

Exchange Rate Fluctuations and Trade Balance in Nigeria: Cointegration, Granger Causality and Fully Modified Least Squares (FMOLS) ApproachAderemi Timothy Ayomitunde¹, Collinz Bamidele Olu`kunle², Emiola Semiu Ajibola³, Famakinde Tolulope⁴¹Department of Economics, Olabisi Onabanjo University, Ago Iwoye, Ogun State, Nigeria²Department of Economics, Olabisi Onabanjo University, Ago Iwoye, Ogun State, Nigeria³Department of Business Administration, Oyo State College of Agriculture and Technology, Igbo-Ora, Oyo State, Nigeria⁴Department of General Studies, Allover Central Polytechnic, Ota, Nigeria***Corresponding author**Aderemi Timothy
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Abstract: One of the catastrophic aftermath effects of the Structural Adjustment Program is the continuous fluctuations in exchange rate in Nigeria. The possible spillover effects of exchange rate fluctuations on trade balance in the country have generated a serious concern among scholars in the recent time. However, mixed results have been observed from the past studies which created a vacuum in the literature in which this study would fill. Consequently, this paper employed Cointegration, Granger Causality and Fully Modified Least Squares (FMOLS) approach to address the objective of the study. The findings that originated from this study are as follows; the exchange rate fluctuations have a negative impact on imports in Nigeria, though not statistically significant. Meanwhile, the impact of exchange rate is positive on exports though not significant in Nigeria as well. Also, economic growth and exchange rate have an inverse relationship in the country. In the same vein, exchange rate has a negative impact on trade balance. Similarly, there is a unidirectional causal relationship between imports and exports in one hand, and exchange rate and economic growth on the other hand in Nigeria. This implies that exchange rate fluctuations have not been favourable to balance of trade and economic growth in Nigeria. Moreover, on the basis of the findings above, it is paramount this paper recommends the following; firstly, the policy makers in Nigeria should embark on policy measures that will ensure the stability of the country's exchange rate. Also, the Nigerian government should put appropriate mechanism that will ensure the competitiveness of the locally made products both in Nigerian and the world markets. The government should have a political will to embark upon aggressive exports promotion of the locally produced goods in the country.

Keywords: Exchange Rate Fluctuations, Trade Balance, Imports, Exports and Nigeria.

INTRODUCTION

One of the principal macroeconomic objectives of the government is the maintenance of exchange rate stability in an economy. A country's exchange rate and its stability determine her ability to absorb any external shocks. The competitiveness of any country in the global community is a function of its exchange rate. In Nigeria, several attempts to achieve the stability of exchange rate in the past has necessitated the adoption of various applications of different mechanisms ranging from a fixed regime in the 1960s to a pegged regime between the 1970s and the mid-1980s. However, the introduction of the structural adjustment programme (SAP) in 1986 sparked off the era of the floating exchange rate regime in the country. Since introduction of what I tagged "catastrophic reform" known as structural adjustment programme (SAP) in 1986, the Nigerian exchange rate has been exhibiting a

continuous depreciation and instability on daily basis. CBN [1] established that the average exchange rate in 1986 was #2 against \$US1. But as at October, 2018, exchange rate was #365 against \$US1. In other words, from 1986 to 2018, Nigerian currency has been depreciated by approximately 8766%. The multiplier effects of daily dwindling in value of Naira have resulted in perpetual decline in investment, standard of living of the masses, and increased cost of production which has been pushing majority of manufacturing firms to neighboring countries in the last decade.

However, depreciation of currency makes foreign goods and services to be more expensive. This creates a vantage position for the locally made products to be highly competitive in the domestic market which will eventually lead to expansion of aggregate output in the country. Consequently, Guitan [2] and Dornbusch

[3], argued that the success or otherwise of a currency depreciation in propelling healthy trade balance is a function of the ability of the home economy to switch its demand in proper direction in one hand, and its capacity to supply sufficient goods to meet the additional demand by its population on the other hand.

In the last three decades, the continuous fluctuations in exchange rate has generated a serious concern among scholars. The literature has shown several submissions about the relationship between exchange rate and economic growth in the country. See Lawal *et al.*, [4], Odusola and Akinlo [5], Mireille [6] and Aliyu *et al.*, [7] However, there has not been a serious research focus on impact of exchange rate fluctuation on trade balance in the country in the recent time. This has created a vacuum in the literature in which this study would fill.

This rest of the study is organized as follows: in section 2, reviews related literature. The theoretical and empirical literature is reviewed systematically. While section 3 presented the estimation of the model, results, discussion and policy recommendation.

