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TERMS OF TRADE, TRADE RESTRICTIONS AND REAL EXCHANGE RATE IN NIGERIA

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Abstract

This study examined the determinants of real exchange rate in Nigeria. To achieve the stated objectives, several empirical tests were conducted to ascertain the relationship among the variables under study. They include the descriptive statistics test, the ADF unit root test, the serial correlation and stability tests, the ARDL bound test and ARDL short run ECM test as well as the cointegration test. Analyses of the results revealed that real government expenditure has a negative but significant relationship with real exchange rate. Both domestic money supply and nominal exchange rate both have a positive and significant relationship with the real exchange rate. The results further revealed that real trade restrictions and technological progress both have a positive but insignificant impact on real exchange rate. In conclusion, both real and nominal variables are the core fundamentals that determined real exchange rate in Nigeria mostly in the short run. Consequently, the study recommended that regarding the real terms of trade; since capital accumulation appreciates the real effective exchange rate, there is need for the creation of enabling environment that encourages investment in the tradable goods sector, rather than the non-tradable goods sector.

Keywords: *real exchange rate; ARDL; Nigeria.*

JEL Classification: F31

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1. Introduction

A study on Real Exchange Rate (RER) will not be complete without an explanation of exchange rate. Obadan (2006) refers exchange rate as a key macroeconomic variable in the general economic policy making and economic reform programs which governments take active interest in. it is made up of two concepts; Nominal Exchange Rate (NER) and Real Exchange Rate (RER). Edwards (1988) defined the focus of this research "Real Exchange Rate" under two main theoretical headings; in external terms, it is defined as the nominal exchange rate adjusted for price level differences between countries. That is, as the ratio of the aggregate foreign price or cost level to home country's aggregate prices or cost level measured in a common currency. The appropriate definition adopted varies for different policy issues; however, both definitions rely on the assumption that the home country has only one trading partner, which within the real world is an invalid assumption.

The two exchange rates are connected in the sense that changes in the nominal exchange rate can cause short-run changes in the real exchange rate. For instance a nominal exchange rate devaluation/depreciation can have the effect of depreciating the real exchange rate. Over several years, countries are increasingly opening their borders to expanded international trade making the economies of the world to be increasingly linked and dependent on each other in services as well as in primary and manufactured goods. This brings out the very importance of real exchange rate which cannot be ignored in international trade.

Most economies (developed and developing) of the world have experienced high real exchange rate volatility, which translates into high degree of uncertainty in the attainment of major macroeconomics and monetary policy objectives in the area of price stability and economic growth. Volatile real exchange rates are associated with unpredictable movements in the relative prices in the economy. Hence, exchange rate stability is one of the main factors influencing foreign (direct and portfolio) investments, price stability and stable economic growth. Ever since the breakdown of the Bretton-Woods system in 1973, the exchange rates of many countries have been fluctuating considerable overtime, and there has been more interest in predicting exchange rates.

Exchange rate policy in Nigeria has substantial transformation since post-independence era when the country operated a fixed exchange rate system that was in alliance with the IMF per value or fixed system. The currency was subjected to administrative management. The exchange rate was largely passive as it was

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dictated by the fortunes or otherwise of the British pound sterling (Obadan, 2006). Following the breakdown of the IMF per value system in December 1971, the naira was adjusted in relation the dollar. It can be said throughout the 1970s the exchange rate appreciated every year in order to source imports for developments projects and service imports substituting industries. When oil price collapsed in the world market, the policy of gradual depreciation of the naira against the dollar of pound sterling was adopted from 1981.

In 1986, Structural Adjustment Programme (SAP) was introduced, naira was floated and an institutional framework for trading in a market determined environment was established. This was pursued under the framework of the Second-tier foreign Exchange Rate Market (SPEM). The essence of SPEM was to evolve an effective mechanism for exchange rate determination and allocation of foreign exchange in order to guarantee stern stability and long-run balance of payment equilibrium. SPEM began as a dual exchange system, the official first tier exchange rate and the free market exchange rate. The essence of the dual exchange rate system was to avoid a deliberate uniform and sizeable depreciation of the naira but to allow it to depreciate in the SPEM while at the same time the monetary authorities would continue a downward adjustment of the first-tier rate until the two rates converge to a realistic exchange rate. SPEM later evolved into the foreign exchange rate, Autonomous Foreign Exchange Rate Market (AFEM), Dutch auction system and currently the wholesale Dutch auction system.

A dual exchange rate emerged with the reintroduction of AFEM in addition to the official exchange rate. It is obvious Nigeria has been moving from one exchange rate policy to another, in most cases a mixture of policies in other to achieve the main objectives of balance of payment balance, stable exchange rate for external and internal macroeconomic balance. But the various exchange rate policies have not been able to stabilize the value of the naira instead naira has to depreciated in value consistently. These calls for an understanding of the factors that are driving the movements in the exchange rate as there affect the real exchange rate.

