

EFFECT OF REAL EFFECTIVE EXCHANGE RATE ON EXPORT OF GOODS AND SERVICES IN NIGERIA

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Abstract

This paper assessed the influence of real effective exchange rate on export of goods and services in Nigeria over the period, 1986-2020. The Error correction model estimation was applied in estimating the multiple regression model. The findings showed that the real effective exchange rate is positive and statistically significant effect on the exports of goods and services in Nigeria. Expectedly, the convergence coefficient or error correction term (ECT) is negatively signed and significant, which suggests that last-period's deviation from a long-run equilibrium influences its short-run dynamics as is being corrected at a speed revealed by the parameter estimate. Thus, the speed of adjustment (or error correction term) shows that deviation from equilibrium relationship is corrected at the speed of 59% on annual basis. We recommend that Nigeria need to focus on the variable to use in improving their economy via trade. if the region wishes to improve its economy by focusing on exports, the currencies should be revalued/appreciated, as export has a positive link with the actual exchange rate, and depreciation will result in revenue loss.

1. Introduction

The notion that a competitive real effective exchange rate stimulates economic growth has piqued the interest of academics and policymakers alike. In the context of this study, the term "real effective exchange rate" refers to the official exchange rate that has been adjusted for inflation. According to World Development Indicators (WDI) [2021], the real effective exchange rate is the official exchange rate index that has been adjusted for fluctuations in national price or cost indicators in the domestic economy. In other words, it denotes the official exchange rate divided by the price deflator or conventional cost index. It has recently gained increased attention, owing to currency movements among the world's largest economies and an apparent disconnect with developing countries, as well as mixed evidence on its impact on trade (Sokolova, 2017; Kang, 2016). Furthermore, the hotly debated question of whether exchange rate uncertainties reduce the incentives to trade internationally appears to be a primary focus of academic interest now that exchange rate variations have increased since the end of the gold standard (Aubion and Ruta, 2011).

Typically, real effective exchange rate dynamics are closely related to trade developments; a lower, more competitive real effective exchange rate has an export-boosting trade impact, though the link is not always clear and the magnitude varies across countries depending on the elasticity

of exports and imports. This implies that devaluation has been an important part of industrial policy and is used as a tool by a number of SSA economies, including Uganda and Tanzania, to increase export share, with varying degrees of success (Papadavid, 2017). The effective exchange rate reflects a country's international competitiveness in terms of its currency. An examination of the causes of fluctuations in the real effectiveness of the real effective exchange rate thus aids in understanding a country's overall international competitiveness.

Though the exchange rate plays an important role in a country's trade performance, whether determined by exogenous shocks or policy, the relative valuations of national currencies and their fluctuation frequently have significant ramifications for international trade (Nicita, 2013). Examining the impact of the exchange rate on international trade in an inflationary economy such as Nigeria, on the other hand, comes with its own set of complications. This issue has persisted in the vast body of existing literature on Nigeria and appears to have gone largely unnoticed. To our knowledge, none of the studies that assessed the exchange rate and international trade nexus in Nigeria used inflation adjusted exchange rate (or real effective exchange rate) in their discourses. This study departs from previous research, particularly in the Nigerian context, by using the real effective exchange rate rather than the official exchange rate. The fact that Nigeria is an inflationary economy influences the choice of real effective exchange rate. Thus, adjusting the inflation effect from the official exchange rate before regressing against exports of goods and services should yield a nearly unbiased result.

2. Review of Related Literature

Mosbei, Samoe, Tisor, and Kipchoge (2021) looked studied the impact of currency rate fluctuation on intra-East African Community trade. The results of the unit root tests revealed that some of the variables were stationary at first, with all variables being I(1) and some being I(2) (0). To measure volatility, differenced panel data was fitted into a General Autoregressive Conditional Heteroscedasticity model. The fixed effect model was found to be appropriate by the Hausman test, and the currency rate, money supply, population, and foreign direct investment all play a role in intra-East African Community regional commerce. It was determined that exchange rate volatility exists in the Intra-East African region, and that exchange rates, money supply, population, and foreign direct investment all have a substantial impact on intra-EAC regional trade. To lessen the volatility of currency rates, EAC member states should establish policies that ensure exchange rate stability in the region. Policies should be put in place to ensure a sufficient supply of money and to attract foreign direct investment.

