

Modelling the Impact of Exchange Rate Volatility on Trade Flows in Nigeria

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Abstract

This study investigates the impact of the persistent exchange rate volatility on trade flows in Nigeria, for the period of 1970-2021, using secondary data obtained from various sources. Data were analyzed using descriptive tools like tables, graphs and other econometric methods, such as the Two Stage Least Squares method. Result of the trade flows equation indicates that though all the explanatory variables conformed to theoretical a priori expectation, none was statistically significant at 5% level. It confirms a negative and insignificant impact of exchange rate volatility on trade flows in Nigeria. Further findings from the EGARCH model indicate that exchange rate volatility in Nigeria has been high, persistent and asymmetric with positive leverage and high clustering effect over the study period. The study recommends pragmatic economic diversification away from oil to the tradable lagging sectors of agriculture, manufacturing and the services sector, in order to stabilize the long run value of the exchange rate. Also, appropriate monetary-fiscal policy measures should be adopted in order to reduce exchange rate volatility, particularly the supply-sided approach. Nigeria should also increasingly open up her economy to foreign trade in order to harness foreign direct investment inflow into the economy.

Keywords: *Exchange Rate Volatility, Trade Flows, EGARCH, Two Stage Least Squares, Conditional Variance*

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Background to the Study

Exchange rate refers to the price with which a particular nation's currency is expressed relative to other nations' currencies. Its volatility thus has to do with the frequent and sustained oscillation or displacement in the value of a given nation's currency from its long run equilibrium path, relative to foreign currencies. The Central Bank of Nigeria, (CBN,2019) outlined the main objective of exchange rate policy in Nigeria as the stabilization of prices, external reserves, internal balance and macroeconomic variables. Nigeria has evolved several exchange rate policy regimes since 1960, with the choice of each regime being dictated by the socio-political and economic climate of the moment. Exchange rate volatility appears to be more pronounced during the flexible as opposed to fixed regimes in Nigeria. That notwithstanding, the persistent fluctuation in the exchange rate of Naira to other global currencies over the years, especially in the last seven years is a serious issue of concern to researchers, policy makers and even analysts.

Trade flows is conceptualized in this study to mean the sum total of the transactions and movement of goods and services between one country and another. The debate about the actual impact of exchange rate volatility on trade flows is inconclusive. Theoretically, exchange rate volatility is generally perceived to constitute the risk of uncertainty, which may depress trade, though the reaction to this risk may be controversial, due to the inability to predict the behaviour of the market agents (Bahmani-Oskooee, 2002 and Kanu and Nwadiubu, 2020). While risk-averse market agents respond pessimistically which tends to depress output and trade, risk-seekers convert it into an opportunity to increase their trade volume to offset any decrease in future revenue, resulting from exchange rate volatility. Exchange rate volatility is perceived to be one of the key drivers of trade flows in Nigeria (CBN,2016).

The debate surrounding the exact impact of exchange rate volatility on trade flows in Nigeria has remained a matter of serious academic contest and is unabated. For instance, while Kanu and Nwadiubu (2020), Yakub et al (2019), Dada and Olomola 2017; Danladi, et al (2015), found a negative and significant impact, Umoru and Oseme (2013), Adeniran, Yusuf and Adeyemi (2014) and Shehu and Yaotang (2012), reported a positive and significant impact. These mixed findings are conflicting and do not provide accurate basis for sound policy prescription, which has provided a justifiable opening for further study on the subject matter, hence, the need for this study. This study therefore evaluated the impact of exchange rate volatility on trade flows in a typical developing economy, using Nigeria a reference point. The uniqueness of this study has to do with its application of the Two-Stage Least Squares method as an estimation technique in order to eliminate the challenges of the ordinary least squares, as well as the use of the EGARCH approach to model exchange rate volatility, instead of the traditional GARCH approach. The rest of the paper is structured as follows; immediately preceding the introduction is the brief review of theoretical and empirical literature, section three contains the trend of exchange rate volatility and trade flows in Nigeria. Section four deals with methodological issues, section five treats empirical data analysis, while section six contains the summary, conclusion and recommendations.