Nigeria continues to face serious depreciation of the naira against major currencies in the world and in a bid to stabilize it; monetary authorities have adopted one exchange rate policy to another. The difference policies have not helped in stabilizing the naira. Naira has depreciated so low in value from 0.6159 in 1975 to over 596.00 in 2020. This has had major constraints to economic growth and development in areas of investments in-inflow, competitiveness of the tradable sectors, and the high cost of doing business. The ability to have a stable and viable

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currency is a solid foundation for growth and sustainability in key sectors of the economy especially as Nigeria focuses on shifting its position from being the 39th economy in the world to becoming one of the 20th economy in world by the year 2020 (Vision 20:2020). This study therefore seeks to answer the following research questions:

i. What is the effect of real terms of trade on real exchange rate in Nigeria?
ii. What is the effect of real trade restrictions on real exchange rate in Nigeria?

2. Empirical Literature

The following regarding the determinants of real exchange rate has been mixed. For instance, Chowdhury (1999) noted that in Papua Guinea, nominal devaluation, net capital inflow, foreign aid, trade restrictions and macroeconomic policies impacted positively on real exchange rate while Patel and Srivastava (1997) revealed that investment-GDP ratio, overall fiscal deficit and nominal exchange rate were the most important determinants of real exchange rate in India. Odedokun (1997) examined the impact of macroeconomic policies, devaluation and fundamentals on real exchange rate movement in a group of 38 African countries. The author concluded that the factors that led to real exchange rate appreciation included public sector fiscal deficits, growth of domestic credit, domestic absorption-GDP ratio, the government consumption-GDP ratio the private consumption-GDP ratio, improvement in terms of trade, income per capita and black market exchange rate premium.

In another panel analysis, Imed and Christophe (2003) analyzed the main determinants of the real exchange rate in the Middle East and North Africa (MENA) countries, their findings proved that government consumption, real interest rate variances, output per capita, as well as the degree of openness of the economy stimulate the real exchange rate. Mkenda (2001) used a co-integration analysis in estimating the long-run determinants of the real exchange rates for imports and exports, and of the internal real exchange rate in Zambia. Their analysis showed that real exchange rate for imports is characterized by terms of trade, government consumption, and investment share while terms of trade, central bank reserves and trade taxes impact real exchange rates for exports in the long-run. The internal real exchange rate is affected by terms of trade, investment share and rate of growth of real GDP in the long-run.

In South Africa, MacDonald and Ricci (2003) found that real exchange rate differential, GDP per capita, terms of trade, overall fiscal balance, degree of

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openness and net foreign assets impact on the real exchange rate. Gelgard and Nagayasu (2004) also investigated the determinants of Angola's real exchange rate and concluded that oil prices and foreign interest rate are the most significant factors. They further argued that a flexible exchange rate is more expedient than a fixed exchange rate regime. Duffrenot and Yehoue (2005) analyzed the correlation between real exchange rates and economic fundamentals in 64 developing countries; their analysis shows that exchange rate dynamics is not likely to be determined by fundamentals such as productivity, terms of trade, and trade openness for middle-income countries than for low income countries.

Obadan (1994) also found that the improvement in terms of trade and the increase in net capital inflows led to appreciation in the nominal and the real exchange rates, respectively, while the increase in monetary aggregates resulted to real exchange rate deprecation. In Angola, Takaendesa (2006) established that terms of trade, the real interest rate differential, domestic credit, the degree of openness of the economy and technological progress have long-run impact on the real exchange rate. Terms of trade, domestic credit and degree of openness of the economy have significant influence on the real exchange rate in the short-run.

In a similar study for Venezuela, Yu-Hsing (2006) concluded that broad money supply, world interest rate country risk, and the estimated rate of inflation have adverse effect on exchange rate while government deficit appreciates the exchange rate. Quite a number of studies have also been conducted to investigate the determinants of real exchange rate in Nigeria and the extent of real exchange rate misalignment. Mapenda (2010) also used the Johansen approach and the vector error correction model (VECM) to evaluate the long-run determinants of the exchange rate in Ghana and Nigeria, using the terms of trade, trade restrictions, domestic interest rates, foreign aid inflow, income, money supply, world inflation, government consumption expenditure, world interest rates, capital controls and technological progress.

Otapo (2020) examined the determinants of exchange rates in Nigeria for the period 1982 to 2018. The Ordinary Least square method of regression estimation was adopted for analyses. The study's model related changes in exchange rates to changes in reserves, domestic credit, foreign inflation, real income, domestic bond and foreign bond. None of the exogenous variables at 5% level of significance had significant effect on exchange rate, their joint effect was also not significant with an F statistics of 1.123, 21.2% of changes in exchange rate were accounted for by changes in the models variables. Domestic credit, foreign prices, reserves and real

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gross domestic product had negative coefficients respectively, while foreign bond and domestic bond had positive coefficients respectively. Reserves, domestic credit and foreign bonds contradict theoretical expectation while foreign prices, real gross domestic product and local bonds were in agreement, furthermore, real gross domestic product had the highest effect on exchange rate. Monetary and fiscal policies that engenders investment in productive sectors should be implemented to bring about economic growth and a progressively appreciating exchange rate

Oke and Adetan (2018) examined empirically the determinants of exchange rate in Nigeria using the ARDL Bounds test approach to co-integration for the period spanning 1986-2016. The result of the analysis shows that the gross domestic product (GDP), Interest rate (INT) and inflation rate (INF) have positive effect on exchange rate in Nigeria while degree of openness (DOP) recorded a negative effect on exchange rate (EXR) in Nigeria. The Error Correction Mechanism result appeared to be correctly signed and significant. The study therefore concluded that gross domestic product, interest rate and inflation rate are the major determinant of exchange rate in Nigeria under the study period. It is therefore recommended that government should focus more on production of goods and services that can be exported and also introduce policies that can discourage importation of goods into the country. The government must pursue a realistic and pragmatic exchange rate policy in the less free trade areas that would stem capital flight and ensure more investment in the Nigerian economy.

