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Asymmetric Effect of External Debt Service on Real Effective Exchange Rate in Nigeria

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Abstract
Given that economic relationships are intractably nonlinear; this study adopted an asymmetric approach to investigating the effect of External Debt Service (EDS) on Real Effective Exchange Rate (REER) in Nigeria for the period 1981 to 2020 using annual data sourced from the World Bank. Other variables used in the study were External Debts (EXD), Official Development Assistance (ODA), Foreign Reserves (FRZ), and Trade Balance (TBAL). The variables were found to be stationary and co-integrated warranting the use of error correction and Nonlinear Autoregressive Distributed Lag (NARDL) models to ascertain both their long-run and short-run effects on REER. It was found that, in the short-run initial REER leads to significant depreciation of REER while, FRZ did so non-significantly even as short run impacts of other variables were nonexistent. Results of the NARDL showed that, ODA and EXD improved REER significantly while TBAL and FRZ did so non significantly. Although, it was found that both the positive and negative changes in EDS had significant depreciating impact on REER of Nigeria; the impact of the positive changes in EDS were higher. The study recommended that, the government should revamp the manufacturing sector to improve TBAL, boost ODA through public accountability, augment her FRZ to improve REER, and curtail EXD since the impact of EDS has neutralized the benefits of EXD in Nigeria.

Keywords: Asymmetry Effect, Exchange Rate, External Debt
JEL Classification Codes: D82, F31, H63

1. Introduction

Global competitiveness is an accompanying macroeconomic objective due to globalization and many countries of the world pursue it among nations. One way of measuring global competitiveness is the

strength of a country's Real Effective Exchange Rate (REER). REER is "a measure of the value of a currency against in order to harvest the gains of international trade. To Voinescua and Moisoiu (2015), the views of the mercantilists on international trade were explicitly built around the issue of competitiveness a weighted average of several foreign currencies divided by a price deflator or index of costs" (International Monetary Fund [IMF], 2022). REER accounts for price and cost changes in the various economies and determines the value of a currency vis-à-vis other currencies of trade partners. When REER decreases, the economy gains competitiveness against its trade partners, and vice versa (Giusti & Zoppè, 2017). It shows the resilience of the monetary stability of an economy by recognizing the issue of relative price level.

However, there is a link between foreign currency flows and global competiveness. The link is such that higher inflows of foreign currencies improve REER and increased outflow of foreign currencies worsens REER as found by Alam and Awar (2018) with respect to external debt service in a group of seven developing countries. Despite warnings against public debts by Smith (1776); Ricardo (1817) and Modigliani (1961), developing countries like Nigeria tend to borrow externally due to dearth of capital to finance development projects (Saheed, Sani & Idakwoji, 2015).

External debts are usually accompanied by external debt service which facilitate outflow of foreign exchange in a manner that may cause the domestic currency to depreciate and by extension loss its global competitiveness or REER. According to the World Bank (2021a) Nigeria's external debt service was $1.6 billion in 2015 and rose steadily by an additional billion each year to hit $5.54 billion in 2020. Also, the same time frame too, Nigeria's REER never went below 100 indicating a weakening global competitive advantage. Sadly, increased external debts in Nigeria like any other economy is accompanied with increased external debt service which appears to be leading the economy towards a weakening global competitiveness and this calls for empirical investigation. However, a lot of empirical studies in Nigeria applied both dynamic and static approaches in investigating the linear impact of external debts service on exchange rate without taking a look at the implications of external debt service on real effective exchange rate (REER) which is a measure of global competiveness of an economy. This has created a serious research gap on the subject matter of external debts, external debt service and REER.

Although, while Alam and Awar (2018) found that external debt service had serious negative impact on REER of a group of selected developing countries; they did so using a linear modelling approach. But in reality, economic and financial variables rarely have linear relationships; as

they are most likely to relate nonlinearly (Shin, Yu & Greenwood-Nimmo, 2014; Shiller, 2005; Kahneman & Tversky, 1979). Besides, there is dearth of empirical literature regarding import of external debt service on real effective exchange rate in Nigeria. Against this background, this study examined the asymmetric (or nonlinear) effect of external debt service on real effective exchange rate in Nigeria.

The rest of this paper is divided into Section 2, which covers review of literature, Section 3 details with the methodology, Section 4 focuses on results and discussion. Finally, Section 5 draws conclusions and makes recommendations for policy.

2. Literature Review

2.1 Theoretical Review

There is a solid theoretical framework that provides grounds for government borrowing due to expanding state activity. There are however, two opposing theoretical standpoints as to why the government should or should not borrow. This review provides theoretical background pointing out the need for government to borrow externally and the consequences of such external borrowing on the economy.

2.1.1 Wagner's Law of Increasing State Activity

Wagner (1883) as later confirmed by Peacock and Wiseman (1961) found that there is a tendency for government expenditure to expand even in jerks. The government stimulus interventionist role proposed by Keynes (1936) in the face of the great depression of the 1930s finally solidified grounds for expanding government expenditure. However, the expanding expenditure of the government can be financed either through increased taxes or loans. Keynes (1936) proved that government expenditure could help solve serious economic problems such as depression. New thinking towards this line of thought is that in serious situations where a rise in tax rates could harm the economy, public borrowing remains a viable option. Churchman (2001) explained that public borrowing can in fact serve as a fiscal stimulus to shore up aggregate demand through some built-in stabilizers with their accompanying multiplier effects. This is because while fiscal stimulus from borrowing can fuel consumption and enhance economic growth; increases in tax rates could reduce consumption and retard economic progress.