Sambo, Farouq and Isma'il (2021) provided empirical evidence of the link between the real exchange rate volatility and the trade balance in the light of financial development, confirming the assertion that the effect is significantly dependent on the country's level of financial development. The empirical estimation is based on the Nigeria's data set spanning the years 1980–2019, and it employs threshold autoregressive non-linear co-integration and non-linear ARDL estimation techniques. According to the findings, financial development magnifies the beneficial benefits of the real exchange rate on Nigeria's foreign trade. It also states that the uncertainty in foreign capital flows has a negative impact on Nigeria's international trade. The findings have broad policy implications, implying that in order to diversify and improve the economy's future growth and

associated international trade, Nigeria's policymakers should promote adequate financial sector development, as financial shocks are amplified by poorly implemented credit markets.

Banik and Roy (2021) examine, empirically, the effect of exchange rate uncertainty on bilateral trade performance, focusing on eight SAARC member economies using the popular modified gravity model of trade. The paper includes eight SAARC members – Afghanistan, Bangladesh, Bhutan, Maldives, Nepal, Pakistan and Sri Lanka panel data set over the period 2005–2018. The authors consider both standardized value (standard deviation) and conditional variance model to determine volatility of exchange rate. Primarily, ordinary least squares, random effects and fixed effects estimation techniques are employed to investigate the impact of exchange rate volatility. Endogeneity and robustness of the findings have been tested using the simultaneity-adjusted model and dynamic panel data two-step system GMM estimation techniques. Findings – Empirical findings endorse the view that exchange rate volatility lowers trade flows in the SAARC regions. However, this adverse effect of exchange rate uncertainty on trade is pretty small. The negative correlation between exchange rate volatility and bilateral trade remains consistent and significant after controlling of simultaneous causality, autocorrelation, year effects, country-pair heterogeneity and endogeneity irrespective of panel data estimation techniques and different measures of volatility.

Carrel and Wilfried (2021) examined the impact of exchange rate on trade in the case analysis of Congolese Partners using the GARCH model. The data used evaluates a series of exchange rates from January 2000 to December 2019, where export and import volumes are considered from the point of their determinants, including exchange rate volatility. The results for this Congolese case show that short run dynamics negatively discouraged with both export and import. This implies that Congolese should opt for direct domestic currency when trading with partners.

Chimhore and Chivasa (2021) reviewed the effect of exchange rates on exports in Zimbabwe using the Ordinary Least Squares (OLS) technique. Using secondary data from ZIMSTAT and World Bank, obtained results from a robust regression showed that South Africa's exchange rates (SAEXRT) were weakly significant at 10%, South Africa broad money supply (SAM2) was significant at 5% and imports (DDIMP) were important to Zimbabwe's export growth at 1% level of significance. To increase exports, there is a need for policy shift, shifting from overly focusing on foreign direct investment and increasing gross domestic product (GDP) because empirical results showed that FDI and gross domestic product were not significant in the model. Policies such as trade cooperation between South Africa and Zimbabwe may increase exports given the impact of South Africa's broad money supply on Zimbabwe's exports.

The impact of the Ethiopian exchange rate and its volatility on foreign trade was explored by

Nguse, Oshora, Fekete-farkas, and Tangl (2021). The research was based primarily on secondary time-series data from 1992 to 2019. The study investigated the long-term link between exchange rate level, volatility, and international trade performance using the Autoregressive Distributive Lag (ARDL) model. In the near term, an error correction model was utilized to estimate the variables. Foreign Direct Investment (FDI), Gross Domestic Product (GDP), and inflation were employed as control variables in the regression study. The study's findings suggest that the exchange rate level has a negative and considerable impact on international trade in the short run. Exchange rate volatility, on the other hand, has a positive and considerable impact on international trade in the short and long term. Furthermore, the gross domestic product, foreign

direct investment, and inflation all have a favorable short- and long-term impact on international trade.

Based on the panel data of 35 OECD countries from 2001 to 2019, Kong (2021) empirically analyzed the nonlinear effect of exchange rate on economic growth of countries through PSTR model. The results show that exchange rate appreciation has a certain role in promoting economic growth. When the value of the local currency is high, the exchange rate appreciation has a stronger effect on promoting economic growth; when the value of the local currency is low, the exchange rate appreciation has a weaker effect on economic growth. Further research shows that when the local currency value is low, the development of export trade has a strong positive impact on economic growth, while the inflow of FDI has a weak effect on economic growth. When the currency value is low, the promotion effect of export trade on economic growth is relatively weak, while the inflow of FDI shows a stronger promoting effect on economic development, and the nonlinear effect of exchange rate on economic growth is positive. It is the comprehensive effect of these channels.