Ajao (2015) investigated the determinants of real exchange rate volatility in Nigeria from 1981 through 2008. Having obtained the volatility of exchange rate through the GARCH (1,1) techniques, the ECM was used to examine the various determinants of exchange rate volatility in Nigeria, while the co-integration analysis reveals the presence of a long term equilibrium relationship between REXRVOL and its various determinants. Our empirical analysis further shows that openness of the economy, government expenditures, interest rate movements as well as the lagged exchange rate are among the major significant variables that influence REXRVOL during this period. This study recommends that the central monetary authority should institute policies that will minimize the magnitude of exchange rate volatility while the federal government exercises control of viable macroeconomic variables which have direct influence on exchange rate fluctuation.

Victor and Dickson (2012) investigated the determinants of the real exchange rate in Nigeria, where their main objective was to present a dynamic model of real exchange rate determination using data from 1970 to 2010. They considered

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government spending, GDP, terms of trade, capital flow, price level, technological progress and nominal effect exchange rate. The Johansen co-integration test they applied suggested that a long relationship existed among the variables. In the same vein, Udousung and Umoh (2012) analyzed exchange rate determinants in Nigeria from 1971 to 2000. Six variables were included in the exchange rate model, including openness of the economy, import tax, balance of payment, the fiscal deficit, exports tax and trends. Their result revealed that import tax, openness of economy and export tax had positive coefficients, implying a direct positive relationship between these variables and the real exchange rate

Ajao and Igbekoyi (2013) investigated the determinants of real exchange rate volatility in Nigeria from 1981 to 2008. Using generalized auto-regression condition heteroskedasticity (GARCH) techniques and the error correction model (ECM) to examine the various determinants of exchange rate volatility in Nigeria. However, the result of their analysis suggest that the openness of the economy, government expenditures, interest rate movements and the legged exchange rate among others, were the significant variables that influenced real exchange rate volatility during the period reviewed. In terms of real exchange rate misalignment, Edwards (1988, 1989) studied about twelve developing countries and found that those with less real exchange rate misalignment performed better (in terms of growth of output) than those with more real exchange rate misalignment. He also observed that the nature of exchange rate misalignment in developing countries has more of overvaluation, which negatively affects the tradable sector by reducing producers real prices.

Aliyu (2008) investigated the impact of exchange rate volatility on non-oil exports trade in Nigeria and the findings revealed that the naira exchange rate volatility decreases non-oil exports while the same estimate for the dollar volatility increased export of non-oil trade in Nigeria. Odedokun (1997) examined the effect of a wide range of macroeconomic policies, devaluation and fundamentals on real exchange rate behavior. The evidence suggests that such macroeconomic policies appreciate the real exchange rate while devaluation, investment-GDP ratio, consumer-wholesale price ratio in trading-partners countries, and boom in industrial countries are found to depreciate real exchange rate.

Ricci, Ferretti, and Lee (2008) presented reduced-form estimates of equilibrium real exchange rate in a sample of industrial and emerging markets, using a new measure of commodity terms of trade, and analyzed the Balassa-Samuelson effect through fairly detailed measures of labor productivity in tradable and nontradable

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(relative to trading partners). The empirical results show the long-run relation between real exchange rate and the proposed set of underlying fundamentals to be significant and economically meaningful; real exchange rate are found to commove positively with a country's net external positions, the productivity of tradable versus nontradable relative to trading partners, the commodity terms of trade, and government expenditure.

Habid and Kalanova (2007) investigated whether oil price has an impact on the real exchange rates of three main oil exporting countries and the results vary for the three countries. It is evidence from the above review that studies on the real exchange rate have no dominant approach. Real exchange rate being a very important macroeconomic policy objective with diverse influence on other macroeconomic variables and objectives, each author studies area of interest with different data sets and methods. We therefore seek to assess the determinants of real exchange rate in Nigeria to see whether it conforms to previous studies in the same area in other African countries.

3. Methodology

3.1 Model Specification

The regular method of modeling RER equilibrium is to convey the theoretical bond between RER and its major determinants. This was corroborated by the findings of (Edwards, 1988; Elbadawi, 1994). The normal formula has been employed in several research works (Ghura & Grannes, 1993; Bashir & Luqman, 2014). The estimates of this study follow the relationship found in investigating the causes of real exchange rate behaviour in Nigeria.