Brief Review of Theoretical and Empirical Literature

This study attempted a triangulation of relevant theories which have been reviewed and appropriately adopted. It is important to note that exchange rate volatility can affect trade directly, through uncertainty and adjustment costs, and indirectly, through its effect on the structure of output and investment and on government policy (Cote, 1994). In evaluating the impact of exchange rate volatility on trade flows, we must take into cognizance the fact that it is not the only determinant of trade. This makes it a bit difficult to isolate its particular impact on trade. However, at a macro level, it may pose cumulative unfavourable spillover impact on trade (Sambo, et al 2021). Thus, the theoretical analysis of the relationship is based on the producer theory of a firm under uncertainty risk. Earlier, the fundamental uncertainty models of trade emphasized the character of undiversifiable firms, whose output schedule may be directly and vaguely dictated by fluctuations in multilateral exchange rates, which in turn constitutes risk of such firms engaging in international trade. A prominent case of such models includes that of Clark (1973), which strictly assumed perfect competition. Baron (1976b) extended this analysis to incorporate volatility effect on prices, while emphasizing the role of invoicing currency. Here, the exporter faces price risk if he is invoicing in a foreign currency, or quantity risk if in a home currency, with unpredictable streams of income. The model also took into consideration the utility function of the purchaser.

For a risk-averse firm confronted with an elastic demand, invoicing in foreign currency increases risk which pushes prices higher. This in turn reduces profit and expected utility (Katusiime, 2021). Conversely, if it invoices in domestic currency, it will face a price fall, given that its function is linear which reduces profit. Hooper and Kohlhagen (1978)'s model however identified the nominal exchange rate as the only potential source of risk and demonstrated that exchange rate volatility only affects the unhedged portion of a firm's profit function. However, in De Grauwe (1998)'s model under a perfectly competitive market condition, participating in foreign and domestic market, the effects of exchange rate volatility depend on the convexity properties of the utility function, which in turn depends on the degree of risk diversion. Earlier models by Ethier (1973) and Baron (1975b) had demonstrated that if there exists adequate forward cover, it may tend to reduce the trade effect of exchange rate volatility. This view was later disputed by later scholars such as Viaene and de Vries (1992), whose models indicated evidence only of the indirect impact of exchange rate volatility on trade, even amidst forward cover. Again, for the modern firm, exchange rate volatility risk may represent an insignificant and unsystematic risk, though this may depend on the type, operational stage as well as the institutional and market efficiency that may prevail at the time.

Three strands of arguments regarding the impact of exchange rate volatility on trade flows have been identified in the literature. These include the direction and magnitude of impact, the degree of exchange rate volatility and agents' perception about volatility risk. From the first strand, divergent submissions have been made. For instance, exchange rate volatility is generally found to exhibit negative and significant impact on trade flows (Musila and Alzyoud, 2012 for sub-Saharan African countries for 1998- 2007; Umoru and Odjegba 2013 for Nigeria for 1973- 2012; Dada and Olomola 2017 in Nigeria for 2000-2015; Danladi, Akomolafe, Babalola and Akpan, 2015 in Nigeria from 1980-2013; Oloba 2014 in Nigeria for

1986:1–2009:4; Nicita, 2013 for 100 countries). Zakaria (2013), however found ambiguous impact on export component of trade flows for Malaysia and her trading partners for 2000-2012. Also, while Nyahokwe and Ncwadi (2013) could not find any statistically significant impact on export trade flows in South Africa for 2000- 2009, Omojinite and Akpokodje (2010) found negligible positive impact on non-oil export in Nigeria for 1986-2007 just as Shehu and Yaotang (2012) also obtained positive impact. Interestingly, Sanassee and Brooks (2012), found neutral impact on manufacturing exports in Mauritius for 1980-2011 using EGARCH method.

On the degree of volatility, Musa, Tasi'u and Abubakar (2014), found from the estimated results of the GJR-GARCH and TGARCH models the existence of exchange rate volatility clustering, persistence and asymmetric effects for 2000-2011 in Nigeria. Similarly, Bala and Asemota (2013), using GARCH models confirmed an improvement in the estimated models with structural breaks than those without, though volatility was generally observed in the exchange rate between Naira/US Dollars, Naira/British Pound and Naira/ Euro returns. It equally found high persistence, though the asymmetric models rejected the existence of leverage effect. Other similar findings include Vee, Gonpot and Sookia (2011), Okyere, Mensah, Antwi and Kumi (2013), for Ghana. In terms of agents' reaction to risk, empirical evidence is also mixed. The extent to which exchange rate volatility can impact on international trade prices is a function of the degree of competition, and the relative degree of risk aversion and risk exposure of importers and exporters. It also depends on the type of firm under consideration, as the influence is more felt with perfect competition as opposed to imperfection. Movement in exchange rates do not necessarily represent risk, but may also serve as an opportunity for profit maximization. With respect to export pricing for instance, Giovannini (1988) showed that exchange rate uncertainty can affect expected profit and decisions of a risk-neutral exporter. Frankel and Wei (1993), found small effect (negative in 1980 but positive in the 1990s). The above review shows mixed impact of exchange rate volatility on trade flows in perspective which may be attributed to differences in the study area, sample size, time frame considered, institutional factors, regime type, as well as the elasticity of demand and supply for import and export. This does not provide suitable ground for realistic policy prescription. The justification for the present study is therefore motivated by the above shortcomings in order to not only contribute to the existing debate on the subject matter, but to also help to resolve the crisis in the literature.

