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# Impact of Exchange Rate Volatility on Export in Nigeria: 2008 – 2021

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**Abstract:** This study examined the impact of exchange rate volatility on export in Nigeria. The specific objectives of the study were to evaluate the individual impacts of parallel market-, interbank, real and nominal-exchange rate volatilities on Nigeria's export. The study employed the ARDL-Error Correction Model and Bound Test using secondary data sourced from the Statistics Database of the Central Bank of Nigeria. Bounds test results for each of the four models, showed long-run relationship among the variables. The results showed that in the long-run, all the exchange rate volatility measures showed negative sign as expected but only the real effective exchange rate volatility was statistically significant in the long run. In the short-run, the average impact of exchange rate volatility was negative in all the four models as expected. However, volatility in real effective exchange rate and nominal effective exchange rate were statistically significant. Finally, if the Nigeria's export deviates from its long-run path due to short-run perturbations, the tendency for it to return to long-run equilibrium from the four models lied between 25% and 39%. Based on these results, this study recommended that efforts to improve Nigeria's trade with other countries should consider stabilizing the Naira exchange rate. The Central Bank of Nigeria should shore up reserve accretion as well as diversify the country's export basket and source for new export destinations.

**Keywords:** Exchange Rate, Volatilities, Export, Nigeria, Real and Nominal Exchange Rate

## 1. Introduction

The exchange rate between two currencies depends on their relative buying power in the region. The volatility of the exchange rate is an indicator of the exchange rate's propensity to increase or fall rapidly within a petite period. The influence of the behaviour of the foreign exchange market is important to consider. In the formation of macroeconomic policy, investment decisions and international trade flows, exchange rate volatility, whether nominal or real exchange rates (RER), causes uncertainty among nations. The study of exchange rate variations and their impacts on trade flows has been actively investigated empirically ever since the failure of the Bretton Woods fixed exchange rate system in the early 1970s, and it is one of the most important literatures in the subject of international finance. Although there is a growing corpus of literature on the impact of exchange rate variations on trade flows in both industrialized and developing nations like Nigeria, empirical evidence has been ambiguous [1].

Most overseas transactions are denominated in the currency of either the exporting or importing country, more empirical evidence supports the notion that increases in the exchange rate volatility tips to a fall in trade flows. Changes in the exchange rate that are unanticipated could have a detrimental influence on trade flows by affecting profitability. There is also evidence that the association between exchange rate volatility and trade flows implies that exchange rate volatility has a beneficial impact on trade flows [2].

Most governments in response to the adversative effects of volatility of exchange rates, through their Central Banks, have taken proactive measures by intervening to limit the unwanted effects of the volatility of exchange rates on their economies in the overseas exchange marketplace. In Nigeria, the introduction of a flexible exchange rate structure was one of the main interventions in the foreign exchange market. In the 1980s and 1990s, the failure of the fixed exchange regime to create an effective mechanism for foreign exchange allocation, coupled with the absence of adequate fiscal rules, an adequate financial management structure for oil-related risks in Nigeria's variable oil and fiscal revenues, led to unstable fiscal policies that gave rise to variable oil and fiscal revenues [3].

The presumption of a negative nexus between exchange rate volatility and trade is an argument routinely used by proponents of managed or fixed exchange rates [4]. Exchange rate fluctuations can result to either a decrease or increase in the prices/volume of imports and exports. The risk inherent in exchange rate fluctuations (volatility) often affects the amount of trade as costs and income are indeterminate because of the doubt regarding the future rates at which foreign trade transactions are to be performed.

Over the last 35 to 40 years, around the world and specifically in developing nation like Nigeria, uncertainties around movements in exchange rate looms more frequently every passing year. Today, the effects of exchange rate volatility is a cliché on the lips of Nigerian. Many have blamed it on poor government policies and/or volatility of the exchange rate market. The uncontrollable price increases of commodities on a weekly basis in the markets are evidences of the after effects of exchange rate volatility on an import dependent nation like ours.

Monetarist posit that availability of money can be used to channel/determine the course of exchange rate since a casual correlation exist between exchange rate and supply of money (foreign currency). That is, availability of foreign exchange in the domestic economy could help in stabilizing volatility of the exchange rate in the international market. As known, export is a major source of acquiring inward flows (stock) of foreign currencies. This implies that if a rise in export would raise the stock of currencies and vice versa, then, it could be deduced that expansion of export could result in increases in availability of foreign exchange which could be used for stabilization of the effects of exchange rate volatility in the domestic economy. Based on the afore-mentioned, can we conclude that export trade of Nigeria can dowse the impacts of exchange rate volatility significantly [5].

This work attempts to empirically examine the effect of exchange rates volatility on exports in Nigeria by using four measures of exchange rates: Parallel market, Interbank, Nominal exchange and Real exchange rates. The specific objective are to: evaluate the impact of parallel market exchange rate volatility on Nigeria's export; examine the impact of interbank exchange rate volatility on Nigeria's export; determine the impact of nominal effective exchange rate on Nigeria's export; and ascertain the impact of real effective exchange rate on Nigeria's export.

