

Exchange Rate Movements: External Debt Problems in Nigeria 1980-2010

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Abstract

Copious of arguments for debt contractions have been put forward especially in favour of the need for developing countries to attain economic growth. This arises as a result of inadequate savings coupled with the inability of the developing countries to operate within the stipulated debt limit. As such the debts mount and the burden keeps rising. The mounting debt is more complicated when it is externally sourced as it requires foreign exchange for its redemption. Unfortunately the fluctuation in the exchange rate further inhibits the payment of interest that eventually adds more to the initial principal amount borrowed.

Observing the Nigeria debt portfolio and its exchange rate movements for some years, the latter's impact has continued to influence the former negatively. This paper thus seeks to use co- integration technique to test for the extent of their relationship from 1980 to 2010.

By so doing, the exchange rate influences the external debt to a greater extent and thus requires that Nigeria must source for other means of financing its growth and development. Further to this, the country should ensure a more conducive macroeconomic environment towards attaining a stable exchange rate.

Keywords: Exchange Rate, Net Export, External Debt, Foreign Direct Investment.

Introduction

The external debt situation in Nigeria is one that has attracted a lot of attention with views from diverse perspectives (Ajayi, 1991; Muoghaluet al., 2007; Cain et al., 2010). External debt by nature is often denominated in foreign currencies and all form

of payment results in mounting pressure on the foreign exchange, ultimately crowding out private investment.

Foreign currency denominated debt refers to the debt a country incurs by borrowing in foreign currency and such debts are exposed to various currency risks or exchange

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rate movements. A currency risk is the volatility of debt servicing due to unexpected foreign exchange movements (Eichengreen et al., 1996). It is thus evident that any adverse behaviour of foreign exchange may hold a dire consequence for the ability of a lender nation to redeem such debt.

Fluctuations that characterized the foreign exchange rate have direct bearings on the ability to repay external debt which has led to a plethora of options used in debt management. Upsurge in external debt as a means to financing growth and development in Nigeria in recent times has therefore becomes more and more challenging on the background of these fluctuations.

This study thus seeks to explore the long run relationship existing between the exchange rate movements and external debt in Nigeria by discussing related views along with the theoretical framework in section two. Section three presents the methodology while section four discusses the results arising from the treated data. This paper is concluded with recommendations for achieving better and a stable exchange rate.

Review of Literature and Theoretical Framework

External debt is widely believed to enhance economic growth and development as also buttressed in the Harrod-Domar growth model where the economy needs to fill the savings gap through capital inflow by either borrowing from abroad or through foreign direct investment and foreign aid

(Domar, 1957; Osinubi&Olaleru, 2006). Debt is thus contracted in the first place to finance the savings – investment gap. Both developed and developing nations seek for external debt so as to boost their economic performance.

Exchange rate is a relative price that measures the worth of one country's domestic currency in terms of another country's currency. It relates the purchasing power of a domestic currency in terms of the volume of goods and services it can purchase vis-à-vis a foreign trading partner's currency over a specific period of time. Thus, the exchange rate reduces the relative strengths of relating economies to measurable aggregates through a number of conceptual frameworks (Obaseki, 2001). The nexus between exchange rate movements and external debt is one that has a far reaching effect on the state of the economy at any given time. Dornbusch (1976) developed a model that reveals a short-run overshooting in exchange rate in an economy experiencing a rise in her external debt position. The author thus concluded that any rise in the monetary aggregate such as money supply in the face of price rigidity will result in overshooting of nominal exchange rate. Corsetti et al (1999) argued that external borrowings particularly by private commercial banks and firms are among the factors responsible for the severity of the East Asian financial and currency crises during the late 1990s.

Therefore the link between capital flight and external debt should be examined. Ajayi (1997) asserted that as the severity of exter-

nal indebtedness in most countries increases, so does capital flight problem worsens in these countries. This is because as capital enters the country in the form of external borrowing, it simultaneously slips out of the country as private capital flight.

