reported on table 4.6

Table 4.6: Vector Error Correction Model (VECM) Result

Error Correction:	D(GDP)	D(EDSP)	D(EXCR)	D(INFR)
CointEq1	0.109430 (0.02133) [5.12996]	14.57886 (30.3865) [0.47978]	-2.33E-08 (1.6E-07) [-0.14620]	-2.04E-07 (3.3E-07) [-0.61653]
CointEq2	-0.000111 (3.3E-05) [-3.32973]	-0.052653 (0.04730) [-1.11324]	2.18E-10 (2.5E-10) [0.87783]	1.92E-09 (5.2E-10) [3.71869]

Table 4.6 indicates that estimated lagged error correction term of growth. The magnitude of the error correction term is negative (appropriately signed), its absolute value lies between zero and one, and it's statistically significant. This implies a long-run convergence of the model; it hereby implies that if any shock is introduced into the model, the model would still converge with time.

The result of the VECM OLS estimation in respect of target/main equation RGDP is reported on table 4.7.

Table 4.7: VECM OLS Estimation of RGDP

	Coefficient	Std. Error	t-Statistics	Prob
C(1)	0.109430	0.015095	7.249252	0.0000
C(2)	-0.000111	2.01E-05	-5.495562	0.0000
C(3)	-0.256699	0.191614	-1.339666	0.1934
C(4)	-4.45E-05	9.25E-05	-0.481677	0.6346
C(5)	-9276.876	19898.80	-0.466203	0.6455
C(6)	9634.885	13388.62	0.719632	0.4790
C(7)	3622113	826719.2	4.381311	0.0002

R-squared= 0.768538 Adjusted R-squared= 0.708157 Durbin-Watson stat= 1.796662
F-statistics= 12.72809 Prob(F- Statistics)= 0.000003 Prob(Wald F-statistics)= 0.000000

From table 4.7 above it can be seen that there are two error correction terms (ECT) i.e C(1) and C(2). But the rule for establishing longrun relationship among the variables is that ECT must be negative in sign and significant at 0.05.

Therefore ECT1 though significant but not negative in sign, is indeterminate. ECT2 is negative in sign and also significant at 0.05, hence we can say that there is a long-run causality running from EDSP, EXCR and INFR to RGDP i.e at long-run the independent variables are moving to equilibrium towards RGDP.

R-squared is 0.768538 indicating that over 76% variation in the dependent variable is explained by the

independent variables.

Results of diagnostic tests for VECM OLS estimation of RGDP are reported on table 4.7.1

Table 4.7.1: Diagnostic Test Results for VECM OLS estimation of RGDP

Types of test	X^2	P-value
Serial correlation	0.518572	0.4715
Heteroscedasticity	5.135135	0.7430
Normality test(Jarque-Bera)	24.34326	0.000005

Diagnostics tests for serial correlation, heteroscedasticity and normality conducted show that the estimated VECM is free of serial correlation, the error are found to be homoscedastic and the standard residual of errors are normally distributed.

Result of the VECM OLS estimation of EDSP is reported on table 4.8.

Table 4.8: VECM OLS Estimates of EDSP

	Coefficient	Std. Error	t- statistics	Prob
C(8)	14.83628	14.51349	1.022241	0.3169
C(9)	-0.051540	0.052630	-0.979280	0.3372
C(10)	-143.7603	113.6641	-1.264783	0.2181
C(11)	-6.684817	0.150722	-4.543594	0.0001
C(12)	-62521037	21811605	-2.866412	0.0085
C(13)	-40836387	29766868	-1.371874	0.1828
C(14)	7.98E+08	5.36E+08	1.486698	0.1501

R-squared= 0.615847 Adjusted R-squared = 0.519808 Durbin-Watson stat= 2.617295
F-statistic = 6.412509 Prob(F-statistic) = 0.000392 Prob(Wald F-statistic)= 0.000099

From table 4.8 it can be seen that there are two error correction terms i.e C(8) and C(9). But the rule is that ECT must be negative in sign and significant at 0.05. Therefore ECT1 (C(8)) is insignificant at 0.05 and positive in sign as a result it indicates that there is no long run causal relationship running from RGDP, EXCR and INFR to EDSP. Also ECT2 (C(9)) is though negative in sign but insignificant at 0.05. Therefore it is indeterminate.

R-squared is 0.615847 62% indicating that over 61% variation in the dependent variable is explained by the independent variables.

However, it is noticed that the model is free from autocorrelation since the DW statistic observed in the model is 2.62 which is above 2. This means that the model is reliable in explaining the impact of external debt on economic growth in Nigeria.