The estimation technique adopted for this study was the autoregressive distributed lag (ARDL) test. The ARDL approach to co-integration as first developed by Pesaran and Pesaran (1997), Pesaran and Shin (1999) and Pesaran, Shin and Smith (2001) has been applied with the help of unrestricted vector error correction model. The aim is to investigate the long run and the short run relationship between real exchange rate and its determinants in Nigeria.

$$RER = f(TOT, TRT, DMS, EXC) \quad 1$$

Its linearized version is given below:

$$logRER = bo + b_1 logTOT + b_2 logTRT + + b_3 logDMS + b_4 logEXC + U_t \quad 2$$

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Where; RER is stands for Real Exchange Rate, TOT is the External Terms of Trade while TRT is Trade Restrictions. Also, DMS means Domestic Money Supply while EXC and Ut are Nominal Exchange Rate and Error Term respectively. The ARDL model version of equation (2) is stated below:

$$\Delta LogRER_t = \alpha_0 + \sum_{n} a_1 \Delta LogRTOT_t + \sum a_2 \Delta LogRTRT_t + \sum a_3 \Delta LogRGEXP_t + \sum a_4 \Delta TRCHP_t + \sum a_5 \Delta LogEXC_t + \sum a_6 \Delta LogDMS_t + p1 \Delta LogRTOT_{t-k} + p2 \Delta LogRTRT_{t-k} + p3 \Delta LogRGEXP_{t-k} + p4 \Delta TECHP_{t-k} + p5 \Delta LogEXC_{t-k} + p6 \Delta LogDMS_{t-k} + et \quad 3$$

4. Results and Discussion

4.1 Descriptive Analysis

Table 1. Result of Descriptive Statistical Analysis

	RER	RTOT	RTRT	RMP	EXC	TECHP	RGEXP
Mean	8.266974	10.89532	4.423117	44.4553	88.82697	29.89000	0.723481
Medium	8.894097	8.733894	4.091356	11.68348	111.9433	27.70000	0.661333
Maximum	23.38905	32.83271	11.98141	197.2820	253.4923	1148.8300	2.333952
Minimum	0.080955	0.763082	0.630086	0.068522	2.020575	-3.640000	0.107985
Std. Dev.	7.463534	8.420858	2.898461	61.16078	70.29011	24.32332	0.536926
Skewness	0.361697	0.787210	0.738643	1.277165	0.209984	1.366749	1.286377
Kurtosis	1.842744	2.950895	3.052552	3.394506	1.996446	5.957848	4.439376
Jarque-Bera	2.405782	3.204894	2.822470	8.628641	1.528680	20.95197	11.22570
Probability	0.300325	0.201403	0.243842	0.013376	0.465641	0.000028	0.003651
Sum	256.2762	337.7548	137.1166	1368.815	2753.636	926.5900	22.42792
Sum Sq. Dev.	1671.130	2127.325	252.0322	112219.2	148221.0	17748.72	8.648692
Observations	31	31	31	31	31	31	31

Source: E-views 10.0 Econometric Software

Table 1 revealed the result of the descriptive analysis of the data used in this study. The Jarque-Bera (JB) test measures the difference of skewness and kurtosis of the series with those from the normal distribution. The JB values of 8.629, 20.952 and 11.226 for DMS, TECHP and RGEXP respectively and their corresponding probability of less than or equals to 0.05 percent confirms the normality of the series and suitability for generalization. It indicates the absence of outliers in the data.

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4.2. Augmented Dickey-Fuller (ADF) Unit Root Test

Table 2. Unit root test using the Augmented Dickey-Fuller (ADF) Statistics

Variables	At Level	At 1st or 2nd Difference	Order of Integration
RER	-1.6744	-5.8372	I(1)
RTOT	-2.0942	-5.9779	I(1)
RTRT	-2.7899	-5.3489	I(1)
TECHP	-5.0656	-	I(0)
RGEXP	-4.3927	-	I(0)
EXC	-2.4948	-5.4706	I(1)
DMA	-0.6755	-4.4781	I(1)

Test of Critical Values: 1% = -3.6793; 5% = -2.9677; 10% = -2.6229

Source: E-views 10.0 Econometric Software

The analysis of the ADF unit root test revealed that not all the variables was found to be stationery at levels (I(0) except for RGEXP and TECHP, hence, it becomes impossible at this stage to reject all their null hypotheses. This is so because the test statistic values at level for (RER, RTOT, RTRT, EXC and DMS) variable using the ADF test were below the critical values at one percent, five percent and ten percent levels of significance. However, when these variables (RER, RTOT, RTRT, EXC and DMS) were differenced once, they were stationery. This is because the tests statistic values were found to be greater than the critical values at one percent, five percent and ten percent levels of significance. Having that all the variables are integrated in order 1(1) for (RER, RTOT, RTRT, EXC and DMS) and order 1(0) for RGEXP and TECHP, hence, all their null hypotheses are rejected.