Trend Analysis of Exchange Rate Volatility and Trade flows in Nigeria

The trend analysis of exchange rate volatility and trade flows in Nigeria for the period of 1970-2016 is presented in Figure 1.

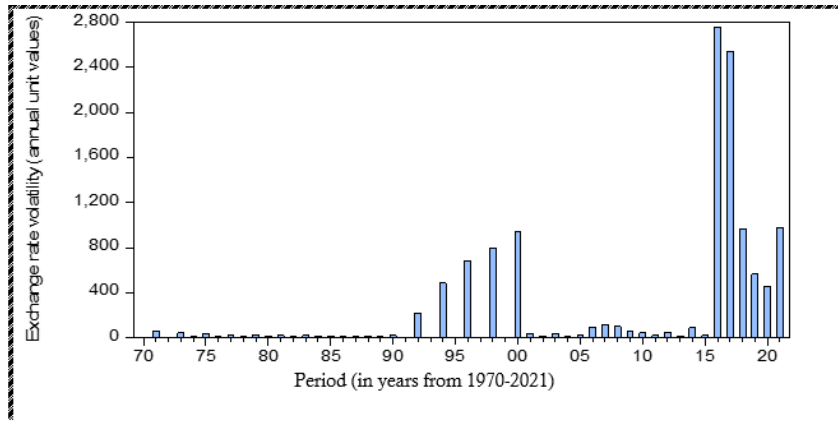


Figure 1: Bar chart showing the trend of exchange rate volatility in Nigeria (1970-2021)

Source: Eviews 10.0 Output

Figure 1 shows generally depicts a rising, erratic, frequent and continuous jump in exchange rate volatility over the study period. Specifically, by initializing from 1970, exchange rate volatility generally followed an upward trend from negative to positive trajectory all through the period (1970-2021). From an initial value of 0.00 in 1970, it sharply declined to -2.65 in 1971, then remained negative throughout the decade (1970- 1980). This period coincided with the time of the oil boom and a fixed exchange rate regime when naira was adjudged to be over-valued relative to foreign currencies. This may partially have accounted for the relatively low rate of volatility within the decade. It then continued to rise up to 1986 when it witnessed a slight fluctuation, following the adoption of SAP and the consequent devaluation of the naira. Exchange rate volatility slightly fell to 1.72 in 1993, and then rose to an all-time high of 5.91 in 2000. It dropped mildly to 3.80 in 2001 and continued to fluctuate up to 2011. Thereafter, it rose significantly to a peak of 7.43 in 2016 when the economy slumped into a chronic recession, perhaps partially due to the influence of the global financial crisis and it fluctuated steadily to low ebb in 2021 when it again plummeted to about 2.25 basis points.

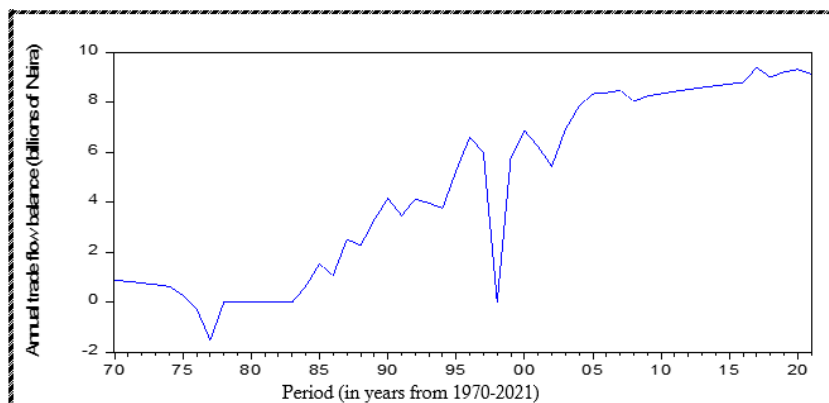


Figure 2: Trend of Trade Flows in Nigeria (1970-2021)