Over the years, the conventional theory was to compare foreign direct investment (FDI) to bonds for which exchange rate movements do not affect the investment decision. Blonigen (1997) has however argued that a depreciation of the currency in the host country reduces the amount of foreign currency needed to purchase the asset but it also reduces the nominal return one receives in the foreign currency thus leaving the rate of return for investors unchanged. Using 30 Sub-Saharan African countries including 24 severely indebted low income countries for the period 1970-1996, Ndikumanana and Boyce (2002) observed that external borrowing is positively and significantly related to capital flight, suggesting that to a large extent capital flight is debt fuelled. Working with unbalanced panel for 87 low and middle income countries, Donneilet al (2010) found evidence to show that exchange rate movement Granger-causes the stock of foreign exchange denominated debt in these countries. Gorg and Wakelin (2001) examined the impact of volatility in the exchange rate and exchange rate expectation on outward United States' FDI in 12 developed countries and inward FDI to United States from same countries for a period 1983 to 1995 and found no evidence for an effect of exchange rate variation on either US outward investment or inward investment in the US.

ment in the US.

Methodology

Time series data were collected from Central Bank of Nigeria (CBN) from 1980-2010 for the following variables: external debt, exchange rate, crude oil price, overall government deficit, net export, foreign direct investment and inflation. Granger causality, ordinary least square regression and Johansen co-integration test were the time series techniques employed for analysis.

The Granger causality model is presented below:

$$XR_t = \alpha_0 + \alpha_1 \sum_{i=1}^n XR_{t-i} + \beta_1 \sum_{i=1}^n XD_{t-i} + e_t \quad (3.1)$$

$$XD_t = \alpha_0 + \alpha_1 \sum_{i=1}^n XD_{t-i} + \beta_1 \sum_{i=1}^n XR_{t-i} + e_t \quad (3.2)$$

Where XR = exchange rate and XD = external debt. The granger causality result output on E-views provides the computed F-statistics and their associated probability values that would be used to interpret the direction of causality connecting the variables. It is expected both models will be significant with $\alpha_i > 0$ and $\beta_i > 0$ implying that there is a two-way causality between them.

The Ordinary least square regression to be estimated is presented below:

$$XR_t = a_0 + a_1 NETX_t + a_2 XD_t + a_3 FDI_t + u_t \quad (3.3)$$

$$XD_t = b_0 + b_1 NETX_t + b_2 XR_t + b_3 CO_t + b_4 OD_t + b_5 INF_t + v_t \quad (3.4)$$

Where $NETX$ is net export, CO is crude oil price, OD is overall government deficit (i.e. total revenue less expenditure), INF is inflation.

tion, while u_t and v_t are the residual terms. A priori, $a_1 > 0$, $a_2 > 0$ and $a_3 < 0$; while $b_1 > 0$, $b_2 > 0$, $b_3 < 0$, $b_4 > 0$, and $b_5 > 0$.

The co-integrating relationship was estimated using Johansen Co-integration presented below:

$$Z_t = \sum_{i=1}^m A_i Z_{t-i} + E_t \quad (3.5)$$

Where Z_t contains all n variables of the model and E_t is a vector of random errors. This model can also be represented in the form of $\beta\alpha$

$$\Delta Z_t = \sum_{i=1}^{m-1} \Gamma_i Z_{t-i} + \Pi Z_t + E_t \quad (3.6)$$

Where:

$$\Gamma_i = -I + A_1 + \dots + A_i \quad (I \text{ is a unit matrix})$$

$$\Pi = -(I - A_1 - \dots - A_m)$$

Matrix Π can be represented in the following form: $\Pi = \alpha\beta$, where α and β are both $n \times r$ matrices. Matrix β is called the co-integrating matrix whereas matrix α is referred to as the adjustment matrix or the feedback matrix. The Johansen method provides not only the direct estimates of the co-integrating vectors but also enables us to construct tests for the order (or rank) of co-integration, r and there can be at most $r = N-1$ co-integrating vectors. The model will be estimated using E-views econometric software.

Results and Discussions

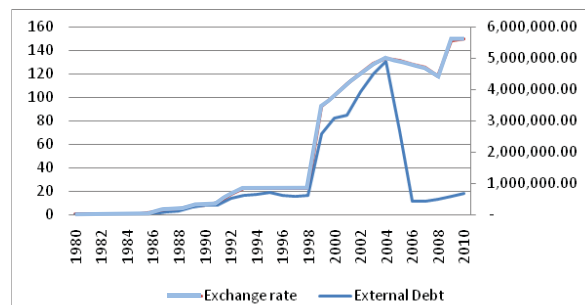
4.1 Trend Analysis

Time series data on exchange rate and

external debt were collected from 1980 to 2010. The trend of exchange rate and external debt over this period is presented figure 1 below:

Figure 1

Exchange Rate and External Debt Trend in Nigeria: 1980-2010



The trend shows that exchange rate and external debt move in the same direction. The sudden drop in external debt in 2006 was attributable to the external debt deal between Nigeria and the Paris club that drastically reduced Nigeria's external debt stock. From 2006 to 2008 therefore, exchange rate appreciated. From 2008 to 2010 however, both the naira exchange rate and external debt stock have continued to rise due to the external shock of the global economic crisis that have further lead to the euro zone crisis.