4.3 ARDL F-bound Test

The result of the ARDL result conducted revealed that, the coefficients of determinant (RTOT), RTRT, RGEXP, TECHP, EXC, DMS) are not jointly co-integrated with the dependent variable, RER, hence, the absence of long-run relationship between the independent variables and dependent variable. This is because the calculated F-statistic is 0.58 compared with Pesaran critical value at all levels of significance is lower than the lower bound (2.12) and the upper bound (4.43). This result indicated that there exist no evidence of long-run co-integration

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between (RTOT, RTRT, RGEXP, TECHP, EXC, DMS) and RER. As a result of the insignificant long run relationship between (RTOT, RTRT, RGEXP, TECHP, EXC, DMS) and RER, there is need to assess and estimate the effects of the long run coefficients. The long run coefficients measure the long run effects of the independent variables on the dependent variable.

Table 3. ARDL F-bounds Test

Hull Hypothesis: No long-run relationships exist		
Test Statistic	Value	K
F-statistic	0.581711	6
Critical Value Bounds		
Significance	10 Bound	11 Bound
10%	2.12	3.23
5%	2.45	3.61
2.5%	2.75	3.99
1%	3.15	4.43

Source: E-view 10.0 Econometric Software

The result of the long run estimates showed that the long run effect between RGEXP and RER was negative (-10.0861) and insignificant (0.9639); the long run effect between RTOT and RER was negative (-18.4109) and insignificant (0.9639); the long run effect between RTRT and RER was positive (16.3261) and insignificant (0.9625); the long run effect between TECHP and RER was positive (0.1188) and insignificant (0.9631); the long run effect between EXC and RER was negative (-16.3222) and insignificant (0.9631); the long run effect between DMS and RER was positive (15.5723) and insignificant (0.9633). With the absence of a long run cointegration between the variables, further tests are conducted to ascertain whether the model is free from serial correlation and problem of stability.

4.4 Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test was conducted to determine whether the model was free serial correlation and to accept or reject the null hypothesis that,

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Table 4. ARDL Cointegration and Long Run Effects Result

Long Run Coefficients

Variable	Coefficient Std.	Error	T-statistic	Prob,
LRGEXP	-10.086149	218.867789	-0.046083	0.9639
LDMS	15.572304	332.030340	0.046900	0.9633
LRTOT	-18.410944	399.097971	-0.046131	0.9639
LRTRT	16.326186	340.869864	0.047896	0.9625
LEXC	-16.322272	369.458234	-0.044179	0.9654
TECHP	0.118862	2.523207	0.047108	0.9631
C	40.835869	946.175434	0.043159	0.9662

Source: E-view 10.0 Econometric Software

Table 5. Breusch-Godfrey Serial Correction LM Test

F-statistic	0.062961	Prob. F(2, 12)	0.9393
Obs*R-squared	0.301150	Prob. Chi-Square(2)	0.8602

Source: E-view 10.0 Econometric Software

There is no serial correlation in the ARDL model. Based on the Breusch-Godfrey serial correlation LM test result, it is shown that F-stat and Obs*R-squared probabilities are greater 0.05,, hence, we accept the null hypothesis that, there is no serial correlation in the ARDL model. It is therefore concluded from the Breusch-Godfrey Serial Correlation LM Test statistics result that, the model is free from the first and second order serial correlation. Hitherto, the stationarity of the ARDL analysis is present. The implication is that, the ARDL model is sufficient enough to capture all the dynamics of the model considering the fact that, the pre-sample missing value lagged residuals were set to zero.