## 2. Literature Review

Exchange rate is the price of one currency in terms of another currency. The market value of a domestic currency is determined by the quantity of units of another currency (convertible currency) that can be exchanged for a unit of the domestic currency. These store of convertible currencies for the purpose of trading is called foreign exchange. The main role of foreign trade is that it ensures that goods manufactured in a particular economy are exported for intending sale or trade with another country. Exports are incredibly important to modern economies because they offer people and firms many more markets for their goods. Countries export services and goods that they have an economic or relative advantage on. Hence, governments support exports for they upturn jobs, foreign currency investments, revenues and liquidity of their domestic economy. For the countries that export, resources from trade transaction contribute to counterbalance the cost of imports and boost the local economy by adding to the Gross Domestic Product (GDP).

The short-run and long-run effects of dollar-euro fluctuations on the trade flows of 67 two-digit industries that trade between the U.S. and Germany are assessed by Bahmani-Oskooee et al [5]. A linear model was estimated; 18 U.S. exporting industries and 19 U.S. importing industries were found to have short-run volatility effects. In 10 and 22 sectors respectively, short-run effects lasted in the long run.

Ikechi and Nwadiubu [6], investigating the effect of exchange rate fluctuations on foreign trade in Nigeria, assumed that exchange rate volatility have an effect on the volume of export and import trading activities using secondary data from 1996 to 2018. Augmented Dickey-Fuller root unit is castoff for preliminary analysis; the ordinary least square (OLS) regression analysis was utilized for short-term estimates. The blend of Granger Causality Test, Impulse Response Test and Johansen Co-integration Test, Variance Decomposition, Vector Auto Regression Analysis and ARCH/GARCH Modelling Techniques were used for long-term estimation. The estimations of the VAR model suggest a converse relationship between export, import and REER during the current period. The entity increase in exports and imports in a given year contributes to a decrease of approximately 0.9 percent and 0.4 percent respectively in RRSPs. The Impulse response analysis shows a negative correlation between exports and the actual effective exchange rate, whereas it was largely positive for imports over the ten-year period.

Bilal et al [7] explore the effects of exchange rate oscillations on the flow of commodity trade between Pakistan and China, using data for the 1982-2017 period. Using the ARDL Bound Research methodology, they found that Pakistan's 63% exporting and 55% importing industries show co-integration. In imports, uncertainty affects 56 percent of industries in both the short and long term.

Arumta et al [8] explore whether the fixed effect, common effect or random effect model of the analytical gravity model is right and what determinants have significant effects on Indonesian cut flower exports to partner countries. The data cover the period from 2008 to 2017 as the series data and as cross-sectional data for the seven destination export countries from Indonesia, using panel regression with the simple gravity model. The results of the estimation show that the model of fixed effects is the right model for explaining the determinants of the bilateral export of cut flowers. The figures indicate that Indonesia's GDP per capita, partner countries' GDP per capita and exchange rate are corroborating signs, whereas distance and trade openness are those variables with the opposite symbol. The promotion of exports, the improvement of quality and the advancement of technology are therefore needed in the development of the export of the cut flower industry.

Oskooee et al [9] investigated the instability of the exchange rate calculated by its volatility, and how trade flows in either direction are affected. The study found that in the short term, but not in the long run, Tunisia's trade flows to each partner are affected asymmetrically. The long-run impacts were symmetric in almost half of the study.

Goya [10] estimates how the number of types of goods exported by countries is related to the exchange rate's level and volatility. Findings show that export variety is positively linked to a weaker exchange rate and to the volatility of the exchange rate.

Many factors account for differences in empirical outcomes, including underlying assumptions in various theoretical models, sample times studied, extent of trade data disaggregation, measurement techniques used, countries studied and their peculiarities, and the specification of standard trade equations: whether in terms of volume or value and the choice of regressors [11]. Another fundamental factor is a lack of agreement on the effective substitution for exchange rate risk. Evidence indicates that empirical effects are typically adaptive to concepts of exchange rate volatility and exchange rate steps. Nevertheless, in recent years, developments in exchange rate volatility metrics and the efficiency of estimation methods have added strength to analytical outcomes.

The long-term macroeconomic factors of exports and imports in Nigeria were analysed using Johansen cointegration tests and analysis for the period studied from 1971 to 2011. Using the Augmented Dickey-Fuller (ADF) tests to perform unit root tests for the related trade indicators, the time series properties of the data were first analysed. A long-term co-integration relationship between trade flows and their determinants was found in the analysis. It also found that exports and imports show varying vulnerability to exchange rate risk risks (i.e volatility or variability). For trade expansion and stable growth of the national economy, a stable exchange rate is therefore recommended, as persistence in exchange rate volatility will snowball into depression if not arrested on time by the central bank of Nigeria through the implementation of a controlled floating exchange rate regime [12].

Juhro, et al [13] investigated whether the Global Economic Policy Uncertainty (EPU) predicts exchange rates and volatility in ten ASEAN countries using monthly data from January 1997 to December 2017. Applying the Wester-Lund and Narayan (2012, 2015) predictive regression model, they found that EPU predicts the exchange rate of 6 out of 10 currencies positively and statistically significantly.