LITERATURE REVIEW

Theoretical Literature

The earliest and popular theoretical framework for the choice of exchange rate regimes lies in the Optimal Currency Area (OCA) theory. This theory was developed by Robert Mundell [8] in an attempt to critically respond to Friedman's [9] proposition that flexible exchange rates are optimal. This theory was later popularized by McKinnon [10] and Kenen [11]. The focal point of this theory is on trade and stabilization of the business cycle. However, the theory argues that a fixed exchange rate regime has the capacity to increase trade volume and consequently output growth by eliminating exchange rate uncertainty and thus the cost of hedging. Also, this encourages investment by reducing currency premium from interest rates. Meanwhile, unnecessary delay of adjustment of relative price in the optimal area could also reduce trade and output growth.

EMPIRICAL LITERATURE

This section presents a compressive review of past studies on exchange rate, trade balance and economic growth in Nigeria, Africa and the entire globe as a whole.

While contributing to the literature, Mireille [6] examines the impact of the real exchange rate on manufacturing exports. The finding from the study establishes that overvaluation of exchange rates have a main impediment to the recovery process of Nigerian and Benin Republican economies. Also, it was suggested from the study that devaluation of currency, appropriate targeted measures and upward adjustment in the domestic prices of tradable products, could create

a mechanism to restore exchange rate equilibrium and improve the performance of the economies under consideration.

However, Aliyu *et al.*, [7] utilize a vector Error Correction Model to estimate exchange rate pass-through in Nigeria between the periods of 1986 to 2007. The study discovers among others that exchange rate pass-through is low and declining in Nigeria during the examined which partly contradicts the conventional submission in the literature that exchange rate pass-through is always significantly higher in developing economies than advanced economies. It was concluded from the paper that pass through had the tendency to increase in the long run. Hence, appropriate monetary policy should be designed towards accommodating the effect.

In the same vein, Odusola and Akinlo [12] analyze the relationship between exchange rate, inflation and output in Nigeria with the adoption of a structural VAR model. The findings from the contemporaneous models indicate a negative impact of the parallel exchange rate on output only in the short term. Meanwhile, prices, parallel exchange rate and lending rate are discovered in the analysis to be strategic sources of perturbations in the official exchange rate. But, output and parallel exchange rate happen to be significant determining variables of inflation dynamics in the country. Therefore, the authors submit by advocating for more concerted efforts by the Central Bank of Nigeria in halting the parallel exchange rate behavior and designing appropriate monetary policies that facilitate income growth in the country.

Harris [13] employs the Generalized Least Square technique to argue that properly managed real exchange rate affects productivity and growth in the short and long run respectively. The finding from the study supports the competitiveness hypothesis, which states that exchange rate depreciation propels productivity and growth in the short run. Consequently, Edwards and Levy Yeyati [14] opine that economies with more flexible exchange rate grow on a faster pace than those with fixed exchange rate. In other words, there is a significant positive correlation between faster economic growth and real exchange rate depreciation. In another perspective, Rogoffs and Reinhartl [15] corroborate that developing economies are relatively better off in adopting flexible exchange rate regimes.

Moreover, Hossain [16] postulates that exchange rate could be used to show a relationship between the relative price systems of two different countries with a view to ensuring the possibility of foreign trade. It also effects the volume of both exports and imports alongside with the country's balance of payments position. While investigating the impacts of the exchange rate depreciation on the Nigerian output,

Odusola and Akinlo [5] establish a mixed result by asserting that in the medium and long term, exchange rate depreciation orchestrates an expansionary impact on output, whereas reverse is the case in the short run. In moving the frontiers of knowledge, Rano-Aliyu [17], finds out that the exchange rate appreciation has direct impacts on real economic growth in Nigeria. However, this scenario could lead to a loss of competitiveness in the economy since the country lacks the capacity to appropriate proceeds gained through competitiveness. The author concludes that dampening of inflation, boosting of domestic investment, increasing savings and enhancement of the standard of living are the economic gratification that accompany currency appreciation.

In addition, Aliyu [18] establishes that exchange rate depreciation facilitates increased imports and reduced exports while the reverse holds for currency depreciation. Therefore, exchange rate depreciation is more likely to bring a shift from imported commodity to domestically made goods, thereby leads to diversion of income from foreign economies to domestic economies via a shift in terms of trade, and this creates a noticeable impact on the economic growth of both exporting and importing countries in the long run.

Also, Asher [19] concludes that real exchange rate has a direct effect on the economic growth while estimating the relationship between exchange rate fluctuation and economic growth in Nigeria during the period of 1980 – 2010. Azeez, Kolapo and Ajayi [20] examine exchange rate volatility affects macroeconomic performance in Nigeria from 1986 – 2010. The authors corroborates that exchange rate has a direct relationship with economic growth.