4.2 Granger Causality

Granger causality test was also conducted to determine the direction of causality between exchange rate and external debt to determine the direction of influence on each other. The result is presented in Table.

Table 1

Pairwise Granger Causality Tests

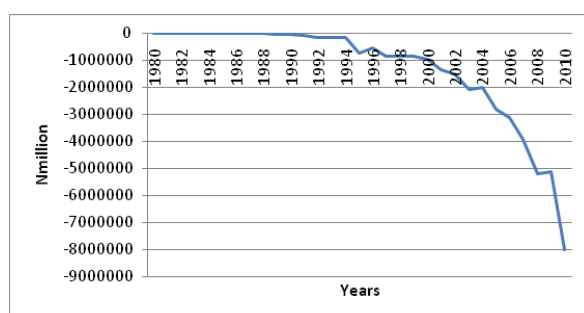
Null Hypothesis:	Lag	F-Statistic	Prob.	Decision
XD does not Granger Cause XR	1	0.02187	0.88354	ACCEPT
XR does not Granger Cause XD		0.19229	0.66450	ACCEPT
XD does not Granger Cause XR	2	0.61371	0.54962	ACCEPT
XR does not Granger Cause XD		0.20784	0.81378	ACCEPT
XD does not Granger Cause XR	3	0.02187	0.88354	ACCEPT
XR does not Granger Cause XD		0.19229	0.66450	ACCEPT
XD does not Granger Cause XR	4	0.49318	0.74086	ACCEPT
XR does not Granger Cause XD		0.90723	0.48064	ACCEPT
XD does not Granger Cause XR	5	0.46249	0.79808	ACCEPT
XR does not Granger Cause XD		0.89803	0.50733	ACCEPT
XD does not Granger Cause XR	6	0.84031	0.56233	ACCEPT
XR does not Granger Cause XD		2.08466	0.13135	ACCEPT
XD does not Granger Cause XR	7	19.3091	0.000096	REJECT
XR does not Granger Cause XD		15.0935	0.00026	REJECT
NETX does not Granger Cause XR	7	6.96612	0.00480	REJECT
XR does not Granger Cause NETX		2.11215	0.14660	ACCEPT
XD does not Granger Cause NETX	7	1.26854	0.36136	ACCEPT
NETX does not Granger Cause XD		5.39127	0.01141	REJECT
FDI does not Granger Cause XR	7	11.1879	0.00084	REJECT
XR does not Granger Cause FDI		4.29111	0.02339	REJECT
FDI does not Granger Cause XD	7	13.5633	0.00040	REJECT
XD does not Granger Cause FDI		23.0511	0.000046	REJECT

Source: Authors' Estimation (E-views Output)

It was found that, within 1-6 years, exchange rate and external debt do not granger cause each other. At lag 7 however, both exchange rate and external debt have a significant influence on each other and thus agrees with the findings of Cain et al (2010) and suggests that the appreciation or devaluation of the naira (relative to the USD) within a period of 7 years has a significant impact on the external debt stock and vice versa. Net export was also found to have a unidirectional causality on exchange rate, while FDI and exchange rate had a bi-directional causality on each other. On the other hand, net export was also found to have a unidirectional influence on external debt while FDI and external debt were found to have bi-directional influence on each other. A look at the trend of net export in Nigeria shows that Nigeria's imports over exports have increased over time

Figure 2

Net-Export Movement in Nigeria: 1980-2010



FDI was found to have a direct influence on both exchange rate and external debt. This implies that rather than importing, foreign investments can be attracted to Nigeria to help create jobs, boost domestic production, create value for our domestic products, stabilize the exchange rate and reduce external debt.

4.3 Regression Analysis

The variables were tested for stationarity using the Augmented Dickey Fuller (ADF) unit root test. It was found that, exchange rate (XR) was I(1), Net export (NETX) was I(0), External debt (XD) was I(1) and Foreign direct investment (FDI) was I(1). To estimate the OLS model therefore, these variables were transformed to ensure stationarity. The OLS result is presented in Table 2.