2.1.2 Classical Theory of Public Debts

While increased taxes may entail curtailing household consumption due to declining disposable income, public loans may harm the future

generation with repayment problems. The classical theory of public debts led by Smith (1776) and Ricardo (1817) particularly faults government borrowing along this line based on the tendency for wasteful spending by governments. Smith (1776) held that "any government expenditure besides defense against foreign aggression, maintenance of internal peace and public development work would be unjust and wasteful". But to Ricardo (1817), "all forms of government spending (both ordinary and extraordinary) are wasteful and mere payments meant to sustain unproductive labourers".

The classical economists held that due to inefficiencies in public expenditure, government should only borrow to finance large capital investments and wars to avert a transfer of debt burden to the future generation. In their opinion, tax cuts in the presence of rising public borrowing may not spur up higher household consumption given that people may make savings to hedge against anticipated future tax raises (Aybarc, 2019). Modigliani (1961) held the same view as the classicalists by positing that, except where the government invests in very productive capital goods with the use of external loans that it will offset either partially or fully the burden of external debt on the future generation; there is no need for external debts.

2.1.3 Dual Gap Model

Chenery and Strout (1966) in their "Dual-Gap Model" postulated that, developing countries like Nigeria do not have adequate capital to execute necessary developmental programmes and hence the need for them to resort to even external borrowing. This postulation followed the Harrod-Domer model of the 1930s and 1940s which emphasized that the growth of an economy is dependent on investment which in turn depends on the rate of capital accumulation which has to be proportional to the rate of savings (Diego, 2004). However, most developing economies like Nigeria lack domestic savings for the requisite capital accumulation. Thus, Arhenful (2013) and Nwokoma (2013) opined that, dearth of domestic capital has been a major reason for external borrowing especially by developing nations. This has further sustained the fact that, as external loans increase, it comes with a burden of external debt service in foreign currencies which in turn exacerbates foreign currency outflow and weakens the domestic economy's degree of global competitiveness.

It must be noted however that, in spite of the advantages external loans may possess, the burden of external loan obligations on the future generations as earlier noted by Smith (1776); Ricardo (1817) and Modigliani (1961) may be damning. Given that Nigeria's economy relies on a primary product (crude oil) for foreign exchange earnings and the prices of oil are

globally determined with high level of volatility, it becomes more challenging to service external loans in foreign currencies. It then becomes clear that with insufficient foreign exchange to finance external debt obligations and other imports, Nigeria's degree of global competiveness may be affected.

2.2 Empirical Review

This subsection gives a snapshot view of previous studies that explored the relationships among external debts, external debt service, exchange rate and REER in Nigeria and other countries around the word. The essence is to provide a generic view of the likely tendencies in the behaviour of these variables and the review is based on a descending order of the most recent study. For instance, Mendoza and Gonzalez (2022) examined the impact of external debt on exchange rate in the Philippines for the period 1980 to 2019 using OLS. It was found that both external debt and external debt service have profound positive effect on exchange rate in the Philippines; implying that they contribute to the depreciation of the Peso. In a panel study of 15 countries of the Franc Zone from 1996 to 2017 by Melingui *et al.,* (2019); it was found that real effective exchange rate (REER) had a profound positive effect on the growth of public debts of the countries of the zone. The effect was similar in both the OLS and generalized method of moment (GMM) estimates. Similarly, Alam and Awar (2018) found among selected seven developing countries that, external debts have serious negative effects on their real effective exchange rate especially when the countries under study have reached their debt thresholds.

Okoh *et al.,* (2021) examined the relationship between external debts and exchange rate fluctuations in Nigeria from 1990 to 2017 using the ordinary least squares (OLS). It was found that external debt has a profound positive influence on exchange rate in Nigeria; implying that, it influences exchange rate depreciation. Aigbedion, Iyakwari and Mairana (2020) while examining the impact of public debts on exchange rate in Nigeria found that external debt service has a profound positive influence on exchange rate in Nigeria for the period 1986 to 2018. The study employed both OLS and Error Correction Model (ECM). This implies that external debt service could lead to nominal depreciation of the Naira.

Aderemi *et al.,* (2020) employed autoregressive distributed lag (ARDL) modelling approach to examine the relationship between external debts and exchange rate in Nigeria using annual data from 1981 to 2018. The study found that, both external debt and external debt service were very strong factors responsible for the depreciation of the Naira. Incidentally, separate studies by, Nwanne and Eze (2015) and Saheed *et al.,* (2015) used

OLS to estimate the relationship between exchange rate and external debt service in Nigeria for the period of 1981 to 2013 and both studies found that, external debt service was responsible for fluctuations in exchange rate in Nigeria.

It is evident that, empirical literature on external debts, external debt service, exchange rate and REER in Nigeria, tend to dwell more on the impact of external debt service on nominal exchange rate and assuming linearity in such relationships. Not much effort has been made towards investigating the long term implications of external debts service on real effective exchange rate which is a measure of global competitiveness of an economy. The studies did not factor in the issue of asymmetry and intractable nonlinearity of relationships among variables in finance and social sciences. This is the gap that exist in literature and for which this paper stands privy.

