Modeling the Impact of External Debt Stock and Servicing on Export in Nigeria (1981-2010)

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ABSTRACT

This study examines the econometric relationship between external debt stock and servicing on exports in Nigeria covering the period 1981-2010. The Ordinary Least Square (OLS) is used to test the explanatory power and level of significance of external debt stock and servicing on exports. The unit root test, co-integration and error correction techniques are introduced to smoothen the spuriousity inherent in time series data as well as to proof the existence of both the short and long-run equilibrium relationship between the variables. The results reveal a 91% explanatory power of debt stock and debt servicing on exports negatively. The ADF test using the Maximum and Trace statistics, shows that only DS is stationary while all others are found to be stationary at first difference at 5% level of significance. The Johansen co-integration test shows that there exists stable long-run equilibrium relationship between the variables. The ECM shows that the coefficient of determination is highly significant at 5% level with the R^2 value of 92%. It is recommended among others that the government should offset trade bills using domestic resources instead of external finance.

***Keyword**: Debt Stock, Debt Servicing, Exports, Export-Led Growth.*

INTRODUCTION

The exports-led growth is an economic strategy used by most developing countries to speed industrialization process that can trigger greater productivity (Eduardo *et al*, 2009). The negative consequences of external servicing payments on nation's balance of payments, external reserves, and exports among others cannot be over emphasized. The ratio of debt to exports and debt servicing to exports have become standard measure of sustainability and also in accessing a country's external debt stock and its servicing obligation capacity. Most of the Nigeria's export earnings go for offsetting external debt repayments and servicing. The increased external debt stock outstanding to US$10718.43million in the 3rd quarter of 2015 from US$10617.35million in the 1st quarter of the same year amidst decreasing total external debt stock to exports from 173, 19.0, 24.4, 31.2 to only 7.5 between 2011 to 2015 call for an investigation of this sort (World Bank Group, 2016). The export earnings had considerably reduced within the period indicating a negative trend (CBN, 2016). No wonder Eduardo *et al* (2009) argue that the expansion of exports can spur economic growth through trade openness and liberalization. They maintain that export-led growth propelled developing countries to higher levels of economic growth but the imbalance such as large - current account imbalances running some growth will have to

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be changed in the future. They asserts that export-led growth is important in two respects, first, export-led growth can create profit, allowing a country to balance their finances, as well as surpass their debts as long as the facilities and materials for the export exist. Secondly, export led growth can increase a nation's productive capacity by creating more exports. They conclude that by introducing this economic strategy countries will gain enough hard currency to import commodities, manufactured more cheaply, somewhere else outside the domestic economy. According to the Nigeria Economic Report (2014), the ratio of gross external debt to exports provides a quick indicator of the capacity of an economy to repay external debt with enhanced revenue from sales to foreign countries. A ratio below 1 suggests that debt can be repaid rapidly, theoretically, in less than one year. Conversely, the higher the ratio, the lower the country's capability to finance the debt with revenue from exports. It is against this backdrop that it becomes imperative to investigate the impact of external debt, stock and servicing on export earning in Nigeria. The main purpose of this work is to explore the econometric impact of external debt servicing and stock on export earnings in Nigeria. Based on the findings, inference will be drawn about the relationship between the external debt servicing and stock on export earnings especially now that the alleged external debt is on the increase against reducing trend in exports earning accruing to the country.

Export-led Growth Hypothesis

The export-led growth hypothesis strongly suggests that developing countries can enhance economic growth by seeking a niche in the world economy for certain type of export industries. Producing exports may receive governmental subsidies and better access to the local market through access to hard foreign currency. Chaido (2013) examines the relationship between economic growths, Exports and Government Debt of Greece over the period 1960-2011. The study uses the Vector Error Correction Model (VECM) to investigate the relationship while employing the Granger Causality Technique in order to explore the presence of causality among the variables. The result shows presence of both short and long-run relationship. Specifically, the result shows a unidirectional Granger Causality running from exports to economic growth as well as from economic growth to government debt.