The result shows that only external debt had a significant positive relationship with exchange rate. When re-estimated using external debt alone, it was found that external debt alone accounts for 13.76 percent of the movement in exchange rate. The re-estimated result is presented in Table 3.

External debt being stationary at second difference implies that it is a volatile variable and thus is influenced by other variables that are susceptible to global economic environment. The OLS for external debt result therefore includes variables that determine external debt such as exchange rate, crude oil price, government overall deficit, net export and inflation. The result is presented in Table 4.

The OLS result shows all the variables are positively related to external debt however, only government overall deficit (OD) is significant. This implies that as the size of government overall deficit increases, external debt increases as well. And as government overall deficit decreases, external debt would decrease as well. When the model was re-estimated using overall deficit alone, it was found that it accounts for 13.79 percent of changes in external debt stock. The result is presented in Table 5.

Table 2

Dependent Variable: D(XR)
Method: Least Squares
Date: 11/09/14 Time: 09:25
Sample(adjusted): 1982 2010
Included observations: 29 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.337046	3.203238	1.353957	0.1879
NETX	5.20E-08	1.31E-06	0.039620	0.9687
D(D(XD))	8.79E-06	3.82E-06	2.301892	0.0300
D(FDI)	6.80E-05	6.28E-05	1.083544	0.2889
R-squared	0.176361	Mean dependent var		5.161655
Adjusted R-squared	0.077524	S.D. dependent var		14.25180
S.E. of regression	13.68823	Akaike info criterion		8.198391
Sum squared resid	4684.188	Schwarz criterion		8.386984
Log likelihood	-114.8767	F-statistic		1.784364
Durbin-Watson stat	1.707333	Prob(F-statistic)		0.175912

Table 3

Dependent Variable: D(XR)
Method: Least Squares
Date: 11/09/14 Time: 09:32
Sample(adjusted): 1982 2010
Included observations: 29 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.139307	2.502787	2.053434	0.0498
D(D(XD))	6.55E-06	3.16E-06	2.075646	0.0476
R-squared	0.137609	Mean dependent var		5.161655
Adjusted R-squared	0.105669	S.D. dependent var		14.25180
S.E. of regression	13.47779	Akaike info criterion		8.106436
Sum squared resid	4904.575	Schwarz criterion		8.200732
Log likelihood	-115.5433	F-statistic		4.308308
Durbin-Watson stat	1.681984	Prob(F-statistic)		0.047578

Table 4

Dependent Variable: D(D(XD))
Method: Least Squares
Date: 11/09/14 Time: 09:53
Sample(adjusted): 1982 2010
Included observations: 29 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	47167.80	206919.0	0.227953	0.8217
D(XR)	13560.48	10730.17	1.263771	0.2190
D(CO)	30337.26	22180.99	1.367714	0.1846
D(OD)	0.638536	0.319289	1.999867	0.0575
NETX	0.038000	0.087002	0.436769	0.6664
D(INF)	1901.848	7944.438	0.239394	0.8129
R-squared	0.275950	Mean dependent var		3411.718
Adjusted R-squared	0.118548	S.D. dependent var		807111.9
S.E. of regression	757762.4	Akaike info criterion		30.09612
Sum squared resid	1.32E+13	Schwarz criterion		30.37901
Log likelihood	-430.3937	F-statistic		1.753156
Durbin-Watson stat	2.164446	Prob(F-statistic)		0.162609

Table 5

Dependent Variable: D(D(XD))
Method: Least Squares
Date: 11/09/14 Time: 10:12
Sample(adjusted): 1982 2010
Included observations: 29 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	40858.69	142846.0	0.286033	0.7770
D(OD)	0.349456	0.168089	2.078991	0.0472
R-squared	0.137992	Mean dependent var		3411.718
Adjusted R-squared	0.106066	S.D. dependent var		807111.9
S.E. of regression	763109.1	Akaike info criterion		29.99466
Sum squared resid	1.57E+13	Schwarz criterion		30.08896
Log likelihood	-432.9226	F-statistic		4.322205
Durbin-Watson stat	2.307092	Prob(F-statistic)		0.047246

4.4 Johansen Co-integration

To examine the long run relationship connecting exchange rate and external debt with the explanatory variables, the Johansen Co-integration test was employed. The result is presented in Table 6.