Babatunde et al [14] investigated the "J-curve" effect, which is the relation between the trade balance (TB) and the real effective exchange rate (REER) in Nigeria. Sequel to the result of the introductory Augmented Dickey Fuller (ADF) check for numbers series stationarity in the model between 1981 and 2016, Johansen Cointegration, Granger causality tests and the Impulse Response Function tests etc, results shows that instead of experiencing deleterious effects, the trade balance gained from the devaluation of the Naira in the short term. The dependent variable (TB) did not have a long-term relationship with the explanatory variables, REER and GDP. However, argument for the J-curve effect was not made in Nigeria in this enquiry of the exchange rate and trade balance relationship.

From the perspective of investment motivation, Yang, (2018) examined the impact of RMB exchange rate depreciation on business innovation. The study found that the devaluation of the RMB exchange rate substantially hindered export enterprise innovation. The paper considers the lagging impact of RMB depreciation in the robustness test and substitutes the business innovation index, and the findings are still consistent with the key results of regression.

Çelik [15] explores the impact of exchange rate fluctuations on exports in Turkey as measured by conditional variable variance models, with monthly data between January 1995 and January 2017, using an ARDL (Autoregressive Distributed Lags Model) boundary test and error correction model methods. The results show that the coefficients' long and short-term signs align with outlooks and are statistically significant. While both long and short-term exports are positively affected by the industrial output index and imports, the true effective exchange rate index and the volatility of the exchange rate are negatively affected in both long and short-term terms.

Hurley and Papanikolaou [16] investigate how China's bilateral trade with the U.S. reacts to exchange rate adjustments of the real Chinese yuan against the U.S. dollar using annual data spanning the period 1985 to 2014. The China-U.S. short-run undercurrents of the Trade balance vs. the depreciation of the yuan is analysed via the effects of the S-curve and J-curve, using the autoregressive distributed lag model, the long-run relationship is defined. In the short-run, the paper establish proof of the S_curve but not of the J_curve, while the J_curve effect is found in the long-run to be present. In the short run, China's bilateral export to import ratio with the U.S. is found to have an inflexible response to the yuan's exchange rate adjustment against the U.S. dollar.

Conrad and Jagessar [17] analysed the effect on the Trinidad and Tobago economy of exchange rate changes as

well as exchange rate misalignments over the period 1960 to 2016 on economic development. They found statistically useful information that both exchange rate appreciation and misalignments have a negative effect on the T&T economy's economic development. Drilling further, they have found surprisingly that there are no non-linear growth effects of misalignments in exchange rates.

Felippe & Azu [18] explores the impact of real bilateral exchange rate fluctuation on bilateral trade between China and Nigeria, taking into account the uncertainty and bilateral exchange rate effects of third countries to assess their implications. An ARDL approach was used to evaluate the long-and short-run effects because of its robustness in time series analyses. Both exports and imports were separately considered. The result showed that Nigeria's imports from China reacted negatively to the increase in the real bilateral exchange rate, just as it did to its volatility. Her exports to China are reacting positively on both fronts, especially in the short term.

Esquivel and Larraín [19] investigated the uncertainty of the G-3 exchange rate and assesses its effect on developing countries. The evaluation provides empirical proof shows that uncertainty in the G-3 exchange rate has a stout and substantially negative effect on exports from evolving countries. Findings indicated that greater constancy in the global exchange-rate system would help to boost the prospects for developing countries' trade and foreign direct investment and help avoid currency crises.

Essien et al [20] explores the dynamics of the real exchange rate (RER) of naira during the period 2000Q1-2016Q1 and the degree to which it deviated from its long-term balance direction. To accomplish this, the Behavioural Equilibrium Exchange Rate (BEER) model method and cointegrating vector were implemented and the results of an endogenously defined breakpoint were integrated into the RER model-cointegrating vector. The presence of a long-run connexion between RER and its elements that is subject to a structural break in 2011Q1 was found to be empirically validated. Model findings have also shown that exchange rate policy, efficiency and interest rate disparities are critical determinants of actual changes in exchange rates.

The 'J-curve' effect, which is the nexus between the trade balance (TB) and the real effective exchange rate (REER) in Nigeria, was investigated by Adegbemi [21]. Sequel to the result of the initial Augmented Dickey Fuller (ADF) test for stationarity of the data sequences in the model within 1981 and 2016, Johansen Cointegration, Granger causality tests and the Impulse Response Function tests was adopted. Empirical results from this analysis shows that instead of experiencing deleterious effects, the trade balance gained from the devaluation of the Naira in the short term. The dependent variable (TB) did not have a long-term relationship with the explanatory variables, REER and GDP.

While the studies examined in this thesis used real effective exchange rate (REER) and/or nominal effective exchange rate (NEER) as exchange rate variables, to the best of my knowledge, there is particular rarity on studies that examined the impact or importance of the different exchange rate windows (Interbank, Parallel market, REER and NEER) in Nigeria with regard to the impact of their volatilities on export. Thus, this study aims to fill the gap in literature by examining the impact of each of the exchange rate windows on the export of Nigeria.

# 3. Data and Model Specifications

The data for this study was obtained from statistical bulletin of the Central Bank of Nigeria (CBN) for the different variables for the period 2008M1 to 2021M1. The choice of the period was due to availability of the data on Real and nominal exchange rates from the CBN. The ratio of the Nigerian CPI divided by the US CPI to the nominal exchange rate will be calculated as the actual exchange rate. The reason for the use of the US dollar is that Nigeria's major trading partner is the United States.