Source: Eviews 10.0 Output

Figure 2 contains the trend analysis of trade flows in Nigeria for the study period. It reveals a generally rising and fluctuating trend. Trade flows was proxied by net export. The figure shows that in 1970, Nigeria witnessed cumulative trade flows of about ₦2.44 billion. Positive trade balances were recorded until 1977 and then became negative between 1978 and 1983. Thereafter, it rose steadily from ₦1.91 billion in 1984 to ₦9.75 billion in 1988, after which it sharply jumped significantly to ₦27.11 billion in 1989. It continued to fluctuate up to 1996 when trade flows balance tremendously increased to ₦746.92 billion. The relative favourable and stable oil supply quota granted by the OPEC, the relative calm in the Niger Delta region, as well as the boost in oil price during the Abacha Administration may have substantially accounted for this sharp rise.

The lowest trade flow balance in Nigeria was recorded in 1998 when it dropped drastically to a negative balance of ₦85.96 billion, which suggests the influence of oil price shock and the glut in the supply of oil at the international market. However, in 1999, the country witnessed again a dramatic rise in trade flows balance to ₦326.45 billion, and then rose phenomenally to ₦960.7 billion in 2000. It again dropped by half in the two years that followed. In 2003, it shot to ₦1007.7 billion, and then more than doubled itself to ₦2,615.7 billion in 2004. It further doubled to ₦4,216.2 billion in 2005, and then continued to fluctuate steadily until it peaked at ₦6,600.6 billion in 2016, after which it steadily fluctuated up to 2021. The overwhelming positive trend witnessed might be attributed to the colossal but illusive impact of oil export throughout the period under consideration.

Methodology

This study only made use of secondary data collected from 1970-2021. Data were obtained from the Central Bank of Nigeria's annual publications and the Nigeria Bureau of Statistics. Both the descriptive and econometric tools have been employed to analyze the data. The Two Stage Least Squares method was used to estimate the data. The GARCH model was also used to model exchange rate volatility.

Model Specification

In order to investigate the direct and indirect impact of exchange rate volatility on trade flows in Nigeria, we model trade flows as a function of its predictor variables. Literature has generally acknowledged the fact that exchange rate volatility is a major determinant of trade flows (Gbaka et al 2021; Guisan and Cancelo, 2002; Wood and Mayer, 2001; Daramola, 2013 and Umoru and Odjegba, 2013). The degree of trade openness (OPEN) of an economy is also considered as dictating for the rate of flow of exports and imports in a country, just as the degree of trade restriction on the other hand as proxied by the import tariff (TAR). Other major determinants of trade flows in a typical developing economy like Nigeria include inflation (INF), real interest rate (RINTR), and real GDP (Zakaria, 2014 and David-Wayas, 2014). The gravity model of trade postulates that GDP (the mass) is an important determinant of trade flows. In this study, real GDP was used in place of its nominal value. Thus,

$$TF = f(EXRV, OPEN, TAR, INF, RINTR, rGDP) \quad (1)$$

The classical economists and the Herckscher-Ohlin theory of trade laid strong emphasis on the role of differences in factor endowments (intensity), as well as natural resource endowment as prime determinants of trade among countries. This prompts us to include population (POP_N) as a predictor variable in the model, given the huge population profile of Nigeria. The model is re-stated as:

$$TF = f(EXRV, OPEN, TAR, INF, RINTR, rGDP, POPN) \quad (2)$$

Non-economic factors such as socio-political and religious crises have also been identified as constituting key influence to the pattern and volume of trade flows in Nigeria. Our trade flows (TF) model becomes:

$$TF = f(EXRV, OPEN, TAR, INF, RINTR, rGDP, POPN, TF_{t-1}) \quad (3)$$

Where TF_{t-1} refers to the lagged value of trade flows, which has been introduced to account for the influence of past shocks on the dependent variable. The stochastic form of the model is obtained by including the white noise term as follows:

$$TF = \alpha_0 + \alpha_1 EXRV + \alpha_2 OPEN + \alpha_3 TAR + \alpha_4 INF + \alpha_5 RINTR + \alpha_6 rGDP + \alpha_7 POPN + \alpha_8 TF_{t-1} + e_i \quad (4)$$

Equation (4) was further transformed into a semi-linear logarithmic form in order to pave way for normalization and smoothen the estimation process.

$$\ln TF = \alpha_0 + \alpha_1 EXRV + \alpha_2 OPEN + \alpha_3 TAR + \alpha_4 INF + \alpha_5 RINTR + \alpha_6 \ln rGDP + \alpha_7 \ln POPN + \alpha_8 \ln TF_{t-1} \quad (5)$$

Where \ln is the notation for natural log, α_0 is the intercept and $\alpha_1 - \alpha_8$ are the parameters to be estimated.