3. Data and Methodology

3.1 Data

The data required for this study were annual time series on External Debt Service (EDS), External Debts (EXD), Official Development Assistance (ODA), Foreign Reserves (FRZ), and Trade Balance (TBAL) of Nigeria and were measured in billions of United States Dollars (USD) except Real Effective Exchange Rate (REER) which measures the value of the Naira against weighted average of several foreign currencies divided by the price deflator All the data series were sourced from the World Bank to cover the period 1981-2020.

3.2 Theoretical Framework

Early theoretical postulations by Smith (1776); Ricardo (1817) and Modigliani (1961) had laid the basis for the fact that external debts plunges the future generation of an economy into the burden of debt repayment (what has come to be known today as external debt service). Available empirical evidence indicates that real effective exchange rate (REER) of a country is closely associated with the country's degree of openness to the global economy and its net foreign assets. These measures of openness and net foreign assets could be Trade Balance (TBAL), External Debt Service (EDS), External Debts (EXD), Official Development Assistance (ODA) and Foreign Reserves (FRZ) (Khomo & Aziakpono, 2020; Alam & Awar, 2018 and Brixiova *et al*, 2013). On the choice of the methodology of Non-linear ARDL, the study found support in the submissions of Shin *et al.*, (2014); Shiller (2005) and Kahneman and Tversky (1979) who found that most relationships in economics are inherently nonlinear.

3.3 Model Specification

There is ample evidence in the theoretical prepositions of Smith (1776); Ricardo (1817) and Modigliani (1961) that external debts and external debt service are intractably related. Following similar prepositions too is the strong empirical evidence which suggests that real effective exchange rate (REER) of a country is closely associated with the country's degree of openness to the global economy and its net foreign assets as found in studies by Khomo and Aziakpono (2020); Alam and Awar (2018) and Brixiova, Égert and Hadj (2013). Thus, it is instructive to relate REER in a functional relationship with its determinants:

$$REER = f(TBAL, ODA, FRZ, EXD, EDS) \quad (1)$$

Where, REER= Real effective exchange rate, TBAL= Trade Balance, ODA= Official Development Assistance from foreign countries, FRZ= Foreign reserves of Nigeria, EXD = External Debts incurred by Nigeria and EDS = External Debt Service.

Now, by taking the semi-log of the variables in equation (1) given that TBAL is reported as net with a tendency for negative signs and REER is a derived variable and presenting the model in a typical NARDL stochastic form, the study obtains:

$$REER_t = \beta_0 + \beta_1 TBAL_t + \beta_2 \ell ODA_t + \beta_3 \ell FRZ_t + \beta_4 \ell EXD_t + \beta_5 \ell EDS\_POS_t + \beta_6 \ell EDS\_NEG_t + \mu \quad (2)$$

Where μ is the error term that accounts for omitted variables and ℓEDS_POS_t refer to positive changes in external debt service and ℓEDS_NEG_t refers to negative changes in external debt service.

But to capture the relationship between REER and the explanatory variables in a dynamic framework of Nonlinear Autoregressive Distributed Lag (NARDL) model, the specification will be modified. Shin *et al.*, (2014) is an agreement with the views of Kahneman and Tversky (1979) and Shiller (2005) that, nonlinearity is intractably inherent in economics and human condition; necessitating the use of asymmetric models.

The general NARDL $(p, q_1, ..., q_k)$ model is specified as:

$$y_t = \alpha_0 + \alpha_1 t + \sum_{i=1}^{p} \psi_i y_{t-i} + \sum_{j=1}^{k} \sum_{l_j=0}^{q_i} \beta_{j,l_j} x_{j,t-l_j} + \varepsilon_t \quad (3)$$

Where ε_t represents innovations, α_0 is a constant term, and α_1, ψ_i and β_{j,l_j} are respectively the coefficients of linear trend, lags of y_t, and lags of the k regressors $x_{j,t}$ for $j = 1, ..., k$. Thus following the generic form, equation (4) can be stated in asymmetric manner as:

$$REER_t = \lambda_0 + \lambda_1 t + \sum_{i=1}^{p} \psi_1 REER_{t-i} + \sum_{j=0}^{q} \psi_2 \ell TBAL_{j-q} + \sum_{j=0}^{q} \psi_3 \ell ODA_{j-q} + \sum_{j=0}^{q} \psi_4 \ell FRZ_{j-q} + \sum_{j=0}^{q} \psi_5 \ell EXD_{j-q} + \sum_{j=0}^{q} \psi_6 \ell EDS\_POS_{j-q} + \sum_{j=0}^{q} \psi_7 \ell EDS\_NEG_{j-q} + \xi_t \quad (4)$$

Where $\psi_1 - \psi_9$, and $\lambda_0 - \lambda_1$ are coefficients and constants respectively.