### *3.1. Model Specification*

It is believed that the volume of trade between countries is directly related to the value of the real exchange rate during trading. Consequently, this research seeks to ascertain the type of relationship (positive or negative) if any, that exist between the various exchange rates in Nigeria and Nigeria's export position. The study used different exchange rates to test the sensitivity of Nigeria's exports to the different exchange rates, since there are different exchange rate windows in the country.

$$\Delta LEX_t = \alpha + \rho(EX_{t-1} - \beta_1 LEXR_{t-1} - \beta_2 LOILP_{t-1} - \beta_3 EXV_{t-1} - \beta_4 OILPV_{t-1}) + \sum_{j=1}^{p} \delta_{0j} \Delta EX_{t-j} + \sum_{j=0}^{q} \delta_{1j} \Delta LEXR_{t-j} + \sum_{j=0}^{r} \delta_{2j} \Delta LOILP_{t-j} + \sum_{j=0}^{u} \delta_{3j} \Delta EXV_{t-j} + \sum_{j=1}^{v} \delta_{4j} \Delta OILV_{t-j} + \varepsilon_t \quad (1)$$

where:

*EX is log of export*

*LEXR is log of exchange rate. The study estimates four regressions by alternating the different exchange rates: interbank exchange rate (INB), parallel market exchange rate (BDC), nominal effective exchange rate (NEER), and real effective exchange (REER).*

*LOILP is log of oil price.*

*EXV is exchange rate volatility.*

*OILV is oil price volatility.*

*Δ is change operator*

*Σ is sum operator*

The subscript t denotes time

*P, q, r, u and v are maximum lags for the corresponding variables entering the model to be determined empirically.*

*α is intercept.*

*ρ is the speed of adjustment to long run equilibrium. It is expected to be less than zero in absolute term and have a negative sign for convergence.*

Equation 1 can be rewritten in a more compact form as:

$$\Delta LEX_t = \alpha + \rho\varepsilon_{t-1} + \sum_{j=1}^{p}\delta_{0j}\Delta LEX_{t-j} + \sum_{j=0}^{q}\delta_{1j}\Delta LEXR_{t-j} + \sum_{j=1}^{r}\delta_{2j}\Delta LOILP_{t-j} + \sum_{j=0}^{u}\delta_{3j}\Delta EXV_{t-j} + \sum_{j=1}^{v}\delta_{4j}\Delta OILV_{t-j} + \xi_t \quad (2)$$

where: $\varepsilon_{t-1} = LEX_{t-1} - \beta_1 LEXR_{t-1} - \beta_2 LOILP_{t-1} - \beta_3 EXV_{t-1} - \beta_4 OILV_{t-1}$ is the error correction term; and $\xi_t$ is the error term.

### *3.2. Measuring Exchange Rate Volatility*

Volatilities are not observed variables but estimates from the variance of the variable for which volatility is measured. This study applied the GARCH (1,1) to estimate the volatility component of the exchange rate variables and oil price. The GARCH model of a variable has two components – the mean, and variance equations. The mean equation assumes that the series is stationary hence the generic equation can be stated as:

$$x_t = \phi_0 + \sum_{i=1}^{k}\phi_i x_{t-i} + \mu_t \quad (3)$$

Where: $x_t$ is a stationary series (herein exchange rate);

The generic conditional variance is modelled following a GARCH (p, q) process as:

$$h_t^2 = \lambda_0 + \sum_{i=1}^{p}\lambda_i\mu_{t-i}^2 + \sum_{i=1}^{q}\gamma_i h_{t-i}^2 \quad (4)$$

Where: $h_t$ is the conditional variance of $x_t$ ; $\sum_{i=1}^{p}\lambda_i\mu_{t-i}^2$ is the ARCH component; $\sum_{i=1}^{q}\gamma_i h_{t-i}^2$ is the GARCH component; $q > 0; \gamma_i \geq 0;$ and $1 \leq i \leq q$ .

### *3.3. Preliminary Analysis*

The studytest for unit root in each of the series using the Philips-Perron, and Augmented Dickey-Fuller unit root test approaches. The Bounds testing approach offers a way of testing for co-integration if the integration orders of the variables in the model are not the same. The ARDL model or Bounds Testing methodology has a range of characteristics that many researchers believe to give it certain advantages over traditional co-integration testing. With a mixture of I(0) and I(1) data, it can be used and it requires only a set-up of a single equation, making it easy to apply and interpret [22][23]. The post estimation test carried out after the analysis were Breusch-Godfrey LM (BG_LM) test for serial correlationand ARCH LM test for heteroscedasticity test.

The ARCH-LM test as a standard test for detecting autoregressive conditional heteroscedasticity in a model was carried out for each of the exchange rates as shown below usingcumulative sum (CUSUM) of recursive residuals and the CUSUM of square (CUSUMSQ) tests to assess the parameter stability [24]. For each of the parameters, the residual variances were constant over time since the Arch-LM probability values were not all significant as shown in table 1 below. Furthermore, the CUSUM and CUSUMSQ graphs for each exchange rates were within the upper and lower boundaries indicating that the statistics does not vary with time (constant). The Breusch–Godfrey test is a test for autocorrelation in the errors in a regression model which makes use of the residuals from the model being considered in a regression analysis to derive test statistic.