Different approaches have been adopted by different scholars in order to model exchange rate volatility. For instance, while the use of standard deviation and rate of return methods are common, the autoregressive conditional heteroscedasticity (ARCH) model, which was first introduced by Engle (1982) has equally gained prominence in terms of estimating the conditional variance of the financial time series. The ARCH model was later modified by Bollerslev (1986) to become the generalized autoregressive conditional heteroscedasticity (GARCH 1,1) model as a veritable tool for analyzing and forecasting financial time series. Recently, the family of GARCH models has become the most popular methods in the literature. The pattern of movement of exchange rate could be likened to an autoregressive (AR) process, moving averages or a combination of both. Generally, the conditional variance equation is derived from the mean equation, which is stated as follows:

$$Y_t = \sum_{i=1}^p a_i Y_{t-i} + \varepsilon_t + \sum_{i=1}^q \beta_i \varepsilon_{t-i} \quad (6)$$

Where Y is the time series being modeled, α_i and β_i are the parameters, while ε_t and ε_{t-1} are the residual and its lagged value respectively. Equation (5) could be re-stated in simple, reduced and stochastic form as:

$$Y_t = \alpha + \beta X_t + \theta h_t + \mu_t \quad (7)$$

Where Y , α , β and θ are parameters, while X_t and h_t are the independent variables (in this case exchange rate) and the conditional variance term respectively and μ_t is the error term. Equation (6) implies that the conditional variance (h_t) is a function of its conditional mean and is obtained as:

$$\delta t^2 = \alpha_0 + \sum_{j=1}^p \beta_j \delta t^2 - j + \sum_{i=1}^q \alpha_i \mu_{t-1}^2 \quad (8)$$

$\mu_t \sim iid N(0, h_t)$

$\alpha_0 > 0, \beta_j \geq 0$ and $\alpha_i \geq 0, i = 1, \dots, q, j = 1, \dots, p$ for positive leverage to be expected. The standard form of the conditional variance equation is obtained by re-arranging equation (6) and transforming (7) to give

$$h_t = \alpha_0 + \sum_{i=1}^p \psi_i h_{t-1}^2 + \sum_{j=1}^q \psi_j \mu_{t-1}^2 \quad (9)$$

Where h_{t-1}^2 is the GARCH term and μ_{t-1}^2 is the ARCH term. This implies that the conditional variance equation is derived from the conditional mean equation. Nelson (1991) and Musa, et. al (2014) observed that the basic GARCH (1,1) method does not capture the element of asymmetry as well as leverage effect of any shock.

This study therefore used the Exponential (EGARCH) method to model exchange rate volatility in order to overcome the shortcomings of the basic GARCH. The model was originally developed by Nelson (1991) in order to capture asymmetric responses of a time changing variance to shocks and at the same time to ensure that the variances are positive. Kamal, Ul-Haq, Ghani and Khan (2012) emphasized that the effects of a shock on the volatility are asymmetric. That is, it could be good news or positive past residuals or bad news which could be a negative lagged residual, though bad news tends to exert more influence on volatility than good news. Thus, the EGARCH uses the natural logarithm of the conditional variance. The GARCH (p, q) model is given as:

$$\log(\delta t^2) = \alpha_0 + \psi_1 \left[\frac{\mu_{t-1}}{\delta_{t-1}} \right] + \psi_2 \log(\delta_{t-1}^2) + \gamma \frac{\mu_{t-1}}{\delta_{t-1}} \quad (10)$$