However, the model must capture the intertemporal dynamics since the study is interested in estimating the relationship between y_t on both its lags as well as the contemporaneous and lagged values of the k regressors $x_{j,t}$. This can be stated in the generic form as:

$$y_t = \alpha_0 + \alpha_1 t + \sum_{i=1}^{p} \psi_i y_{t-i} + \sum_{j=1}^{k} \beta_j(1) x_{j,t} + \sum_{j=1}^{k} \beta_j(L) \Delta x_{j,t} + \xi_t \quad (5)$$

Where the first difference notation is $\Delta = (1-L)$. But given that equation (5) does not explicitly solve for y_t, it can then be referred to as a regression for intertemporal dynamics. Thus, the practical regression setting of equation (5) that uses theoretical coefficients can be specified as:

$$REER_t = \lambda_0 + \lambda_1 t + \sum_{i=1}^{p} \beta_{0,i} REER_{t-i} + \beta_1 TBAL_t + \beta_2 \ell ODA_t + \beta_3 \ell FRZ_t + \beta_4 \ell EXD_t + \beta_5 \ell EDS\_POS_t + \beta_6 \ell EDS\_NEG_t + \sum_{j=1}^{k} \varphi_{1,j} \Delta TBAL_{t-j} + \sum_{j=1}^{k} \varphi_{2,j} \Delta \ell ODA_{t-j} + \sum_{j=1}^{k} \varphi_{3,j} \Delta \ell FRZ_{t-j} + \sum_{j=1}^{k} \varphi_{4,j} \Delta \ell EXD_{t-j} + \sum_{j=1}^{k} \varphi_{5,j} \Delta \ell EDS\_POS_{t-j} + \sum_{j=1}^{k} \varphi_{6,j} \Delta \ell EDS\_NEG_{t-j} + \xi_t \quad (6)$$

The conditional Error Correction Form and the Bounds Test can be specified as:

$$\Delta y_t = \alpha_0 + \alpha_1 t - \psi(1) EC_{t-1} + \left(\psi^*(L) \Delta y_{t-1} + \sum_{j=1}^{k} \beta_j(L) \Delta x_{j,t-1} \right) \quad (7)$$

From equation (7), it can be seen that the error correction term, typically denoted as EC_t, is also the cointegrating relationship when y_t and $x_{1,t}, ..., x_{k,t}$ are cointegrated. Given that, there may be no trend from cross examination, the study assumes no trend and restricts the constant inside the co-integrating equation, thus, specifies and estimates restricted constant with no trend. The model with restricted constant and no trend specification can be specified as:

$$\Delta y_t = \alpha_0 + b_0 y_{t-1} + \sum_{j=1}^{k} b_j x_{j,t-1} + \sum_{i=1}^{p-1} c_{0,i} \Delta y_{t-i} + \sum_{j=1}^{k} \sum_{l_j=1}^{q_j-1} c_{j,l_j} \Delta x_{j,t-l_j} + \sum_{j=1}^{k} d_j \Delta x_{j,t} + \varepsilon_t \quad (8)$$

Whereas: $EC_t = y_t - \sum_{j=1}^{k} \frac{b_j}{b_0} x_{j,t} - \frac{a_0}{b_0}$ (9)

With $H_0 : b_0 = b_j = \alpha_0 = 0, \forall_j$

Where is a vector and the variables in x_t are allowed to be purely I(0) or I(1); α is a Constant

b , c and d are coefficients $j = 1,...,k$; p, q are optimal lag orders and ε_t is a vector of the error terms. Thus, the asymmetric error correction model can be specified as:

$$\Delta REER_t = \sum_{i=1}^{p} \beta_1 \Delta REER_{t-i} + \sum_{i=1}^{q} \beta_2 \Delta TBAL_{t-i} + \sum_{i=1}^{q} \beta_3 \Delta \ell ODA_{t-i} + \sum_{i=1}^{q} \beta_3 \Delta \ell FRZ_{t-i} + \sum_{i=1}^{q} \beta_3 \Delta \ell EXD_{t-i} + \sum_{i=1}^{q} \beta_4 \Delta \ell EDS\_POS_{t-i} + \sum_{i=1}^{q} \beta_5 \Delta \ell EDS\_NEG_{t-i} + \lambda EC_{t-1} + \varepsilon_t \quad (10)$$

Where λEC_{t-i} is a component of speed of adjustment towards the equilibrium path of the model and ε_t is the error term.

3.4 Estimation Procedure

In order to estimate the result of the study, unit root tests for stationarity were conducted using Augmented Dickey Fuller (ADF) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS). Since NARDL makes use of lag values, the optimal lag length for the model was estimated and the bounds test was carried out to ascertain whether there was a long run relationship among the variables. Having determined the cointegration of the model, the short run ECM and the long run NARDL were estimated. The dynamic multiplier of the model was estimated and then some post estimation tests aimed at gauging the goodness of fit of the model were carried out such as normality test, Ramsey test, heteroscedasticity and serial correlation test.