***Table 1.*** *Arch-LM and Breusch-Godfrey LM test Results.*

| Test | PM | | INB | | NEER | | REER | |
|---|---|---|---|---|---|---|---|---|
| | F-stat | Chi-square | F-stat | Chi-square | F-stat | Chi-square | F-stat | Chi-square |
| ARCH_LM | 0.283 (0.596) | 0.286 (0.593) | 0.314 (0.576) | 0.317 (0.573) | 0.159 (0.691) | 0.161 (0.688) | 0.393 (0.532) | 0.397 (0.529) |
| BG_LM | 1.601 (0.206) | 3.586 (0.167) | 0.832 (0.437) | 1.857 (0.395) | 0.099 (0.906) | 0.233 (0.890) | 1.229 (0.296) | 2.706 (0.258) |

Note: PM and INB represent Parallel market and interbank market exchange rates, respectively; NEER and REER are nominal and real effective exchange rates, respectively; ARCH_LM is ARCH LM test for heteroskedasticity; BG_LM is Breusch-Godfrey LM test for serial correlation; values in parenthesis are probability values.

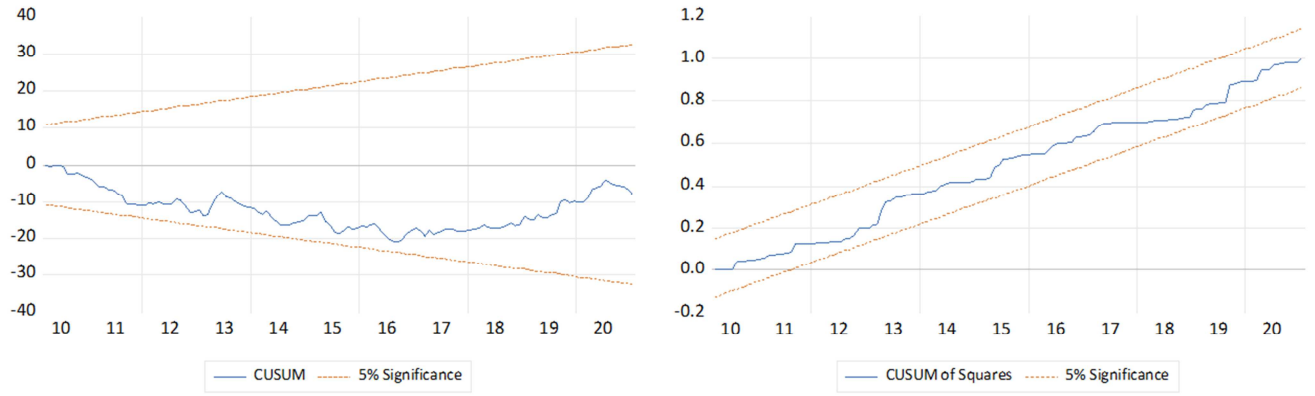


***Figure 1.*** *CUSUM and CUSUM Square of Parallel Market Exchange Rate Model.*

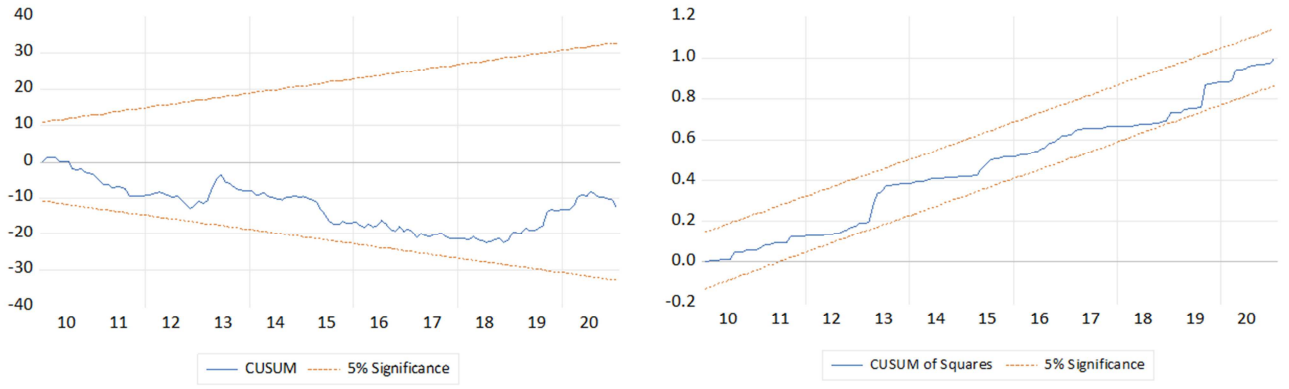


***Figure 2.*** *CUSUM and CUSUM Square of Interbank Market Exchange Rate Model.*

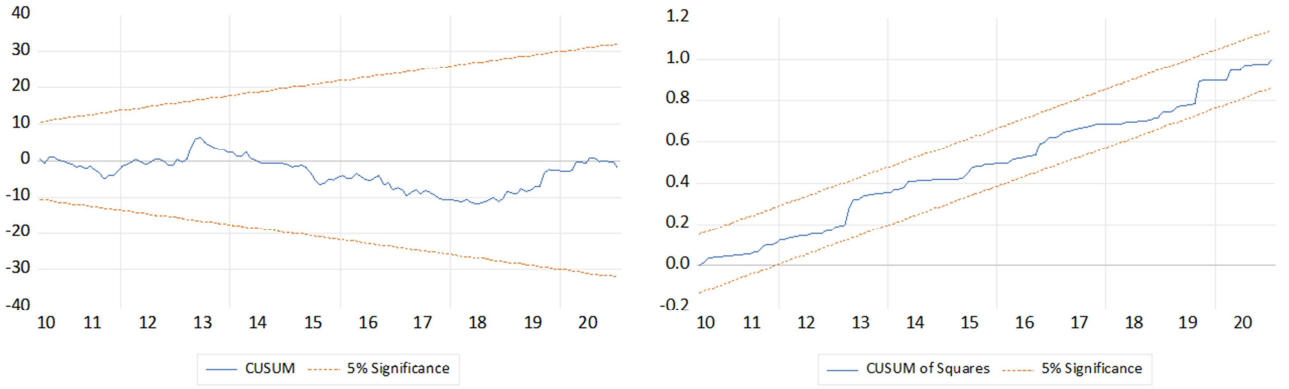


***Figure 3.*** *CUSUM and CUSUM Square of Nominal Effective Exchange Rate Model.*

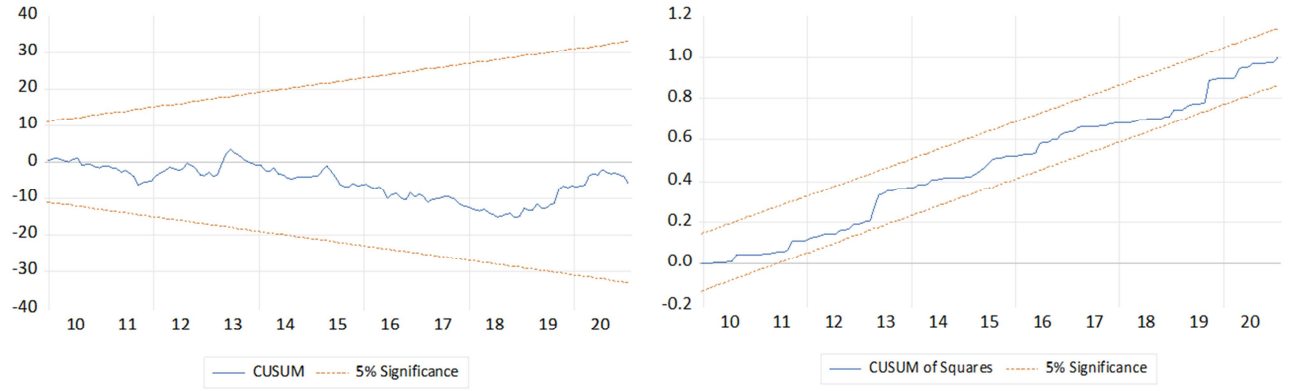


***Figure 4.*** *CUSUM and CUSUM Square of Real Effective Exchange Rate Model.*

## 4. Result and Discussion of Findings

The study test for unit root and presented are the results in Table 2. The results from both the augmented Dickey-Fuller (ADF) and Philips-Perron (PP) tests indicated that all the variables including the different variants of exchange rate was stationary after first difference, that is, the series are all integrated of order one, I(1), thus satisfying the first order condition for test of ARCH effect. Therefore, the study tested for ARCH effect in the first differenced series and the results are presented in Table 3.