Wadad (2012) examines the econometric relationship between external public debt servicing, Exports and Economic Growth in Lebanon. The study empirically investigates the relationship between these variables using an econometric analysis over the period 1970-2010. The exchange rate was included as the fourth macro-economic variable. Exports were introduced to test the export led-growth hypothesis for Lebanon. The error correction methodology was introduced to test the presence of series correlation among the variables as well as a long-run equilibrium relationship. The results proof the presence of both the short and a long-run relationship. The result also shows bidirectional causality from external debt to exports. Also, a unidirectional causality from exports to economic growth and a unidirectional causality running from exchange rate to economic growth. Quazi, Mohammed and Shaista (2013) examine economic growth, exports, and debt

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causality; the case of Asian countries. They used the Granger Causality test, the study reveals that there is a bidirectional relationship between the studied variables and pointed out that a reduction in debt stock would led to improvement in economic growth supporting the export-led growth theory. Evan and Thian (2014) examine the nexus between external debt and economic growth covering seventeen Asian countries. The study found that external debt work through two channels, directly and indirectly in which the causality runs from external debt to GDP and directly in which it positively enhance exports through which foreign financial capital can potentially stimulate exports through economic growth while strengthening the bidirectional causality between exports and GDP. With the backdrop of uncertainties around the globe, for example, the debt crisis efficiency suggest that coordination in implementing debt management is needed to support economic development which should be on every Asian regional agenda.

METHOD

This study employed annual time series data for Nigeria published in the Central Bank of Nigeria statistical bulletin. The study covers the period of 1981 to 2010. In order to achieve the objective of the study; the Ordinary Least Square (OLS), unit root, co-integration and the vector error correction techniques were used to explore the impact of external public debt stock and servicing on exports. The choice of this econometric estimation is because they maximize minimum variance, error sum of square, consistency and a number of advantages. Also, it is widely used as it is simple and easy to understand. The model used to analyze the relationship is implicitly stated as:

$$EXP = f(DS, XDS) \quad - - - - - - \quad 1$$

Transforming equation 1 above into a linear function we have;

$$\text{EXP}_t (\beta_o + \beta_1 + DS_t + \beta_2 XDS_t + \mu \quad - - - - \quad 2$$

Where:

EXP	=	Export earnings
DS	=	External debt stock
XDS	=	External debt servicing
β_o	=	The constant or incept.
$\beta_o + \beta_2$	=	The coefficient of the explanatory variables
	=	Error terms

It has been widely argued that the log-linear form is more likely to find evidence of a deterrent effect than a linear form. We therefore log-linear the equation as:

$$\text{Log EXP}_t = \beta_o + \beta_1 \log \text{DS}_t + \beta_2 \log \text{XDS}_t + \quad - - - \quad 3$$

Ordinary Least Square (OLS): This tests the magnitude and nature of relationship between the variables in the short-run, using R^2 rest in the regression equation. R^2 explains the high power of the explanatory variables on dependent variable.

Unit Root: This involves testing the behaviour of the data and the order of the integration

of the individual series under consideration. This is necessary because most time series are non stationary. Granger and Newbold (1974) in their work entitled "spurious regressions in econometrics" hold that it is commonly reported in applied econometrics literature that time series regression equations with good fit measure in terms of coefficient of multiple correlation R^2 with a low value Durbin-Watson statistics depicts presence of spuriousity or auto correlation. One of the most popular unit roots test, the Augmented Dickey Fuller developed by Dickey-Fuller (1987) is adopted for this work. This allows for test for non stationarity and stationarity of time series data.

Co-integration Equation: Dickey (1991) notes that lack of co-integration suggests that such variables have no long-run relationship, they wander arbitrary far away from each other, hence, the use of the co-integration test to confirm the presence or otherwise of co-integration between the series and order of integration by forming the co-integration equation expressed as:

The basic idea behind co-integration is that, if in the long-run two or more series moves closely together, even though the series themselves are trended, the difference between them is constant.
Where:

$\{\eta m \log RPC_t - \sum_{i=0}^{n}\} \beta X t$ = the linear combination of the non co-integrated vectors.