4. Results and Discussion

4.1 Descriptive Statistics

Table 1: Descriptive Statistics

	REER	TBAL($' B)	ODA($' B)	FRZ($' B)	EXD($' B)	EDS($' B)
Mean	147.9720	3.04	1.41	18.2	29.9	2.53
Median	100.5465	2.21	.294	7.67	29.4	1.96
Maximum	536.8903	24.4	11.4	53.0	70.6	8.81
Minimum	49.7447	-32.2	0.0317	0.933	11.4	0.496
Std. Dev.	117.1855	12.6	2.16	17.8	12.6	1.80
Skewness	1.9056	-0.7272	2.8866	0.5473	1.1281	1.5785
Kurtosis	5.8394	4.4328	13.0766	1.6742	4.7721	5.3863
Jarque-Bera	37.6457	6.9471	224.7807	4.9264	13.7180	26.1016
Prob.	0.0000	0.0310	0.0000	0.0852	0.0011	0.0000

Source: Extract from E-views 10

Table 1 describes Nigeria's real effective exchange rate (REER) and five other variables most likely to affect the dependent variable (REER). The variables are measured in billions of United States dollars except for REER which is measured as a rate. Any REER above 100 indicates depreciating competitiveness and any REER below 100 indicates improved competitiveness. In other words, higher values of REER connote a depreciating degree of competitiveness and vice versa. The variables under investigation are not normally distributed given their probability and Jarque-Bera except for foreign reserves (FRZ) whose probability value of 0.0852 is greater than the 0.05 critical value.

However, non-normality of the distribution may not pose any problems for quality of the result. Again, it can be observed that, the variables are positively skewed except for trade balance (TBAL) which is skewed to the left signifying overall unfavourable TBAL during the period under review. Equally, the kurtosis of each variable explains whether the distribution of a variable is either platykurtic (flat) or leptokurtic (peaked). For any variable whose kurtosis is less than 3 which is a statistically set threshold, it is regarded as platykurtic otherwise it is leptokurtic. It then means that apart from FRZ whose kurtosis is 1.6742 which makes it platykurtic; the rest of the variables are leptokurtic.

It is equally evident that, REER averaged 147.97 with a standard deviation of 117.19 which means that the deviation did not wonder very far away from the average. However, it shows that the country's real effective

exchange rate clearly depicts a picture of a declining competitiveness of the economy. The least REER (and indeed the best) was achieved in 1992 at 49.74 while the worst and highest REER of Nigeria was recorded in 1984 at 536.89 when the military truncated the second republic democratic rule in Nigeria. On trade balance (TBAL), it can be seen that it averaged around 3.04 billion dollars with a very high standard deviation of 12.6 billion. This is an indication that Nigeria's TBAL has fluctuated very widely.

The worst TBAL in Nigeria was recorded in 2020 to be a deficit of 32.2 billion dollars while her best and highest TBAL was recorded in 2005 to be 24.4 billion dollars. Incidentally, while the worst TBAL was achieved in 2020 during the year of global lockdown due to the outbreak of COVID-19 pandemic, the best TBAL was recorded in the same year Nigeria's external debt service hit an all-time highest of 8.81 billion dollars in a bid to secure partial debt relief from the Paris Club.

Relating to official development assistance (ODA), it was least at 317 thousand dollars in 1985 during the prolonged military incursion in Nigeria but increased and got to its peak of 11.4 billion dollars in 2005 when Nigeria's democracy was about six years. With an average of 1.41 billion dollars and standard deviation of 2.16 billion dollars it means that ODA in Nigeria is characterized by wide jumps alternating between higher and lower values. Concerning foreign reserves (FRZ), they were 933 million dollars in 1983 which was the least and 53 billion dollars in 2008 shortly after the debt relief of 2005. With an average of 18.2 billion dollars and a standard deviation of 17.8 billion dollars implying that the data points were widely spread.

The behaviour of external debts (EXD) and its servicing obligations followed similar pattern as the other variables with wide fluctuations as indicated by their standard deviations. Whereas, EXD averaged 29.9 billion dollars with standard deviation of 12.6 billion dollars, external debt service (EDS) averaged 2.53 billion dollars with a standard deviation of 1.80 billion dollars. The least EXD of 11.4 billion was incurred in 1981 and the highest was 70.6 billion dollars incurred in 2020. However, the least EDS was recorded in 2013 at 496 million dollars while the highest was 8.81 billion dollars which was recorded in 2005. On the whole, Nigeria seems to be spending a sizeable amount of her foreign exchange to service external debts.

4.2 Pre-estimation Tests

Table 2: Unit Root Result

Variables	ADF at level	ADF at 1st Difference	Order of Integration	KPSS Statistic at Level	KPSS Statistic at 1st Difference	Order of Integration
REER	-2.0887	-4.2908**	I(1)	0.3672**	--------	I(0)
TBAL	-3.0216**	----------	I(0)	0.1592**	--------	I(0)
LODA	-1.1106	-5.7534**	I(1)	0.7084	0.0999**	I(1)
LFRZ	-0.7802	-5.6962**	I(1)	0.6941	0.1612**	I(1)
LEXD	-2.0218	-4.5749**	I(1)	0.2490**	---------	I(0)
LEDS	3.6349**	----------	I(0)	0.1065**	---------	I(0)

Note: Both the ADF and KPSS unit root tests results are reported here at 5% significance level. Whereas the t-statistic value of the former is -2.9411 that of the latter is 0.4630. The asterisks (**) indicate that the variable is significant otherwise it is not just as the lines (----) indicate that stationarity was achieved at levels and so there are no results at first difference.
Source: Extracted from E-views 10

The (ADF) unit root is tested against the null hypothesis that, the variable under investigation has unit root. Thus a variable is adjudged stationary when the probability value of its corresponding t-statistics is less than 0.05. In Table 2, for every t-statistic value whether at levels or first difference the asterisks (**) indicate that the variable is stationary otherwise, it is not. Therefore, it can be inferred that, all the variables were stationary at first difference except TBAL and LEDS which were stationary at level. On the other hand, the KPSS tests is attained where the KPSS statistic is less than the 0.4630 and it can be seen that all the variables were stationary at level except LODA and LFRZ which were stationary at first difference. It can be observed however that, only TBAL and LEDS were stationary in both ADF and KPSS tests. Thus, there is mixed order of integration of the variables using either of the unit root test approaches which is still suitable for NARDL approach.