***Table 2.*** *Unit root tests.*

| Variable | ADF | | | PP | | |
|---|---|---|---|---|---|---|
| | Level | 1st Diff. | Decision | Level | 1st Diff. | Decision |
| LPM | -2.407 | -5.093*** | I(1) | -0.495 | -10.540*** | I(1) |
| LEX | -2.516 | -9.597*** | I(1) | -2.011 | -14.396*** | I(1) |
| LINB | -2.372 | -10.247*** | I(1) | -0.416 | -10.146*** | I(1) |

| Variable | ADF | | | PP | | |
|---|---|---|---|---|---|---|
| | Level | 1st Diff. | Decision | Level | 1st Diff. | Decision |
| LNEER | -1.823 | -10.972*** | I(1) | -0.61 | -10.909*** | I(1) |
| LOILP | -2.792 | -7.574*** | I(1) | -2.181 | -9.439*** | I(1) |
| LREER | -2.171 | -9.705*** | I(1) | -2.161 | -11.501*** | I(1) |

***Table 3.*** *ARCH Effect from GARCH (1,1) Model.*

| Mean Equation | DLOILP | DLPM | DLINB | DLNEER | DLREER |
|---|---|---|---|---|---|
| Constant | 0.008 | 0.004 | 0.007 | 0.005 | -0.003* |
| L1 | 0.274*** | 0.086 | 0.259* | 0.093 | -0.058 |
| Variance Equation | | | | | |
| Constant | 0.001** | 3.0E-04*** | 5.71E-04 | 2.27E-04* | -1.35E-08 |
| ARCH(1) | 0.827*** | 0.372** | -0.011*** | 0.011 | 1.269*** |
| GARCH(1) | 0.292*** | 0.467*** | 0.578* | 0.869*** | 0.573*** |
| ARCH LM Stat. | 9.964 | 1.608 | 0.535 | 8.632 | 14.098 |
| AIC | -1.907 | -3.875 | -3.796 | -3.413 | -3.745 |

Note: *(**)*** Significant a 10% (5%) 1%

The results for ARCH effect show significant volatility in oil price. All the variants of exchange rate showed significant GARCH effect, however, the graph of GARCH (1,1) model indicates that, the real effective exchange rate (REER) and Parallel Market exchange rate (PMER) showed more volatility clustering compared to other variants of exchange rate (Figure 1). The study, however, used the volatilities from all the exchange rate measures in the study to identify which would have impacted more on export.