X = a vector of the non co-integration variables

$\{\eta m \log RPC_T \alpha 1 \eta m Z_t \eta m \log RPC_t - \sum_{i=0}^{n}\} \beta X t + V_2$

The Error Correction Model Equation: When the co-integration is proven, then the next step requires the construction of error correction mechanism to model the dynamic relationship. The purpose of the error correction mechanism is to indicate the speed of adjustment from the short run equilibrium to the long-run equilibrium state. The greater the coefficients of the parameters, the higher the speed of the adjustment from short run to long-run equilibrium. The individual influence of the co-integration variables can only be separated with an Error Correction Mechanism (ECM) through an error correction model as shown below:

$$\eta = \log RPC_t = \alpha 1 + Z_t - \lambda ECM^T - 1 + V_t 1$$

Where

λECM = The error correction mechanism

= The magnitude of error corrected each period specified in its prior form so as to restore *z* to equilibrium where *z*, represent the explanatory variables.

RESULTS AND DISCUSSION

The short-run regression carried out on the model (table 1) shows that the coefficient of determination is 0.91 indicating that the explanatory variables explained 91% of variation

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in export. The overall regression model did not show any significant correlation, thus, that there exists serial correlation in the model. A look at the above result shows that the D. W Statistics value of 1.40 also was relatively low confirming the existence of serial correlation hence; the model has a unit root implying non-stationarity. We therefore proceed to the unit root-test. As observed from the regression model (table 1), it was a spurious regression, hence all the series at both level and first difference and with constant and trend equation were run. As usual, the appropriate lag level applied in the unity root test follows the SIC Criterion. The ADF test is used to test for the presence of unit roots in the variables. The result is shown on table 2. The results show that only LN (DS) is stationary, while all others were stationary at 1st difference at 5% level of significance.

From the results on table 2, only DS was found to be integrated at order 1, hence it calls for long-run test of relationship. Co-integration Test was aimed at determining the existence of long run equilibrium relationship between our variables. Separate co-integrations are carried out on Export, with its relationship with Debt Stock and External Debt Servicing. As usual, the Trace and Maximum Eigen Statistics are used to confirm whether the variables are co-integrated or not as indicated on table 3. The results show that both the Trace and Maximum Eigen Statistics rejected the null equation at 5% level. Maximum Eigen tests shows that all the variables are co-integrated at 5%. The implication is that a liner combination of all the five series was found to be stationary and hence are said to be co-integrated. In other words, there is a stable long-run relationship between them and so we can avoid both the spurious and inconsistent regression problems which otherwise would occur with non stationary data series.

The data estimated on table 4 were treated with both linear and log linear specification and the one that suites the specification, judgement in terms of goodness of fit, precision of estimate and a tolerable level of multi-linearity was adopted for the study. From the result on table 4, the log linear model is preferred since it has high R^2 and most parameters are significant. The short-run regression carried out shows that the coefficient of determination (R^2) of 0.91 or 91% accounts for the explanatory power of EX, DS and XDS on the dependent variables exports (EXP). The overall regression model was not significant an indication of pressure of serial auto correlation with a low coefficient of D.W. (1.40). The unit roots test applying ADF test indicates that only debt stock (DS) was found to be a stationary at 5% significant level, while the overall variables were co-integrated using both the Trace and Maximum Eigen statistics, the co-integration hypothesis was rejected at 5% level of significance. These indicate that there is a linear combination among the series and were found to be stationary. In other words, there is a stable long-run relationship among the variables.

Result of the error correction model (ECM) the most oparamatized and paracimonious specification indicates that the parsimonious error correction model shows that the coefficient of determination was statistically and significantly high. This is, the explanatory variable (DS) and (XDS) account for 92% variations in the dependent variable (EXP). The overall model was found to be significant at 5% level with a high value of D.W. of 2.10 implying absence of serial correction. The ECM results also shows that exports

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(EXP) adjust fairly to the influence of DS and XDS as the explanatory variables with some having the expected signs while some does not.

Table 1: Ordinary Least Square (OLS) Regression Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.983561	0.907506	1.083806	0.2880
LOG(DS)	-0.086402	0.143909	-0.600397	0.5532
LOG(XDS)	1.245391	0.140365	8.872539	0.0000
R-squared	0.916990	Mean dependent var		12.84483
Adjusted R-squared	0.910841	S.D. dependent var		2.526872
S.E. of regression	0.754513	Akaike info criterion		2.369151
Sum squared resid	15.37082	Schwarz criterion		2.509271
Log likelihood	-32.53726	F-statistic		149.1302
Durbin-Watson stat	1.406181	Prob(F-statistic)		0.000000

Source: Author's Computation Using e-views 3.1.