The result shows that three variables are co-integrated with external debt. This is because at one percent critical value, the likelihood ratio is greater. When compared to the 5 percent critical value, all the variables are co-integrated.

Table 6

Date: 11/09/14 Time: 10:29

Sample: 1980 2010

Included observations: 27

Test assumption: No deterministic trend in the data

Series: D(D(XD)) D(XR) D(CO) D(OD) NETX D(INF)

Lags interval: 1 to 1

Eigen-value	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.891919	156.8612	82.49	90.45	None **
0.749318	96.78951	59.46	66.52	At most 1 **
0.677332	59.43307	39.89	45.58	At most 2 **
0.410949	28.89250	24.31	29.75	At most 3 *
0.315313	14.60293	12.53	16.31	At most 4 *
0.149607	4.375516	3.84	6.51	At most 5 *

*(**) denotes rejection of the hypothesis at 5%(1%) significance level

L.R. test indicates 6 co-integrating equation(s) at 5% significance level

Normalized Co-integrating Coefficients: 1 Co-integrating Equation(s)

D(D(XD))	D(XR)	D(CO)	D(OD)	NETX	D(INF)
1.000000	-16724.26	-11916.10	-0.962224	-0.667329	-1356.578
	(5233.64)	(10546.6)	(0.20193)	(0.20160)	(3878.67)

Log likelihood-1480.367

Source: Authors' Estimation (E-views Output)

Policy Recommendation

This study has found that in Nigeria, external debt and exchange rate has a bi-directional relationship, thus, boosting domestic production by revitalizing domestic industries would help in stabilizing exchange rate movement and narrowing external debt thereby, addressing external debt problems in Nigeria. The co-integrated behaviour of

our explanatory variables implies that, in the long run, movement in exchange rate, crude oil prices, over all government deficit, net export and inflation could be used to reduce external debt problems in Nigeria. Keeping overall deficit low and prudent exchange rate management would however play very significant roles in addressing external debt problems.

References

- Ajayi, R. (1991). *The simultaneous interactions of external debt, exchange rates and other macroeconomics variables: The case of Nigeria*. Centre for Economic Research on Africa.
- Ajayi, S. (1997). *Capital flight and external debt in Nigeria*. African Economic Research Consortium Research Paper, No 35.
- Blonigen, B.A. (1997). *Foreign direct investment behaviour of multinational corporations*. American Economic Reviews, 87 (3).
- Cain, D., Thaxter, A., Thomas, K. and Walker, A. (2010). *Exchange rate movements and the stock of foreign currency denominated government debt: Some panel co-integration evidence*. 42nd Annual monetary studies conference, 9-12 November, 2010. Trinidad and Tobago.
- Corsetti, G., Penseti, P. and Roubin, N. (1999). *What caused the Asian currency and financial crises? Japan and World Economy II*, pp. 305-373.
- Domar, E (1957). *Essays in the theory of economic growth*. New York: Oxford University Press Incorporation.
- Dornbusch, R (1976). *Expectation and exchange rate dynamics*. Journal of Political Economy, 84: 1161-1176
- Siregar, R.Y., and Pontines, V. (2005). *External debt and exchange rate overshooting: the case of selected East Asian Countries*.
- Eichengreen, B., Rose, A.K and Wyplosz, C. (1996). *Contagious current crises*. NBER Working Paper, 5681. Cambridge.
- Gorg, H. and Wakelin, K. (2001). *The impact of exchange rate variability on US direct investment*. Paper prepared for the GEP conference on FDI and economic integration, University of Nottingham, June 29-30, 2001.
- Muoghalu, M.I., Ezirim, B.C. and Elike, U. (2002). *Foreign investment burden, exchange rate and external debt crises in Nigeria: An empirical extension*. Banks and Banks System, 2, pp. 82-90.
- Ndikumama, L. and Boyce, K. (2002). *Public debts and private assets: Explaining capital flight from sub-saharan African countries*. Economic Department Working Paper, 91, pp. 2002-2.
- Obaseki, P.J. (2001) *Issues in Exchange Rate Policy Design and Management*, the CBN Economic and Financial Review, 39(2).
- Osinubi, T.S and Olaleru, O.E. (2006). *Budget deficit, external debt and economic growth in Nigeria*. Applied Econometrics and International Development, 6, pp. 27-32.