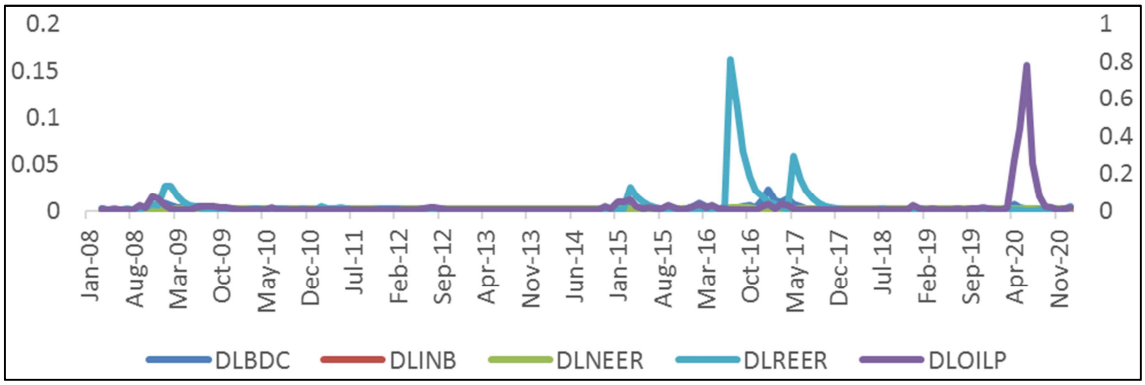


***Figure 5.*** *Volatility Estimates from GARCH (1, 1) Model.*

### *4.1. Results Parallel Market Exchange Rate (PMER)*

Using the estimation from the ARDL procedure in Table 4 below:

***Table 4.*** *Parallel Market Exchange Rate.*

| Significance | I0 Bound | I1 Bound |
|---|---|---|
| 10% | 2.45 | 3.52 |
| 5% | 2.86 | 4.01 |
| 2.50% | 3.25 | 4.49 |
| 1% | 3.74 | 5.06 |
| F-statistic | 5.88 | 4 |

The bounds test results on parallel market exchange rate indicated the existence of co-integration as the bounds F-statistics of 5.88 was greater than the upper bound F-critical values. This means that, Nigeria's export has a long-run relationship with parallel market exchange rate.

***Table 5.*** *Long run Results.*

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(OILP) | 0.762955 | 0.164798 | 4.629638 | 0.0000 |
| OILP_VOL | -1.933496 | 1.055822 | -1.83127 | 0.0692 |
| LOG(PM) | -0.079334 | 0.111038 | -0.71448 | 0.4761 |
| PM_VOL | -7.207342 | 13.225939 | -0.54494 | 0.5867 |
| C | 5.80627 | 1.20705 | 4.8103 | 0.0000 |

Analysis from the long-run multiplier result presented in Table 5, showed that parallel market exchange rate volatility is negative as expected, hence when volatility rises in PM exchange rate, export will decline. An assessment of the statistical properties of the parallel market exchange rate volatility coefficient shows that volatility in PM exchange rate is statistically not significant as the probability of 0.05867 was greater than the critical point of 0.05. Furthermore, if the coefficient (-7.207) of the parallel market exchange rate volatility is divided by its corresponding standard error (13.226), the value (-0.545) was less than 2. Therefore, based on the aforementioned, the study could not reject the null hypotheses $H_{01,}$ and concludes that parallel market exchange rate volatility has no significant impact on Nigerian export.

***Table 6.*** *Short run and Error Correction Results.*

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| DLOG(EX(-1)) | -0.539051 | 0.107427 | -5.01782 | 0.0000 |
| DLOG(EX(-2)) | -0.438759 | 0.095205 | -4.60858 | 0.0000 |
| DLOG(EX(-3)) | -0.246892 | 0.070079 | -3.52303 | 0.0006 |
| DLOG(OILP) | 0.731901 | 0.073484 | 9.960002 | 0.0000 |
| DLOG(OILP(-1)) | -0.035655 | 0.126434 | -0.282 | 0.7784 |
| DLOG(OILP(-2)) | 0.409128 | 0.103051 | 3.970149 | 0.0001 |
| D(OILP_VOL) | 0.019055 | 0.280502 | 0.067931 | 0.9459 |
| DLOG(PM) | -0.539213 | 0.218642 | -2.46619 | 0.0149 |
| DLOG(PM(-1)) | 0.628086 | 0.325199 | 1.93139 | 0.0555 |
| DLOG(PM(-2)) | -0.489032 | 0.221299 | -2.20982 | 0.0288 |
| D(PM_VOL) | -1.990774 | 3.819912 | -0.52116 | 0.6031 |
| ECM | -0.276215 | 0.107001 | -2.58142 | 0.0109 |