Table 2: Unit Root Test of Variables Using ADF Test (1981-2010)

Variables	**At Levels**	**Order of Integration**	**1st Difference**	**Order of Integration**
"LN (EXP)	-0.556275	1(0)	-4.693829	1(1)
"LN(DS)	-3.215252	1(0)	-4.112140	1(1)
"LN(XDS)	-1.653212	1(0)	-5.761876	1(1)
"LN(EXR)	-0.586500	1(0)	-6.276974	1(1)

Critical values at levels: 1%-3.679322, 5%-2.967767, 10%-2.622989.
At 1st difference: 1%-3.699871, 5%-2.976263, 10%-2.627420
Source: Author's Computation (2015) Using e-views 3.1.

Table 3: Johansen Con-Integration Tests Result (1981-2010)

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.800050	83.35866	29.79707	0.0000
At most 1 *	0.599013	41.50678	15.49471	0.0000
At most 2 *	0.494693	17.74730	3.841466	0.0000

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (MacKinnon, Alfred and Michelle, 1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigen value)

Hypothesized No. of CE(s)	Eigen value	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.800050	41.85188	21.13162	0.0000
At most 1 *	0.599013	23.75949	14.26460	0.0012
At most 2 *	0.494693	17.74730	3.841466	0.0000

Max-eigen value test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (MacKinnon, Alfred and Michelle, 1999) p-values
Source: Author's Computation (2015) Using e-views 3.1

Table 4: The Parsimonious Error Correction Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.685481	0.114626	5.980161	0.0003
D(LOG(EXPORT(-1)))	0.426405	0.167474	2.546096	0.0344
D(LOG(EXPORT(-2)))	0.399852	0.140921	2.837411	0.0219
D(LOG(EXPORT(-4)))	-0.537601	0.139578	-3.851626	0.0049
D(LOG(EXPORT(-6)))	0.520930	0.184858	2.818001	0.0226
D(LOG(DS))	0.299445	0.105738	2.831965	0.0221
D(LOG(DS(-2)))	-0.366587	0.160433	-2.284983	0.0517
D(LOG(DS(-6)))	0.231306	0.147298	1.570324	0.1550
D(LOG(XDS))	-0.196787	0.087921	-2.238215	0.0556
D(LOG(XDS(-1)))	-0.794759	0.122442	-6.490899	0.0002
D(LOG(XDS(-2)))	-0.379535	0.120721	-3.143904	0.0137
D(LOG(XDS(-4)))	-0.354291	0.104762	-3.381857	0.0096
D(LOG(XDS(-5)))	-0.814802	0.185011	-4.404072	0.0023
D(LOG(XDS(-6)))	-0.502831	0.101037	-4.976701	0.0011
ECMM(-1)	-0.853348	0.122737	-6.952670	0.0001
R-squared	0.922791	Mean dependent var		0.256337
Adjusted R-squared	0.787674	S.D. dependent var		0.404190
S.E. of regression	0.186246	Akaike info criterion		-0.275200
Sum squared resid	0.277501	Schwarz criterion	0.465340	
Log likelihood	18.16480	F-statistic	6.829592	
Durbin-Watson stat	2.108032	Prob(F-statistic)	0.005105	

Source: Author's Computation (2015) Using e-views 3.1

CONCLUSION AND RECOMMENDATIONS

This work appraises the impact of external debt dynamics (debt and services) on the Nigerian export earning within the period 1981-2010. The estimated results point that external debt dynamics impact negatively on exports earning in Nigeria servicing payment or liability, which means diverting export proceeds which would have been otherwise for productive investment purposes caused by crowding out and credit rationing effect of external public debt. The results further show negative correlation between external debt dynamics (DS), (XDS) and Nigerian export earnings (EXP). Our analysis also confirms the existence of both short and long run equilibrium relationship among the studied parameters.

Therefore effort aimed at driving the nation with the exported growth strategy would be a good omen for Nigeria government. Our overall results indicate that exports earnings is a significant variable that determines economic growth the world over. If the nation is to enhance its foreign exchange earnings from export proceeds, then, there is the need for deploying contracted loans into capacity of the country. The Nigerian government should pursue the export led-growth strategy so that it can help in financing its trade bills rather than relying on foreign debt to finance it.

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