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4.5 CUSUM Stability Test

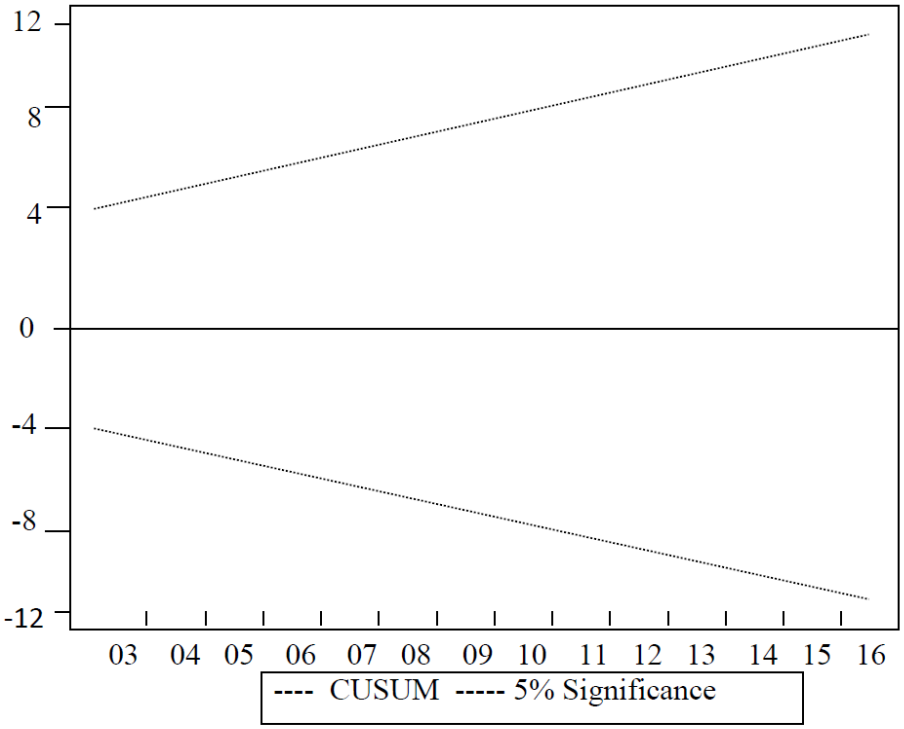

Figure 1: Cusum Stability Test
Source: E-view 10.0 Econometric Software

This is a test to ascertain the stability of the model. This was done using the CUSUM stability test analysis. The condition of the CUSUM stability test holds that, the middle line (trend) must not lie outside the set-region, bordered by two slant lines. The CUSUM stability test revealed that this condition has been met satisfactorily, hence, it is concluded that, the ARDL model is stable or has stability at five percent level of significance.

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4.6 Variance Inflation Factors

Table 6. Variance Inflation Factors Test

Variance Inflation Factors

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
LRER(-1)	0.066315	1173.135	787.6969
LRER(-2)	0.071094	1175.268	852.0231
LRGEXP	0.011254	47.44944	27.50606
LRGEXP(-1)	0.009725	39.72434	23.70268
LRMP	0.038825	1638.431	946.1525
LRMP(-1)	0.091567	3608.853	2279.666
LRMP(-2)	0.079191	2835.856	1922.108
LRTOT	0.009609	19.0394	45.69845
LRTOT(-1)	0.019676	384.1340	92.58864
LRTRT	0.010579	89.91598	28.05952
LEXC	0.017922	1280.991	97.39721
LEXC(-1)	0.077531	5235.951	468.7632
LEXC(-2)	0.076890	4905.156	548.3457
TECHP	9.04E-07	5.305650	2.044692
C	0.895829	3568.826	NA

Source: E-view 10.0 Econometric Software

Variance inflation factors (VIF) measure how much the variance of the estimated regression coefficients are inflated as compared to when the predictor variables are not linearly related. It is used to explain how much amount multicollinearity is dangerous because it can increase the variance of the regression coefficients. Variance inflation factors range from I upwards. The numerical value for VIF tells you (in decimal form) what percentage the variance (i.e. the standard error squared) is inflated for each coefficient. A rule of thumb adopted for interpreting the variance inflation factor in this study is:

VIF less than or equals to 1	=	not correlated.
VIF between 1 and 5	=	moderately correlated.
VIF greater than 5	=	highly correlated.

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From Table 6, the VIF Tolerance values of the variables are consistently smaller than 1. This shows that there is absence of multicollinearity as inferred by Tobachnick & Fidell (1996) and Musa (2005). The VIF values, moreover, reaffirm the absence of multicollinearity among the variables considered since the values are consistently lower than 1 ad suggested by Neter, Kutner, Nachtsheim & Wasserman, (1996), Cassey & Anderson (1999) and Musa (2005).

4.7. Test for Heteroskedasticity

One of the important assumptions of linear regression is that, there should be no heteroskedasticity of residuals. In simpler terms, this means that the variance of residuals should not increase with fitted values of response variable. It is customary to check for heteroskedasticity of residuals once you build the linear regression model. The reason is to heck if the model thus built is unable to explain some pattern in the response variable (dependent variable), that will eventually shows up in the residuals. This would result in an inefficient and unstable regression model that could yield bizarre predictions later on.

Table 7: Heteroskedasticity Test: Breusch-Pagan-Godfrey

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.905304	Prob. F(14,14)	0.5725
Obs*R-squared	13.77933	Prob. Chi-Square(14)	0.4663
Scaled explained SS	2.549246	Prob. Chi-Square(14)	0.9996

Source: E-view 10.0 econometric software

4.8 ARDL Short Run Test

The short run dynamics of the ARDL as shown in table 8 revealed that the ARDL model has a good fit on the data in the short run. This is given by the high value of the R-squared of 0.9985 (99.85 percent) and the adjusted R-squared of 0.9966 (99.66 percent). Based on the value of the adjusted R-squared, about 99.7 percent of the systematic variations in the real exchange rate in Nigeria has been determined by changes in real terms of trade (RTOT), real trade restrictions (RTRT), real government expenditure (RGEXP), technological progress (TECHP), nominal exchange rate (EXC) and domestic money supply (DMS).

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Table 8. ARDL Short Run Dynamics Result

Dependent Variable LRER

Variable	Coefficient Std.	Error	t-Statistic	Prob.
LRGEXP(-1)	-0.246843	0.115287	-2.141111	0.0535
LDMS	0.739269	0.212300	3.482181	0.0045
LRTOT(-1)	-0.210293	0.161488	-1.302218	0.2173
LRTRT	0.192783	0.121134	1.591482	0.1375
LEXC	0.919039	0.151581	6.063032	0.0001
TECHP	0.001317	0.001028	1.281413	0.2243
C	0.421502	1.051406	0.400894	0.6955
ECT(-1)	0.028530	0.478002	0.059686	0.9534