Mehtiyev, Magda and Vasa (2021) examined exchange rate impacts on international trade using correlation and multiple regression techniques. The research analyzes the correlation between inflation and devaluation and clearly states their impacts on trade balance. The case study about devaluation of the currency of Azerbaijan elaborates the impacts of currency volatility on exports which is illustrated and analyzed in this research. Moreover, inflation and devaluation correlations and their impacts on import level of a country are studied through correlation and multiple regression analyses based on the data exported from OECD and World Bank. The results conclude that exchange rate volatility significantly impacts the trade balance in terms of imports and exports. Given the results, exchange rate is a non-trade barrier and affects foreign trade

From 2004 to 2018, Tarasenko (2021) looked studied the effects of currency rate volatility on exports and imports of a variety of items between Russia and its 70 trading partners. The products in question are divided into eight categories: i) agricultural raw materials; ii) chemicals; iii) food; iv) fuels; v) manufactured goods; vi) ores and metals; vii) textiles; viii) machinery and transportation equipment. The standard deviation of the initial difference in the logarithmic daily nominal exchange rate is used to calculate exchange rate volatility. The report concludes that exchange rate volatility harmed agricultural raw materials, manufactured goods, and machinery and transportation equipment exports. On the other hand, it was discovered to have a beneficial and considerable impact on fuel commerce as well as chemical and textile imports.

Rajković, Bjelić, Jaćimović and Verbič (2020) employed the FGLS estimation to examine the relationship between the real exchange rate and the foreign trade imbalance in both the Western Balkan (WB) and Central and Eastern European (CEE) countries. The aim of the research was whether exchange rate devaluation and/or depreciation are capable of effectively and fully eliminating the negative effects of the global economic crisis, as well as the consequent poor export performance and contracted economic activity. Our findings show that during an economic crisis those countries that use their own currency cannot substantially adjust their trade deficit by depreciating their currency. Moreover, it is suggested that during the global economic crisis, the balance of payments deficit is not impacted significantly by the exchange rate, any more. In such cases, other factors play a more significant role, like as government spending, followed by foreign demand and direct investments.

Abbas, Nguyen and Nguyen (2020) investigated the impact of China exchange rate policy on its trading partners by using a country multi-dataset GVAR model. The study used annual time series data over the period 1992 to 2017, and constructed currency misalignment index which provided some interesting features about the currency undervaluation and overvaluation. The results of the currency misalignment showed that China's Renminbi is structurally more undervalued over the sample period as compared to other countries, and fluctuation in major currencies effects the global trade around the world. The overall empirical results of the GVAR model indicate that RMB undervaluation affects the trade pattern and macroeconomic performance of China's trading partners. Overall, China's exchange rate undervaluation has mixed effects on trading partner's GDP, exports and imports. The devaluation of China's RMB efficiently stimulated China's exports and reduced imports. While, in some countries, this effect is reverse, the RMB undervaluation increases the GDP of partner countries and also increases their exports to China. The results confirm the strong and leading role of the Chinese Renminbi in the global trade.

Pasricha (2020) looked into the impact of currency rate fluctuations on India's overseas commerce. The study has been conducted on the annual values of foreign exchange rate of India and international trade of India covering the data from 1991 to 2019. The ordinary Least Square regression model has been used to establish the relationship between exchange rate and international trade of the country. The study has emphasized on finding out the impact of exchange rate on international trade of the country. A higher-valued currency makes imports of a nation less costly, and its international exports more expensive. A lower-valued currency makes imports costlier for a nation and international markets less costly for its exports. A higher exchange rate can be expected to worsen a country's trade balance whereas it can be expected to be boosted by a lower exchange rate.

3. Data and Method

Data for the study are basically secondary data and were obtained from the World Bank Development Indicators and Central Bank of Nigeria Statistical Bulletin, 1986-2020. We collated data on Real effective exchange rate, exports of goods and services (in ratio of GDP), imports of goods and services (in ratio of GDP), Balance of trade (as a ratio of GDP), GDP growth rate and broad money supply (as a ratio of GDP) over the period, 1986-2020.

Modeling and estimation of our respective hypotheses are based on the Error Correction Model (ECM) approach which directly estimates the speed at which a response variable returns to equilibrium after a change in the explanatory variables. The notion of an Error Correction Model is considered to be a very powerful organising principle in applied econometrics and has been applied widely. Alogoskoufis and Smith (1991) suggest that estimating structural model is founded on practical applications where the error correction formulation provides an excellent framework within which it is possible to apply both the data information and the information obtainable from economic theory.