Consequently, Adebisi and Dauda [21] apply error correction model to postulate that trade liberalization stimulates industrial sector growth in Nigeria and stabilizes the exchange rate market during the periods of 1970 to 2006. It was concluded from the study that there exists a direct and significant relationship between real export and industrial production index.

Finally, literature on exchange rate related issues is ongoing in Nigeria, and there is no yet a consensus reached about how this variable affects other important economic variables in the country. Hence, the relevance of this study.

METHODOLOGY

This study employed secondary data from 1990 to 2016 for the analysis. Data on exchange rate, inflation rate, economic growth, imports, exports, trade balance were extracted from the CBN Statistical Bulletin. E-Views software was utilized for the running of the data.

Model Specification

The model for this study can be specified in the general form as follows:

$$EXCHR = F(IMP, EXP, TBAL, INFL, GDP, \dots) \quad (1)$$

If model (1) is linearized, model (2) is emerged as follows.

$$EXCHR_t = \beta_1 + \beta_2 LnIMP_t + \beta_3 LnEXP_t + \beta_4 LnTBAL_t + \beta_4 Ln GDP + \beta_4 INFL + \mu_t \quad (2)$$

It important to perform various diagnostic tests such as unit root test with the aid of Augmented Dickey Fuller and Philip-Perron test on the data used for the analysis. However, the examination of the long run equilibrium relationship among the variables is very crucial in the case where variables are in different order of integration. Therefore, the adopted Johansen and Juselius [22] whose Trace statistics and Maximum eigenvalue statistics can be estimated from the eigenvalues of the coefficient matrix. The null hypothesis of the Trace statistics is stated thus that there are at most *r* cointegrating vectors. The alternative hypothesis is that there are more than *r* cointegrating vectors, and the maximum eigenvalue statistics test the null that there are *r* cointegrating vectors against the alternative that there are *r* + 1 cointegration relationship.

The Direction of Causality between Exchange Rate, Imports and Exports in Nigeria

Furthermore, in analyzing the Granger causality between exchange rate, imports and exports this study adopted pairwise granger causality analysis in estimating the VAR model in equation (3-6) which states thus;

$$EXCHR_t = \alpha_0 + \sum_{i=0}^p \alpha_1 EXCHR_{t-1} + \sum_{i=0}^p \alpha_2 IMP_{t-1} + \sum_{i=0}^p \alpha_3 EXP_{t-1} + \sum_{i=0}^p \alpha_4 GDP_{t-1} + \varepsilon_{1t} \quad (3)$$

$$IMP_t = \beta_0 + \sum_{i=0}^p \beta_1 IMP_{t-1} + \sum_{i=0}^p \beta_2 EXP_{t-1} + \sum_{i=0}^p \beta_3 EXCHR_{t-1} + \sum_{i=0}^p \beta_4 GDP_{t-1} + \varepsilon_{2t} \quad (4)$$

$$EXP_t = \gamma_0 + \sum_{i=0}^p \gamma_1 EXP_{t-1} + \sum_{i=0}^p \gamma_2 IMP_{t-1} + \sum_{i=0}^p \gamma_3 EXCHR_{t-1} + \sum_{i=0}^p \gamma_4 GDP_{t-1} + \varepsilon_{3t} \quad (5)$$

$$GDP_t = \gamma_0 + \sum_{i=0}^p \gamma_1 GDP_{t-1} + \sum_{i=0}^p \gamma_2 EXCHR_{t-1} + \sum_{i=0}^p \gamma_3 IMP_{t-1} + \sum_{i=0}^p \gamma_4 EXP_{t-1} + \varepsilon_{4t} \quad (6)$$

Where EXCHR denotes exchange rate, IMP means imports, EXP connotes exports, GDP is used to proxied economic growth, INF represents inflation rate which measures the stability of economy, Ln used to

capture natural logarithm and u_i is error term. $t = 1990-2016$.