R-squared	0.998528	Mean dependent var	1.473336
Adjusted R-squared	0.996688	S.D. dependent var	1.593376
S.E. of regression	0.091697	Akaike info criterion	-1.645096
Sum square resid	0.100900	Schwarz criterion	-0.883836
Log likelihood	39.03134	Hannan-Quinn criterion	-1.412371
F-statistic	542.6997	Durbin-Watson statistic	1.972348
Prob(F-statistic)	0.000000		

Source: E-view 10.0 Econometric Software

On the same note, the high value of F-statistics (542.6997) shows that the overall model is statistically significant. The overall significance of the short-run model implies the joint significance of all explanatory variables in explaining short-run changes in the real exchange rate position in Nigeria. The result for the variables shows that the unexpected positive sign of error correction term (ECT) is highly insignificant. The highly insignificant ECT further confirms the existence of an unstable and insignificant relationship between real exchange rate and its determinants in Nigeria with their various lags. The coefficient of ECT (0.0285) imply that deviation away from the long run real exchange rate (RER) is uncorrected by 2.85 percent by the following year. This positive sign signal a non-oscillating convergence in real exchange rate (RER) and a movement away from equilibrium.

Analysis of the short-run estimates revealed further that, changes in the previous lagged period of real government expenditure (RGEXP) have a negative but significant impact on the current value of real exchange rate (RER) in Nigeria. The

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negative value (-0.2468) revealed that, a percent increase in real government expenditure will negatively impact real exchange rate determination in Nigeria by 0.24468 in the short run, ceteris paribus. Further analysis of the short-run estimated revealed that, changes in the current period of domestic money supply (DMS) have a positive and significant impact on the current value of real exchange rate (RER) in Nigeria. The positive value (0.7392) revealed that, a percent increase in domestic money supply will positively impact real exchange rate determination in Nigeria by 0.7392 in the short-run, ceteris paribus.

Analysis of the short-run estimated revealed further that, changes in the previous lagged period of real terms of trade (RTOT) have a negative and insignificant impact on the current value of real exchange rate (RER) in Nigeria. The negative value (-0.2102) revealed that, a percent increase in real terms of trade will negatively impact real exchange rate determination in Nigeria by 0.2102 in the short run, ceteris paribus. Analysis of the short-run estimated revealed further that, changes in the current period of nominal exchange rate (EXC) have a positive and significant impact on the current value of real exchange rate (RER) in Nigeria. The positive value (0.9190) revealed that, a percent increase in real terms of trade will positively impact real exchange rate determination in Nigeria by 0.9190 in the short run, ceteris paribus.

Finally, the analysis of the short-run estimates revealed further that, changes in the current period of technological progress (TECHP) have a positive but insignificant impact on the current value of real exchange rate (RER) in Nigeria. The positive value (0.0013) revealed that, a percent increase in technological progress will positively impact real exchange rate determination in Nigeria by 0.0013 in the short run, ceteris paribus.

4.9 Discussion of Findings

The study empirically examined real exchange rate determinants in Nigeria. The study also adopted the ARDL model technique as a result of the ADF unit root test orders of integration (1(0) and 1(1)). The ARDL bound test revealed the absence of a long run existence in the model. This was as a result of the F-statistics value being lower than the Pesaran lower and upper critical bound values. The ARDL model was also subjected to the serial correlation and stability tests. The results revealed that the model satisfied both the no serial correlation and stability requirements and conditions. The stability test was conducted using the CUSUM stability test.

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The ARDL short run dynamics test was conducted to attempt to correct the existing disequilibrium position in the short run. The error correction (ECM) factor did not have a negative sign and was not statistically significant as theoretically expected. The highly insignificant ECT further confirms the existence of the long run insignificant relationship between real exchange rate and its determinants in Nigeria with their various lags.

Further analysis of the ARDL results revealed that, the coefficient of real government expenditure (RGEXP) is both correctly signed and significant statistically. The implication of the negative sign of the coefficient is that increase in government spending relative to GDP induces real exchange rate depreciation. This is because in the long run, higher government spending most likely according to Maesofernandez, Osbat and Schnatz (2001) undermines confidence in a currency thereby leading to distortions and consequently exerts a negative effect on the real exchange rate. This is, however, not to deny the fact that an increase in real government expenditure which increases the demand in the nontradable sector stimulates higher productivity, conserves foreign exchange, which otherwise would be used for imports, and improves real exchange rate. Perhaps this condition is not likely to hold for Nigeria given the low level of capacity utilization, high energy and other operating costs, among others, in the nontradable sector.

This was also supported by Bouakez and Eyquem (2011) that an unexpected increase in public expenditures leads to a fall in the risk-adjusted long-term real interest rate causing the real exchange rate to depreciate. In their study, they proposed a small-open-economy model that features three key ingredients: incomplete and imperfect international financial markets, sticky prices, and a not too-aggressive monetary policy. The coefficient of the RGEXP has the expected negative sign with respect to the RER in the model but it does not have any significant effect in the long run but does in the short run at the conventional five percent level of significance.