In the course of our estimation, we first determined the stationarity of our variables using the Augmented Dickey Fuller unit root test. A series is said to be stationary if its mean and variance are constant over time. The ADF model is expressed thus:

$$\Delta y_t = \mu + \alpha_{t-1} + \sum_{i=1}^p \gamma_i \Delta y_{t-i} + \varepsilon_t \quad (1)$$

Where μ is a vector of deterministic terms (constant, trend etc.) and ε is the stochastic error term. The differencing operator is denoted by Δ . The p lagged difference terms, Δy_{t-j} , are used to approximate the Autoregressive Moving Average (ARMA) structure of the errors, and the value of p is set so that the error ε_t is serially uncorrelated. The error term is also assumed to be homoskedastic. The specification of the deterministic terms depends on the assumed behaviour of y_t under the alternative hypothesis of trend stationarity. Under the null hypothesis, y_t is I(1) which implies that $\varphi = 1$.

Secondly, if all our variables are found to be stationary after first differencing, we may test for a long-run relationship among the variables using the Johansen cointegration test. The nature of relationship which Johansen cointegration test is bound to determine was modeled in Atemnkeng, et al., (2011) but modified and expressed for our purpose thus,

$$\Delta \gamma_t = \lambda \gamma_t - 1 + \sum_i^k \delta_i \gamma_t - i + \mu_t \quad (2)$$

γ = vector of variables whose dynamics are studied.

λ = a matrix number

δ = A matrix whose rank explains the number of cointegrating equations.

Once the condition of stationarity at first differencing, and cointegrated equations are met, an error correction model, then, is the best alternative to model the problem since it consists of a dynamic equation with a steady-state solution that is compatible with the equilibrium (Lebo and Kraft, 2017). Additionally, the error correction model includes the other specifications as special cases and the error correction parameter. Against this backdrop, we consider the following general Error Correction Model specification:

$$\Delta Y_t = \delta + \gamma \Delta X_{t-1} + \alpha \lambda_{t-1} + \varepsilon_t \quad (3)$$

Where ε is the error term, and the parameter of interest is γ . It measures the movements of saving and investment in response to shocks that affect the economy. The error correction term λ_{t-1} captures the speed of adjustment towards long-run equilibrium relationship.

Our variants estimation is patterned after the above model in modified and expanded form thus.

$$\begin{aligned} \Delta EXP_t = & \beta_0 + \sum_{i=0}^n \beta_1 \Delta EXP_{t-1} + \sum_{i=0}^n \beta_2 \Delta \log REER_{t-1} + \sum_{i=0}^n \beta_3 \Delta GDPGR_{t-1} \\ & + \sum_{i=0}^n \beta_4 \Delta BMS_{t-1} + \beta_5 ECT_{t-1} + \varepsilon_t \end{aligned} \quad (5)$$

Where,

EXP	=	Export of goods and services (% of GDP)
LogREER	=	the log of Real effective exchange rate
GDPGR	=	GDP growth rate (% annual growth)
BMS	=	Broad money supply (% of GDP)
β_0	=	Constant term
β_1 - β_5	=	Coefficients
ε	=	error term.
ECT	=	error correction term
Δ	=	differencing operator

4. Results and Discussion

4.1 Descriptive Statistics

Table 1 shows the trend of our variables. It is description of the measures of central tendency, deviation and probabilities of our dependent and independent variables.

Table 1: Descriptive Statistics of the Panel Series

Statistics	REER	EXP	GDPGR	BMS
Mean	110.26	20.58	4.20	15.81
Median	99.56	21.03	4.23	13.09
Maximum	272.92	36.02	15.33	24.90
Minimum	49.73	5.25	-2.04	8.46
Std. Dev.	54.66	7.25	3.96	5.41
Skewness	1.82	-0.10	0.47	0.40

Kurtosis	5.57	2.45	3.27	1.52
Jarque-Bera	28.97	0.50	1.40	4.13
Probability	0.00	0.78	0.50	0.13
Sum	3859.24	720.16	147.11	553.21
Sum Sq. Dev.	101597.10	1788.72	533.58	994.76
Observations	35	35	35	35

Source: Researcher's Compilation, 2021

Table 1 presents the descriptive statistics of our model variables. The results revealed that average real effective exchange rate was 110.26 to the US dollar between 1986 and 2020. The highest level EXP was 36.02%. EXP averaged 20.58% between 1986 and 2020. We observed from the results that all the variables included in our model with the exception of REER are normally distributed and statistically different from zero. The normality in the variable description is based on the skeweness of the variables, all of which are rightly skewed. The results indicate that the probability value of the Jarque-Bera (J-B) statistics for each of the variables is greater than 5% conventional level of significance, and entails that we cannot reject the null hypothesis that our variables are normally distributed.