Where (δt^2) is the conditional variance of exchange rate series for the study period, $\left[\frac{\mu_{t-1}}{\delta_{t-1}} \right]$ is the ARCH term, showing the magnitude of past shocks to exchange rate volatility, as well as the degree of volatility clustering, δ_{t-1}^2 is the GARCH term, $\frac{\mu_{t-1}}{\delta_{t-1}}$ is the ARCH component showing leverage effect, α_0 is the constant, ψ_1 is the coefficient of asymmetry, ψ_2 is the coefficient of persistence, while γ is the leverage coefficient showing the leverage effect where negative returns (shocks) are expected to produce higher volatility than positive returns of the same magnitude which further confirms the role of asymmetry and

μ_t is the error term that is uncorrelated with its past values. The main advantage of the EGARCH model over the basic GARCH is that since the log (conditional variance) is modelled, then even if the parameters are negative, the log of conditional variance will be positive. There will be no need to artificially impose non-negative constraints on the model parameters (Gbaka, 2020).

Empirical Data Analysis

Descriptive Statistics of the Data

Descriptive statistical tests serve as the fundamental pre-estimation tests for any meaningful result to be obtained. They are also known as *normality tests*, and usually bother on the general distribution of the data set around the mean value. The prominent statistics of interest here include the mean, maximum, minimum, standard deviation, skewness, kurtosis, Jaque-Bera test and its probability value. However, emphasis is usually placed on the skewness, kurtosis and the Jaque-bera statistics as the major indices for assessing the normality of a given distribution. The descriptive statistical properties of all the variables used in the macro model are presented and analysed in Table 1.

Table 1: Descriptive statistical properties of the variables

Variable	Mean	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Prob.	Obs
EXRV	2.30	7.43	-2.65	2.58	-0.23	2.32	1.30	0.5221	51
INF	18.58	72.80	3.46	15.43	1.77	5.68	38.60	0.0034	51
OPEN	46.93	81.81	15.32	17.03	-0.01	2.11	1.54	0.4625	51
POPEN	18.45	19.07	17.84	0.37	0.02	1.83	2.65	0.2667	51
rGDP	12.46	13.48	10.48	0.74	-0.78	2.99	4.76	0.0901	51
RINTR	-3.20	25.28	-43.57	15.96	-0.53	3.28	2.35	0.3195	51
TAR	60.49	1935.00	7.78	279.99	6.59	44.63	3733.34	0.0559	51
TF	4.08	8.79	-1.51	3.47	0.05	1.43	4.85	0.0965	51

Source: Author's computations from Eview 10.0

In this study, almost all the variables used have values skewed to the theoretical value of zero, except inflation (INF) and import Tariff (TAR). This may be attributed to the high degree of volatility of these financial time series variables over a long period of time. Similarly, in terms of the Kurtosis, most of the variables have values that are not too far from the theoretical value of 3, except again for INF and TAR. The most important and frequently used measure of normality is the Jaque-Bera test statistic. The dataset for this study reveals that most of the variables used were normally distributed as their probability values were not statistically significant at 5% level, with the exception of only INF. Given that nearly all the variables were normally distributed, the data set used could be said to be suitable and reliable for analysis and forecasting of future economic trends for Nigeria.

Analysis of Unit Root Test

In order to avoid a situation of spurious regression result, all the variables used in the study were carefully examined to verify their stationarity properties. The Augmented Dickey-Fuller (ADF) and Philip-Perron (PP) tests were conducted. The null hypothesis for both tests states

that the series has unit root, or the series is non-stationary. Result of the model indicates that some of the variables were not stationary at levels. However, when they were differenced once, they all became stationary. The null hypothesis of the existence of unit root was therefore rejected. Only variables such as INF, RINTR, rGDP and TAR achieved stationarity at both levels and first difference. This implies that the data used for the study is free from unit root problem and is therefore suitable and reliable for analysis and forecasting of future trend of variables.

Estimated Result of the Trade Flows (TF) Equation

The results of the trade flows model are presented in Table 2.

Table 2: The trade flows equation (Dependent variable: TF)

Variable	Coefficient	Std Error	t. Statistic	Prob.
C	-104.9597	61.12340	-1.717177	0.0862
INF	-0.006047	0.018841	-0.320982	0.7483
RINTR	-0.023142	0.015694	-1.474541	0.1406
OPEN	-104.9597	61.1234	-1.717	0.0862
rGDP	0.317221	0.350709	0.904513	0.3659
POP	5.602054	3.290403	1.702544	0.0889
TAR	-0.000343	0.000672	-0.511423	0.6092
EXRV	-0.193010	0.259622	-0.743426	0.4574