Results of diagnostic tests for VECM OLS estimation of EDSP are reported on table 4.8.1.

Table 4.8.1: Diagnostic Test for VECM OLS Estimation of EDSP

Types of test	X^2	P-value
Serial correlation	4.657089	0.0309
Heteroscedasticity	8.229069	0.4114
Normality test(Jarque-Bera)	2.116803	0.347010

Diagnostics tests for serial correlation, heteroscedasticity and normality conducted show that the estimated VECM is free of serial correlation, the errors are found to be homoscedastic and standard residual of errors are not normally distributed.

5.0. Discussion of Findings

The discussion of findings is done in line with objectives of the study.

Objective 1: To determine the effect of external debt servicing on real gross domestic product in Nigeria.

It was found that external debt service has negative significant relationship with RGDP in the longrun, which is in line with the results of most researches as evidenced in the works of Kasidi and Said (2013), Amootang and Amoako (1996), Momodu (2012), Ezeabaili et al (2011) and Mbah et. al (2016). This means that an increase in debts brings about reduction in the nation's RGDP. Debt servicing could be described as proboscis of a mosquito for sucking out blood from its victim. It is a tax on unearned income/resources. It is so in that a debtor nation has to service its debt with attendant depletion of resources which may result to debt overhang and uncertainty. Uncertainty occasioned by excessive large debt makes the macro environment (interest rate, exchange rate and inflation) unstable with disastrous economic consequences such as scarce investment and reduced access to International Financial Market.

Objective 2: To establish the impact of exchange rate and inflation on real gross domestic product in Nigeria.

Results show that exchange rate had a positive though not significant relationship with RGDP. This means

that an increase in exchange rate brings about an increase in RGDP. An increase in exchange rate (i.e. currency depreciation) encourages export, as foreign currency could easily be exchanged with less value to buy from that nation, but discourages import. By so doing, demand for locally produced goods increases. Following increase in demand, production increases and this may result in increased employment, and eventual increase in RGDP. Similar views on the impact of positive relationship were expressed by Rodric (2006) and Obansa, Okoroafor, Aluko and Millicent (2013).

However, some studies found that exchange rate has negative impact on the economy. Such findings were in agreement with Arinze, Osang and Slottje (2000). Similar finding was made by Eme and Johnson (2012). Furthermore, Eme and Olugboyega (2012) found that there is no evidence of a strong direct relationship between changes in exchange rate and RGDP growth. This study also reveals that the impact of exchange rate as insignificant on the economy. But exchange rate usually exerts reasonable pressure positive or negative on the economy. Negative influence occurs mainly at extreme of exchange rate volatility where the value of the currency becomes so low that the investment is stifled while foreign raw material and sub-assemblies are so high that factories start closing down.

6.0 Conclusion and Recommendations

This study makes modest contributions to the debate about external debt and its impact on economic growth. The VECM OLS regression result shows a negative relationship between external debt service payment and economic growth. The implication of this result is that a change in external debt service payment out of the country leads to decrease in economic growth; thereby showing that the importance of external debt should not be underscored. It was observed that exchange rate has a positive relationship with RGDP i.e. increase in exchange rate will lead to increase in economic growth, Furthermore, government should also formulate policies that will encourage export oriented manufacturing and high technology products to improve the nations export base as well as reduce its level of deficit financing. Development projects could be financed through increased export earnings rather than resulting to borrowing.

The following recommendations should be considered to ensure robust, effective and efficient management of Nigeria's external debt towards achieving sustainable economic growth and development.

The government should endeavor to support various export promotion programmes and institutions. This could be achieved by encouraging financial institutions, both formal and informal, to make loans available at reduced rates of interest for investors as to increase the level of investment in this country which will attract foreign investor consequently leading to increase in Real Gross Domestic Product .

All external borrowing should be thoroughly assessed to ensure their conformity with the nation's objectives and priorities which promises potential benefits for the economy. Also Debt Management Office (DMO) should set maximum limit of loans states and federal governments could be allowed to acquire based on certain stipulated criteria.

Government should pursue further internal reforms to increase government revenue so as to minimize its dependence on external debt as a means of financing that are detrimental to the economic health.

An appropriate articulated national policy on development cooperation which provides appropriate guidelines for effective mobilization and utilization of borrowed resources is a crucial aspect of socio-economic management. Therefore, the government should endeavor to speed up process of putting in place a well-articulated national policy on Development Corporation. Such a policy should be subjected to considerable discussion at all levels of government before it becomes a national document. The recent launching of the economic growth and development plan (EGDP) by the federal government of Nigeria is a step in the right direction.

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