4.2 Tests for Stationarity

The results of our variables' stationarity tests are shown in Table 2 below. It demonstrates the consistency of time series data and its utility in predicting.

Table 2: Unit Root Test Results

Variable	ADF-Statistic	5% critical value	P-value	Order of Integration
LogREER	-6.222870	-2.954021	0.0000	I(1)
EXP	-7.704305	-2.954021	0.0000	I(1)
GDPGR	-3.939693	-2.960411	0.0050	I(1)
BMS	-5.329842	-3.845006	0.0001	I(1)

Source: Author's Computations, 2021

Table 2 presents the result of the unit root test which indicates that all the variables included in the model are all stationary at first differencing. Thus, the stationarities so attained are all at order one, 1(1), and are therefore integrated at same order. This result now allows us to run the Johansen cointegration test to establish if the variables move along together in the long-run. This further satisfies the condition for estimating the Error Correction Model (ECM) and informs our choice of the ECM as the most efficient and unbiased estimator for our analysis.

Restatement of Hypothesis in null and alternate Forms:

- H₀₁:** Real effective exchange rate did not have positive and significant impact on the growth of exports of goods and services in Nigeria.
- H_{a1}:** Real effective exchange rate had positive and significant impact on growth of exports of goods and services in Nigeria.

4.5.1.2 Presentation and Analysis of Results

**Table 3: Results of ECM Estimations for Model 1
(Hypothesis one)**

Dependent Variable: D(EXP)				
Method: Least Squares				
Sample (adjusted): 1987 2020				
Included observations: 34 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG(REER))	1.473483	6.876403	2.514281	0.0004
D(GDPGR)	-0.030621	0.255066	-0.120051	0.9053
D(BMS)	-0.336656	0.465559	-0.723122	0.4756
ECT(-1)	-0.590640	0.183620	-3.216649	0.0033
C	0.424641	1.020216	0.416227	0.6804
R-squared	0.786893	Mean dependent var		0.271874
Adjusted R-squared	0.749307	S.D. dependent var		6.909426
S.E. of regression	5.783703	Akaike info criterion		6.486693
Sum squared resid	936.6342	Schwarz criterion		6.713436
Log likelihood	-102.0304	Hannan-Quinn criter.		6.562985
F-statistic	4.417263	Durbin-Watson stat		1.965888
Prob(F-statistic)	0.006805			

Source: Author's Compilation, 2021.

Table 3 shows that the Log of real effective exchange rate (LogREER) rate is positively and significantly connected with Nigerian exports of goods and services (EXP). This was explained by the positive coefficient value of our explanatory variable logREER and the corresponding probability value $0.0004 < 0.05$. The coefficient of the independent variable is 1.47, which entails that when real effective exchange changed by one-unit, exports increased by 1.47 units. This is consistent with a priori expectation that exchange rate depreciation stimulates export of goods and services.

Expectedly, the convergence coefficient or error correction term (ECT) is negatively signed and significant, which suggests that last-period's deviation from a long-run equilibrium influences its short-run dynamics as is being corrected at a speed revealed by the parameter estimate. Thus, the speed of adjustment (or error correction term) shows that deviation from equilibrium relationship is corrected at the speed of 59% on annual basis.

The coefficient of determination (R^2) is 0.79, indicating that changes in the explanatory variables account for 79 percent of the variance in the EXPGS, while variables not included in the model account for the remaining 21%. With a probability value of $0.0000.05$, the F-statistic (4.42) indicates that the independent variables are jointly important in explaining the response variable. The Durbin-Watson statistic is around 2, which is greater than R^2 , indicating that the results are not false and free of autocorrelation issues.

5. Conclusion

Exchange rate depreciation improved export of goods and services and balance of trade while it caused a decline in import of goods and services. The economics of this, is that International trade in Nigeria can be improved by the dynamics of foreign exchange rate management. Import substitutions and production of complementary goods, export promotions policies, border operations and ease of doing business incentives should be the focus of government policy measures. These policy measures will control production in the economy for trade. Effective exchange rate management should be supported with improved competitiveness and innovation by reducing delays in consummating transactions and also creating free and accessible information outlets for activities in the entire financial system. This would strategically improve financial depth and penetration and facilitate greater participation in international trade.

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