Adjusted R-Squared = 0.87 DW = 2.43

Source: Eviews 10 output

Table 2 shows a high adjusted R-squared of 0.87, which indicates the high goodness-of-fit of the model. The model has high explanatory power. The Durbin Watson (DW) value of 2.43 indicates the absence of serial correlation problem among the set of regressors included in the model. The model is said to have performed well. In terms of individual parameter estimates, the result indicates that all the explanatory variables were not statistically significant, except the lagged value of trade flows. Thus, a 1% increase in inflation, real interest rate, real GDP, population, import tariff, exchange rate volatility and lag of trade flows would stimulate a 0.01% and 0.02% reduction in trade flows, a 0.32% and 5.60% increase in trade flows, a 0.00%, 0.19% reduction in trade flows and 0.56% increase in trade flows respectively.

The negative relationship between inflation and trade flows shown by the result agrees with a priori expectation. It shows that inflation tends to depress trade flows in Nigeria, as it raises the cost of transaction, while discouraging both domestic and foreign direct investment inflow into the economy. The inverse relationship between real interest rate and trade flows is partially accepted. A rise in real interest rate is expected to discourage investment and hence, reduce the tendency to borrow for business. Conversely, a rise in real lending rate should attract foreign capital inflow which may boost domestic investment. However, given the relative low volume of portfolio and capital inflow into the economy, the actual situation on ground seems to portray a rather negative relationship. Real GDP is positively correlated with trade flows,

which is as accepted. A boost in Nigeria's real GDP is expected to stimulate high and active level of participation in external trade by marketing agents. However, in the case of Nigeria, the seemingly poor quality of export component of real aggregate output may be responsible for the low trade flows share between Nigeria and the rest of the world, amidst huge annual real GDP growth.

Also, population is positively correlated with trade flows, which is correctly signed. Population is expected to be an incentive to trade flows. However, structural rigidities, infrastructural and institutional failures may have partially accounted for the abysmal state of intra-regional trade flows domestically. The negative relationship between import tariff and trade flows is accepted. This indicates that higher tariff constitutes an impediment to smooth trade flows in Nigeria, thus, affecting trade openness. Exchange rate volatility also shows a negative correlation with trade flows in Nigeria. The economic interpretation behind this is that an increase in exchange rate volatility leads to uncertainty which might have a negative impact on trade flows-since most business agents tend to be risk-averse. The insignificant magnitude of the impact underscores the dominant influence of importation on Nigeria's total trade flows. Nigeria's trade flow is heavily lopsided in favour of in-flow of processed products and industrial inputs to the detriment of exports. Most of such transactions do involve hard currencies. The volatility effect, even though present may be a negligible force, giving rise to an overall net insignificant impact on total trade flows for the country. This finding is in tandem with that of Aliyu (2010), who discovered that naira exchange rate volatility decreased non-oil exports in Nigeria. The only point of departure here is that Aliyu (2010)'s study disaggregated trade flows into export and import and concentrated on the non-oil component of export trade flows. It also found a positive relationship between US dollar volatility and non-oil exports in Nigeria.

The findings also agree with those of Oloba (2014) and Danladi, et.al (2015), who equally found negative relationship between the two variables in Nigeria. However, Shehu and Yaotang (2012) particularly found significant positive impact of exchange rate volatility on trade flows in Nigeria- a sharp contrast with the current study. It also disagrees with findings of Umoru and Oseme (2013) and Adeniran et.al. (2014)'s findings. Elsewhere, Vergil (2001) found significant negative impact for Turkey, Hassan (2013) for Pakistan and Zhao (2010) for New Zealand. The differences in results could also be due to variation in sampled data, study period, scope and methodology.

Estimated Result of the Exchange Rate Volatility Model (The EGARCH Model)

In order to investigate the rate, persistence and nature of exchange rate volatility in Nigeria within the study period, the model specified in Chapter Three was estimated using the EGARCH approach. The results are presented in equation Table 3. The result shows that the probability value of all the estimated coefficients of the EGARCH model for both the mean and conditional variance equations were statistically significant at 5% level.