4.3 Optimal Lag Selection

Dynamic models stand out among static models because of their incorporation of lags and firm conviction that lags of the dependent variable could as well be useful in explaining its present or future behaviour (Gujarati, 2013). The use of lags also come with the problem of loss of

degree of freedom and the need to obtain efficient estimates as shown in Figure 1.

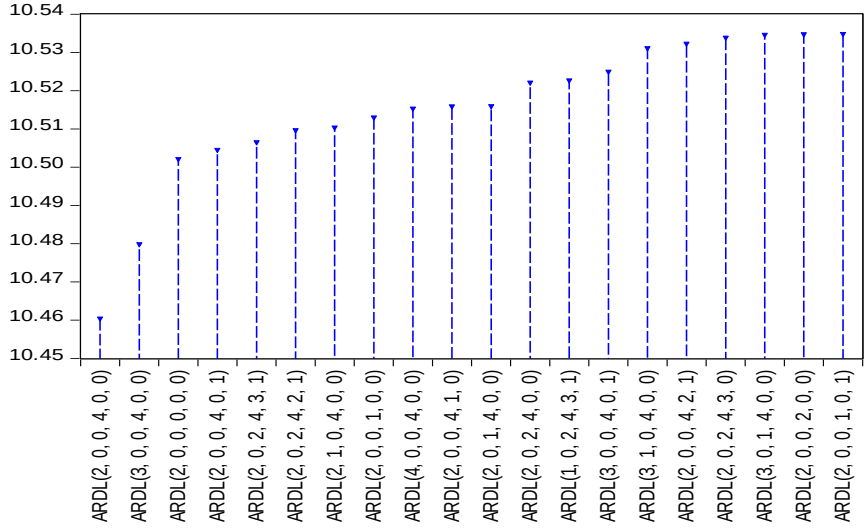

Figure 1: Akaike Information Criteria (AIC) for ARDL Optimal Lags
Source: Extract from E-views 10

Estimation of NARDL is preceded by estimates of ARDL and hence the need to ensure that the optimal lag length is used when estimating the ARDL to avoid the use of arbitrary lags with their attendant consequences of yielding spurious results. Using the AIC criterion, the optimal lag length for the model was automatically selected to be (2,0,0,4,0,0) as indicated by the shortest bar in Figure 1.

4.4 Bounds Test for Co-integration

Table 3 is a test of bounds test to confirm that the variables are co-integrated and will not diverge with the passage of time.

Table 3: Bounds Test for Co-Integration Result

Level of Significance	F- Statistic Value	Lower Bound I(0)	Upper Bound I(1)
10%		2.12	3.23
5%	3.77	2.45	3.61
2.5%		2.75	3.99
1%		3.15	4.43

Source: Extract from E-views 10

The outcome in Table 3 indicates that, at the 5% level of significance, the F-statistic value of 3.77 exceeds the upper bound. This

leads to the conclusion that there is a long run relationship among the variables and that the null hypothesis of no level relationship is rejected.

4.5 Short-run Result

Table 4: Short-run Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4230.651	748.8198	5.6498	0.0000
D(REER(-1))	0.4359	0.1169	3.7292	0.0009
D(LFRZ)	35.2753	17.6571	1.9978	0.0555
ECM(-1)*	-0.6212	0.1098	-5.6581	0.0000
R-squared: 0.5543			**Durbin-Watson Stat:** 2.1625	

Source: Extract from E-views 10

Result in Table 4 show that, in the short run, inertia or previous values of REER in Nigeria would have serious adverse effect on the global competitiveness of the economy. This is because, the lag values of REER have positive and significant positive effect on its current values; implying a depreciating tendency of the Naira among Nigeria's trading partners with serious domestic issues of inflation. In the short run too, foreign reserves (FRZ) equally have adverse effect on REER, though not statistically significant. This implies that, if there is any useful link between FRZ and REER, it may be a long term phenomenon rather a short term one. Thus, scaling up FRZ may not ameliorate REER problems in Nigeria in the short run as it may take relatively longer periods for the FRZ to influence exchange rate before it may translate to desirable impact on REER.

The effects of other variables like official development assistance (LODA), external debt (LEXD), external debt service (LEDS) and trade balance (TBAL) are however non-present on REER in the short run. This shows that the impact of these variables on REER exchange rate in Nigeria are not noticeable in the short run but in the long run. Finally, the ECM (-1) of -0.6212 is statistically significant. It is an indication that the variables in this model possess over 62% self-mean reverting ability within a year in any event of a temporary deviation from the equilibrium path. Also, the R-Squared of 0.5543 is an indication of 55.43% explanatory power of the model over changes in REER in Nigeria in the short run and he Durbin-Watson Statistic of 2.1625 that easily approximates to 2 means that the model is free from autocorrelation.