The role of macro policy as proxied by domestic money supply is found to be significant in affecting the RER in the model in the short run. A one percent increase in domestic money supply will insignificantly appreciates the RER by 15.57 in the long run though, however, domestic money supply will appreciate RER significantly by 0.739 in the short run. Unsustainable macroeconomic policy, in terms increased domestic money supply, raises the domestic price of nontradables and appreciates the RER, confirming the theoretical analysis of the RER. Furthermore, Yu-Hsing (2006) concluded that broad money supply, would

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interest rate, county risk, and the estimated rate of inflation have adverse effect on exchange rate while government deficit appreciates the exchange rate.

Theoretically, the sign of coefficient of terms of trade is ambiguous. It depends on whether the substitution or income dominants. Here, the positive income effect of a change in terms of trade dominates and hence the coefficient's sign is positive. Although Nigeria is a price taker in the world economy, faces quantity restrictions from the organization of oil producing states (OPEC) and crises in the oil producing region, which adversely affect supply, yet changes in its terms of trade results in appreciation of real exchange rate. This development and indeed those in the above could, however, spur more imports into the economy.

The result indicates that an improvement in RTOT does not have any significant short run and long run impact on the real exchange rate. With the coefficient indicating a negative sign in relation to RER, it is not statistically significant in either the short run or the long run at conventional five percent level of significance. The finding of this study disagrees with Victor and Dickson (2012). They investigated the determinants of the real exchange rate in Nigeria, where their main objective was to present a dynamic model of real exchange rate determination using data from 1970 to 2010. They considered government spending, GDP, terms of trade, capital flow, price level, technological progress and nominal effective exchange rate. The Johansen co-integration test they applied suggested that a long relationship existed among the variables. With respect to trade restrictions, it is seen that due to more trade restrictions and import barriers on the nation, it would lead to exports and it appreciation of real exchange rate. From the results of this study, real trade restrictions have an insignificant positive effect on RER. The result indicates that the introduction of restrictive trade policies from the mid-1980s appreciated the RER in the long run as well as in the short run. Trade restrictions tend to have appreciated the RER in Nigeria by 16.32 percent in the long run and by 0.19 percent in the short run. Thus, the trade regime has an important bearing on the movement of RER in Nigeria.

The coefficient of the nominal exchange rate is statistically significant and positive, as expected by the theoretical model. The result indicated that there is a close link between nominal exchange rate and the real exchange rate in Nigeria. A one percent nominal devaluation causes the RER to depreciate by 16.32 percent in the long run, while one percent nominal appreciation causes the RER to appreciate by 0.91 percent in the short run as the conventional five percent level of significance. This finding agrees with Ajao and Igbekoyi (2013) who investigated the

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determinants of real exchange rate volatility in Nigeria from 1981 to 2008. Using Generalized Auto-regression Condition Heteroskedasticity (GARCH) techniques and the Error Correction Model (ECM) to examine the various determinants of exchange rate volatility in Nigeria. However, the result of their analysis suggest that the openness of the economy, government expenditures, interest rate movements and the lagged exchange rate among others, were the significant variables that influenced real exchange rate volatility during the period reviewed.

5. Conclusion and Recommendations

Real exchange rate has been erratic, fluctuating and highly volatile over the years. The unabated problems of high unemployment, inflation and overall economic hardships have been attributed to the unstable real exchange rate/ the purpose of this study has been to examine real exchange rate determinants in Nigeria and evaluate whether it follows the theoretical expectations postulated by the theoretical framework of the study.

The theory of real exchange rates states that, while the long run equilibrium value of the real exchange rate is determined by real variables, the actual or observed real exchange rate is determined by both real and nominal variables in the short run. Movement of the equilibrium RER from its original position does not necessarily represents disequilibrium since the long run equilibrium is affected by real variables.

This study has examined the extent to which real and nominal determinants can explain the behaviour of the real exchange rate in Nigeria in the short run. The ARDL result concluded that, at the long run level, the real variables alone that influences real exchange rate in Nigeria were insignificant. However, real exchange rate in Nigeria was determined by both real and nominal variables are the core fundamentals that determined real exchange rate in Nigeria mostly in the short run.

Based on the findings of this study, the following measures are recommended.

i. Regarding the real terms of trade; since capital accumulation appreciates the real effective exchange rate, there is need for the creation of enabling environment that encourages investment in the tradable goods sector, rather than the non-tradable goods sector. This can be done by reforming the Nigerian agricultural and industrial sectors to attract investment for the purpose of export and reforming the mining sector for increased investment.

ii. A guided trade liberalization is needed to minimize the depreciating effects of the openness on the real effective exchange rate in the country. Given the fact

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that trade restrictions appreciate the real exchange rate, there is need to encourage Nigeria's increased integration with other economies in the West African sub-region as well as out of the sub-region.

iii. Government expenditure should be directed on the issue of investible goods and how spending on imported good should be drastically reduced to avoid the danger of worsening the current account balance that may cause real exchange rate depreciation.

iv. Since output growth rate (TECHP) has a positive impact on the real effective exchange rate, to generate substantial real exchange rate depreciation, supply side policies that will improve productivity will be useful in Nigeria. This will include human capital development in form of education and health as well the improvement in basic infrastructural facilities like electricity amongst others.

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