Table 3: Result of the Estimated Exchange Rate Volatility Model

Variable	Coefficients	Std Error	t. statistics	Prob.
<i>Mean Equation</i>				
<i>EXR (-1)</i>	1.028669	0.015798	65.11424	0.0000
<i>Variance Equation</i>				
α_0	0.393298	2.29E-05	17147.16	0.0000
ψ_1	-0.448185	0.009271	-48.34168	0.0000
ψ_2	-0.345654	0.110386	-3.131318	0.0017
γ	1.065641	3.20E-12	3.33E+11	0.0000

Source: Author's Computations using Eviews 10.0

It reveals that current exchange rate volatility is positively related to the previous period exchange rate volatility. The conditional variance equation is usually considered when interpreting the EGARCH model. The first coefficient, $\alpha_0 = C(2)$ is the constant and has a positive value of 0.393. The second coefficient, $\psi_1 = C(3)$ is the ARCH term which shows the impact of the magnitude of shocks in the past residuals on the current value of volatility. In other words, it shows the clustering of volatility outliers in a typical distribution. From our result, $\psi_1 = C(3) = -0.448$, with a probability value of 0.000, implying that past shocks (residuals) impacted negatively on current volatility, such that a unit depreciation in exchange rate would trigger about 0.458 increase in volatility in the current period. The negative ARCH effect agrees with theoretical expectation. The increase in exchange rate volatility in Nigeria will equally have a tendency for causing a reduction in the exchange rate volatility in other countries (her trading partners), *ceteris paribus*.

The third coefficient, $\psi_2 = C(4)$ is known as the GARCH term. It is called the coefficient of persistence which shows the rate at which past volatility explains current volatility of exchange rate. In other words it portrays the GARCH effect. Estimated result shows that $\psi_2 = C(4) = -0.346$ with a probability value of 0.002. This means that the coefficient is statistically significant at 5% level. This implies that exchange rate volatility in Nigeria is persistent and high. It implies that exchange rate volatility in the previous period has high impact and persistent impact on current volatility. It shows that a unit change in the previous volatility would induce a 0.346 unit variation in the current period volatility. This implies that past volatility exerted a less than proportionate impact on the current period value, and that volatility has overlapping effect over different time periods.

The last coefficient, $\gamma = C(5)$ is called the coefficient of asymmetry or leverage. It shows the asymmetric effect of the impact of the sign of a shock on volatility i.e, whether bad news and good news of the same size have different impacts on volatility. If $\gamma = C(5)$ is negative, it shows *leverage effect*, meaning bad news has more impact than good news of the same size. Bad news

occurs when the expected rate of returns on a particular variable is lower than the actual rate of returns. The opposite is usually the case with good news. If the sum of ψ_1 and Y or $C(3)$ and $C(5)$ is up to 1, it means the overall magnitude of the shock is very high. The estimated result shows that $C(5) = 1.066$, with a corresponding probability value of 0.000. This implies that the leverage effect is *good news* or positive impact. This means that positive shock has a greater impact on exchange rate volatility, rather than the negative shocks of the same magnitude.

By implication, investors are more prone to the positive news in comparison with the negative news. This shows that the volatility spillover mechanism is asymmetric. The overall magnitude of the shock is quite positively high [depicted by the sum of $C(3)$ and $C(5) = 0.618$]. Thus, exchange rate volatility in Nigeria is not transitory, nor spontaneous, but has an all-time record of continuous and transmitting effect from one period to another, and that increases in exchange rate (depreciation of the naira) tends to impose greater shocks on naira-dollar volatility than its reduction (appreciation).

Conclusion and Recommendations

This study submits that exchange rate volatility in Nigeria has been high, persistent and asymmetric with positive leverage and high clustering effect over the study period. It also posits that there is a negative and insignificant impact of exchange rate volatility on trade flows in Nigeria; volatility does not have significant impact on trade flows. The study therefore recommends that Nigerian government should consciously and programmatically diversify her source of income and foreign exchange earnings from oil to the tradable lagging sectors such as agriculture, manufacturing and the services sector. This is because the sectors, unlike the oil sector have the potentials for both forward and backward linkages that would spark off further output growth, employment and income. This is more so as the nation does not seem to have benefitted from oil revenue as poverty rate keeps worsening by the day, despite massive increases in oil revenue. If this policy is actually implemented, it would stimulate output growth in these sectors, encourage inter-sectoral growth and promote non-oil export, which may help to stabilize the long-run value of the Naira. Also, in order to improve the quality of made-in-Nigeria products, government should declare a state of emergency on the manufacturing sector. Appropriate monetary-fiscal policy measures should be adopted in order to reduce exchange rate volatility, particularly the supply-sided approach. Nigeria should increasingly open up her economy to foreign trade as this would help foster foreign trade participation as well as attract foreign direct investment inflow into the country.

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