RESULTS AND DISCUSSION

Table-1: Descriptive Statistics of Annual Data Series (1990-2016)

Descriptive Statistics	LIMP	LRGDP	LTBAL	LEXP	EXCHR	INFL
Mean	7.250404	44.24957	6.658862	7.795995	94.45883	19.66875
Median	7.458026	31.11933	6.891544	8.035242	119.7685	12.55000
Maximum	9.305274	346.1660	8.669502	9.633122	158.5526	72.84000
Minimum	3.822490	30.60445	3.465736	4.699444	8.037808	5.380000
Std. Deviation	1.622778	64.30949	1.785215	1.608340	57.66819	18.64281
Skewness	-0.528318	4.586952	-0.482310	-0.589934	-0.473798	1.736902
Kurtosis	2.266776	22.04135	1.793550	2.088784	1.514028	4.703962
Jargue-Bera	1.654098	446.7334	2.386013	2.500204	3.106051	14.97080
Probability	0.437338	0.000000	0.303308	0.286476	0.211607	0.000561
Sum	174.0097	1061.990	159.8127	210.4919	2267.012	472.0500
Sum. Sq. Deviation	60.56840	95121.33	73.30085	67.25573	76489.27	7993.751
Observation	26	26	26	26	26	26

Source: Authors` Computation (2018)

Various descriptive statistics of the data have been examined and shown in the above table. Before the estimation of econometric technique, it is necessary to provide vital information about the sample series such as the mean, median, minimum and maximum values; and the distribution of the sample which is measured by the skewness, kurtosis and Jaque-Bera statistics. This gives us crucial details about the assumptions of normality and asymptotic properties of data series. As shown in the table 1 above, the values of mean and median of imports, exports and trade balance

variables are very close. Meanwhile, there is no significant difference between the mean and median vales of the remaining variables as well. Karmel and Polasek [23] submitted that when a distribution is having a perfect symmetry, the mean, mode and median values must be identical. However, in the case of a near symmetry, it is important that the three aforementioned measures must be moving towards convergence. Hence, from table-1 it could be concluded that all annual data series utilized for this study, are normally distributed.

Table-2: Unit Root Test

Variables	ADF Test			PP Test		
	@Level	@First Difference	Remarks	@Level	@First Difference	Remarks
LRGDP	-2.9810**		I (0)	-2.9810**		I (0)
LIMP	-2.9810**	-2.9862**	I (1)	2.9810**		I (0)
LEXP	-2.9810**	2.9862**	I (1)	-2.9810**	-2.9862**	I (1)
LTBAL	-3.0048**	-2.9918**	I(1)	3.0048**	-3.0207**	I(1)
EXCHRATE	2.9810**	-2.9862**	I(1)	-2.9810**	-2.9862**	I(1)
INFL	-2.981**	-2.9862**	I(1)	2.9810**	-2.9862**	I(1)

Source; Authors` computation (2018) ** %5 level

In order to eliminate the emergence of spurious regression in this paper, efforts has been made to subject the data to stationarity tests with the aid of the standard Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. Consequently, the reported results in

table 2 clearly shows that the data are a mixture of I (0) and I (1). This implies that some variables of interest like exchange rate, imports, exports, trade balance and inflation possess unit roots.

Table-3: Johansen Cointegration Test (Trace Statistics)

Null Hypothesis	Eigenvalue	Trace Statistics	P-value
$r=0$	0.942233	178.1027	0.0000
$r\leq 1$	0.915205	121.0760	0.0000
$r\leq 2$	0.787412	71.72573	0.0001
$r\leq 3$	0.681499	40.75772	0.0019
$r\leq 4$	0.581028	17.87514	0.0215
$r\leq 5$	0.023524	0.476096	0.4902

Source; Authors` computation (2018)

Table-4: Johansen Cointegration Test (Maximum Eigenvalue)

Null Hypothesis	Eigenvalue	Maximum Eigenvalue	P-value
$r=0$	0.942233	57.02670	0.0003
$r\leq 1$	0.915205	49.35030	0.0004
$r\leq 2$	0.787412	30.96801	0.0177
$r\leq 3$	0.681499	22.88258	0.0281
$r\leq 4$	0.581028	17.39904	0.0155
$r\leq 5$	0.023524	0.476096	0.4902

Source; Authors` computation (2018)

The variables of interest exchange rate, real, imports, exports, trade balance and inflation are I (1) and there is high tendency these variables have a long run equilibrium relationship. Therefore, it is important that a multivariate cointegration test be examined. This study employed a technique put forward by Johansen and Juselius [22]. The reported results of the multivariate cointegration analysis in table 3 and 4 indicate that there is at least two cointegrating vectors in the systems. From the trace statistics, it was observed that there is existence of at least five cointegrating

vectors in the model at a lag interval of 1 to 1. In the same vein, the maximal eigenvalue statistics above shows the existence of at least five cointegrating vectors. It could be established from the analysis above that variables of interest possess a long run equilibrium relationship with one another which may likely show some adjustment to short run disequilibrium through one channel. Therefore, this paper estimated a long run relationship with the aid of Fully Modified Least Squares (FMOLS).