4.6 Long-run Result

Table 5: Long-run Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TBAL	-1.11	2.06	-0.5382	0.5947
LODA	-87.3969	23.6429	-3.6965	0.0009
LFRZ	-1.2259	30.9102	-0.0397	0.9686
LEXD	-209.3655	54.3664	-3.8510	0.0006
LEDS_POS	88.0763	27.5201	3.2004	0.0034
LEDS_NEG	54.1056	23.8087	2.2725	0.0309

Source: Extract from E-views 10

From Table 5, trade balance has a negative influence on real effective exchange rate. Although the influence is not statistically significant it shows that favourable trade balance provides a hedge over the depreciating tendencies of the naira against other currencies. Similar outcome was obtained for foreign reserves (FRZ) with similar implications. On the other hand, it can be observed that both official development assistant (ODA) and external debts (EXD) have negative and statistically profound impact on REER. This means that inflows of ODA and EXD could improve the competitiveness of the Naira and indeed the Nigerian economy at the global stage. The duo could guard against the fast depreciating tendencies of the naira in the face of other currencies of the world.

However, it can be seen that the reverse is the case for external debt service (EDS). The partial sum process impact of both the negative and positive changes in EDS on REER indicate that, the positive changes in external debt service have more profound undesirable impact on REER than the negative changes. This can be seen in the magnitude of their coefficients and probability values of their confirmation of statistical significance. Whereas the coefficient of LEDS_POS is 88.08 with a probability value of 0.0034; that of LEDS_NEG is 54.11 with a probability value of 0.0309. This finding is consistent with the submissions of Melingui, *et al.,* (2019) and Alam and Awar (2018) who found in their different panel studies that external debt service weakens REER. Similarly, studies in Nigeria by Aderemi *et al.,* (2022) Aigbedion, *et al.,* (2020) and Saheed, *et al.,* (2015) have variously found external debt service as a cause of Nigeria's depreciating exchange rate.

On the whole, the asymmetric results of EDS on REER indicate that, the Nigeria's REER depreciates more in the presence of increases in external debts service as it is the case with decreases in external debts service. Asymmetric result of the effect of the variable on REER shows that for both positive and negative changes are profoundly positive. That is to say that the

REER values tend to increase as long as external debts are serviced. In other words, higher financial commitment to obligations of foreign loans tend to weaken the naira and reduce the global competitiveness of the economy.

4.7 Dynamic Multipliers

The cumulative dynamic multipliers depict a graphical representation of a unit change in REER due to the positive and negative changes in external debt services (EDS) in Nigeria. It explains the response patterns that occur in REER due to shocks (both positive and negative) in EDS as shown to figure 2.

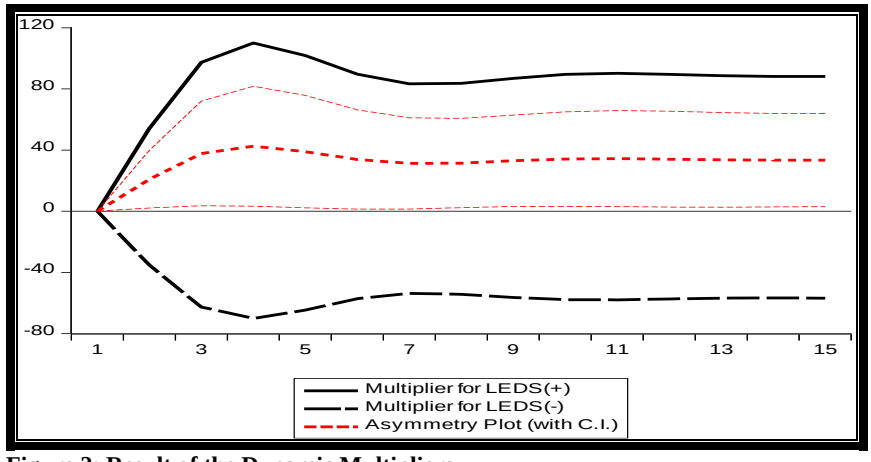

Figure 2: Result of the Dynamic Multipliers
Source: Extract from E-views 10

Looking at figure 2, one can observe that, either positive or negative unitary shocks to the EDS, the multiplier displays the pattern of REER's adjustment to its new long-run equilibrium path. The REER's response to positive and negative shocks in EDS at a specific forecast horizon is shown by the positive change (thick black line in the upper region) and negative change (thick broken line in the lower region) curves. The disparity between the positive and negative effects of multipliers to shocks in EDS is shown by the asymmetry line (broken thick red line). The thin dotted red lines represent the upper and lower confidence bonds at 95% confidence level. They provide a measure that shows that, the asymmetry is statistically significant. Given that, the neutral line lies outside the upper and lower bonds, the asymmetric effects of EDS on REER are statistically significant at 0.05 critical level.

4.8 Post Estimation Tests

This subsection deals with the post estimation analysis of the model with a view to ascertaining that the model was never a spurious and as such Figure 3 shows the residual normality test for the model.