Table-5: The Impact of Foreign Capital on Industrial Performance in Nigeria Fully Modified Least Squares (FMOLS) Dependent Variable: EXCHR

Variable	Coefficient	t-statistics	P-value
LRGDP	-0.230692	4.74	0.0002
LIMP	-6.298081	0.15	0.8852
LEXP	61.29458	0.91	0.3774
LTBAL	-27.05672	1.07	0.3002
INFL	-1.004315	4.51	0.0004
C	-122.1396	2.22	0.0408
R-Squared	0.927134		
Adjusted R-Squared	0.904364		

Source: Authors` computation (2018)

The table-5 above shows that the variable exchange rate fluctuations have a negative relationship with imports in Nigeria, though not significant. This implies that fluctuations in exchange rate discourage importation in Nigeria. The coefficient of exports shows an insignificant positive relationship with exchange rate in Nigeria. These findings are in line with economic theory. Increase in exchange rate makes imported goods to be very expensive. These findings contradict the submission of Aliyu [18] who stipulated that exchange rate depreciation increased imports and reduced exports in Nigeria. However, exchange rate and trade balance have an insignificant inverse relationship in the country. This implies that the positive impact of exchange rate on exports was not significant enough to absorb the negative impact on imports in the country. Similarly, exchange rate fluctuations and economic growth have a

significant negative relationship in Nigeria. This result further confirmed the negative balance of trade observed in this study. The finding in this study corroborates the assertion of Odusola and Akinlo [12] despite the adoption of different methodology. In the same vein, inflation and exchange rate have a significant inverse relationship in the country. In addition, the explanatory/ independently variables of the model which comprises of imports, exports, trade balance, real GDP and inflation jointly explained about 93% of the systematic variations in the dependent variable, exchange rate, leaving 7% unexplained as result of random chance. This shows that the model utilized is good for the analysis. Meanwhile, after adjusting for the loss in the degree of freedom, the explanatory power reduces to 90%.

Table-6: Pairwise Granger Causality Test

Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Prob.
IMP does not Granger Cause EXCHRATE	25	1.27296	0.3017
EXCHRATE does not Granger Cause IMP		1.13610	0.3409
EXP01 does not Granger Cause EXCHRATE	25	2.88948	0.0590
EXCHRATE does not Granger Cause EXP01		2.37302	0.1189
RGDP does not Granger Cause EXCHRATE	25	11.3015	0.0005
EXCHRATE does not Granger Cause RGDP		1.20511	0.3205
EXP01 does not Granger Cause IMP	25	4.88899	0.0187
IMP does not Granger Cause EXP01		0.04120	0.9597
RGDP does not Granger Cause IMP	25	0.15609	0.8565
IMP does not Granger Cause RGDP		0.45685	0.6397
RGDP does not Granger Cause EXP01	25	0.21422	0.8090
EXP01 does not Granger Cause RGDP		0.37346	0.6930

Source: Authors' computation (2018)

This section examined the causal relationship among exchange rate, imports, exports and economic growth within Pairwise Granger Causality Test. From the above table, it could be pinpointed that there is an existence of unidirectional causality which runs from imports to exports. This shows the existence of trade relationship between Nigeria and the rest of the world. Also, there is a unidirectional causality from economic growth to exchange rate in Nigeria. Similarly, exports granger cause exchange rate in one direction. However, there is no feedback relationship between exchange rate and exports in the country.

CONCLUSION AND RECOMMENDATIONS

In this study, an attempt has been made to investigate the relationship between exchange rate fluctuations and trade balance in Nigeria over the period of 1990 to 2016. Due to the findings that originated from this study, the following could be inferred. There is a unidirectional causal relationship between imports and exports in one hand, and exchange rate and economic growth on the other hand in Nigeria. However, there is no feedback relationship among imports and exchange rate and exports and economic growth. Consequently, the exchange rate fluctuations have a negative impact on imports in Nigeria, though not statistically significant. Meanwhile, the impact of exchange rate is positive on exports though not significant in Nigeria as well. Also, economic growth and exchange rate have an inverse relationship in the country. In the same vein, exchange rate has a negative impact on trade balance. This implies that exchange rate fluctuations have not been favourable to balance of trade and economic growth in Nigeria. Moreover, on the basis of the findings above, it is paramount this paper recommends the following; firstly, the policy makers in Nigeria should embark on policy measures that will ensure the stability of the country's exchange rate. Also, the Nigerian government should put appropriate mechanism that will ensure the competitiveness of the locally made products both in Nigerian and the world markets. The government

should have a political will to embark upon aggressive exports promotion of the locally produced goods in the country.

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