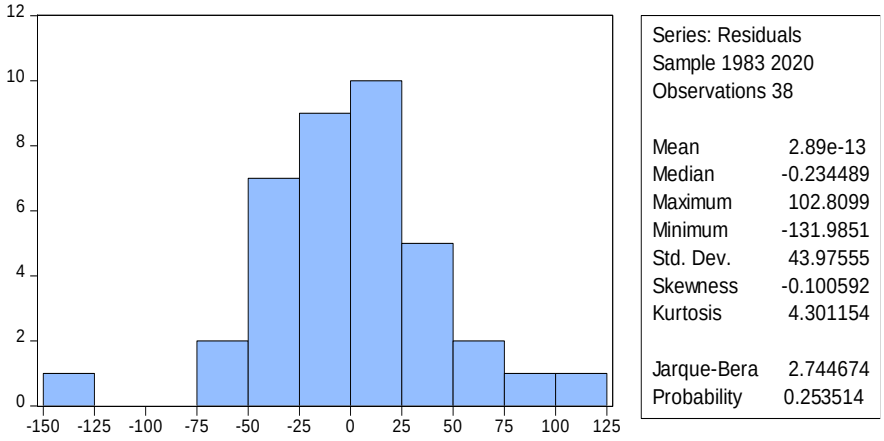

Figure 3: Normality Test Graph of the Variables
Source: Extract from E-views 10

The residual normality graph as shown in Figure 3 confirms that the residuals are normally distributed given that probability value of 0.2535 which is higher than the 0.05 critical value. The Kurtosis of 4.3011 which is higher than the Kurtosis threshold value of 3 shows that the distribution of the residuals is leptokurtic (that is, it is peaked). Implying that the series contain some outliers.

Table 6: Ramey RESET, Heteroscedasticity and Serial Correlation Tests

Test Type	Ramsey RESET		Heteroskedasticity		Serial Correlation LM	
	Value	Prob.	Value	Prob.	Value	Prob.
t-statistic	1.4236	0.1660	----	----	----	----
F-statistic	2.0266	0.1660	1.2864	0.2875	0.7005	0.5055
Obs*R-squared	----	----	11.1158	0.2679	1.9430	0.3785
Scaled Exp. SS	----	----	9.9615	0.3536	----	----

Note: The dashes (----) in Table 6 show that the statistic is not applicable for that particular test.
Source: Extract from E-views 10

Table 6 shows results of the post estimation tests to ascertain the goodness of fit of the model employed by the study. It is evidently clear from

the table that, the relationship between REER and its explanatory variables was correctly specified given that both the t-statistics and the F-statistic values of the Ramsey regression equation specification test (RESET) have their probability values as 0.1660 each. Once the individual probability values are greater than 0.05 critical value, the relationship is correctly specified otherwise it is not. Similarly, the result of the heteroscedasticity test indicates that the residuals possessed constant variance which is in line with the stochastic process and as such can be adjudged to be homoscedastic. This conclusion is predicated on the probability values of the F-statistic (0.2875), observed R-squared (0.2679) and Scaled explained sum of square (0.3536) which are greater than the 0.05 level of significance. Finally, the results of the serial correlation test indicate that no case of autocorrelation was observed in the residuals most especially that, the probability values of the F-statistic is 0.5055and that of the observed R-squared is 0.3785. These post estimation results confirm that the model performed well and aptly fits the data.

5. Conclusion and Policy Recommendations

Based on estimated results of this study, it can be concluded that, although external debts have a way of improving Nigeria's real effective exchange rate since they are negatively related, the cost of servicing the debts may have neutralized and even worsen the situation. This is because in the long run each of the changes in debt service (positive or negative) has a strong positive impact on real effective exchange rate. This implies that any amount of foreign currencies used by Nigeria to service loans may lead to further depreciation of her real effective exchange rate. This implies that external debt service lowers Nigeria's level of global competitiveness and hence the need for the fiscal authorities to take corrective steps.

The study makes the following policy recommendations to mitigate against depreciation of Nigeria's real effective exchange rate and by extension improving the country's global competitiveness**.**

i. Although Nigeria's trade balance has the potential to improve her real effective exchange rate, it is not statistically significant. This is because Nigeria's trade balance as explained in the descriptive statistics section is tilted towards the negative. That is Nigeria has recorded more negative trade balances than the positives. The government must take steps to improve the local manufacturing sector, to carter for domestic demand for finished goods and curtail imports of goods to improve trade balance and REER.

ii. Official development assistance has proved to be very useful in improving Nigeria's REER and hence the need to encourage more of its inflow. Foreign governments and non-governmental organizations carrying

out humanitarian activities believe in transparency and accountability. Nigerian governments at all levels benefitting from ODA must be willing to eschew corruption and entrench transparency and accountability to attract more ODA and improve REER the more.

iii. Nigerian foreign reserves also have shown a potential for improving the REER of the country. However, the influence is not statistically significant which may be due to either the consistent fluctuations in volume of the reserves or the in ability to shore it up steadily. The Nigerian government must learn to eschew waste and learn to save in foreign assets over longer periods of time to give a boost to the country's competitiveness.

iv. External loans have shown very strong ability towards enhancing Nigeria's REER in the long term but it comes at a cost "external debt service". The cost of servicing external debts has proven to aggravate the problem of Nigeria's depreciating REER. The asymmetric results have shown that, the adverse effects of positive changes in external debt service on REER are more severe than those of the negative changes. It then implies that, as external debt service obligations rises, it weakens the REER of the country faster and by extension worsens the degree of the economy's global competitiveness. Thus, the government must curtail on contracting external debts and must do so only when it is extremely necessary and channel such debts into revenue generating ventures that could pay up such loans eventually.

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