Results from the short-run estimates and error correction mechanism presented in Table 6 showed that Nigeria's export have a significant and negative inertia with PM exchange rate, indicating that it is more probably for a decline in export to continue for 3 consecutive months before it begins to adjust back to equilibrium at a speed of 28% per month. Also, movements in the PM exchange rate showed a net negative sign which is statistically significant (0.0149) in the short run. This means that movements in the PM exchange rate impacts export significantly in the short run, indicating that depreciation in parallel market exchange rate would cause export to rise. Finally, volatility of PMER in the short run was statistically not significant on export. Result also showed that in Nigeria, returns on oil price is robust and has a positive impact on export. It was also observed that oil price volatility was positive, although it is not statistically significant. This means that volatility in oil price returns has no important role it plays on export in Nigeria.

***Table 7.*** *Bounds test for Nonlinear Cointegration in PM model.*

| Level of Significance | F-Bounds critical values | | t-Bounds critical values | |
|---|---|---|---|---|
| | I(0) | I(1) | I(0) | I(1) |
| 10% | 2.26 | 3.35 | -2.57 | -3.86 |
| 5% | 2.62 | 3.79 | -2.86 | -4.19 |
| 2.50% | 2.96 | 4.18 | -3.13 | -4.46 |
| 1% | 3.41 | 4.68 | -3.43 | -4.79 |
| Note: | | | | |
| (i) F-statistic= 4.304446 | | | | |
| (ii) t-statistic=-5.178804 | | | | |
| (iii) Null Hypothesis: No levels relationship | | | | |

***Table 8.*** *Long run Results.*

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOILP | 0.790162 | 0.154386 | 5.118104 | 0.0000 |
| DLOILP_VOL | -1.80796 | 1.070469 | -1.68894 | 0.0936 |
| LPM | -0.18159 | 0.214076 | -0.84827 | 0.3978 |
| DLPM_VOL_POS | 589.9209 | 1035.411 | 0.569746 | 0.5698 |
| DLPM_VOL_NEG | 353.2827 | 929.205 | 0.380199 | 0.7044 |

Analysis on the nonlinear ARDL co-integration bounds test showed that there was level relationship at 5% significant levels (Table 7). Consequently, further analysis on the long run relationship was carried out to determine if there was a significant asymmetric relationship between export and PM exchange rate. Results showed a positive but statistically not significant relationships for both the positive and negative changes in PM exchange rate (Table 8).

***Table 9.*** *Wald test for Asymmetry (PM).*

| Test Statistic | Value | df | Probability |
|---|---|---|---|
| t-statistic | 0.771485 | 130 | 0.4418 |
| F-statistic | 0.59519 | (1, 130) | 0.4418 |
| Chi-square | 0.59519 | 1 | 0.4404 |
| | | Value | Std. Err. |
| DLPM_VOL_POS- DLPM_VOL_NEG | | 68.80262 | 89.18202 |
| Restrictions are linear in coefficients. | | | |

***Table 10.*** *Short run error correction results (PM).*

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 1.792119 | 0.345442 | 5.187895 | 0.0000 |
| D(LEX(-1)) | -0.49233 | 0.075288 | -6.53926 | 0.0000 |
| D(LEX(-2)) | -0.36986 | 0.075727 | -4.88405 | 0.0000 |
| D(LEX(-3)) | -0.21591 | 0.06337 | -3.40711 | 0.0009 |
| D(LOILP) | 0.681169 | 0.071185 | 9.568972 | 0.0000 |
| D(LOILP(-1)) | 0.228882 | 0.083358 | 2.745787 | 0.0069 |
| D(LOILP(-2)) | 0.286612 | 0.092958 | 3.083247 | 0.0025 |
| D(LPM) | -0.70702 | 0.218939 | -3.22931 | 0.0016 |
| D(LPM(-1)) | -0.01873 | 0.22111 | -0.08471 | 0.9326 |
| D(LPM(-2)) | -0.54118 | 0.213608 | -2.53353 | 0.0125 |
| D(LPM(-3)) | 0.330212 | 0.230234 | 1.434241 | 0.1539 |
| D(DLPM_VOL_NEG) | 989.2562 | 393.8115 | 2.512005 | 0.0132 |
| ECM | -0.29075 | 0.056142 | -5.1788 | 0.0000 |

Also, Wald Test analysis for asymmetric parallel market exchange rate showed a similar result of no statistical significance along these corridors (Table 9). Furthermore, results on Table 10 showed that the speed of adjustment to long run equilibrium is 29.1%, indicating that whenever there is a short run disturbance, the model returns to equilibrium at a speed of about 29% per month.

### *4.2. Results Interbank Exchange Rate (INBER)*

***Table 11.*** *Bound Test.*

| Significance | I0 Bound | I1 Bound |
|---|---|---|
| 10% | 2.45 | 3.52 |
| 5% | 2.86 | 4.01 |
| 2.50% | 3.25 | 4.49 |
| 1% | 3.74 | 5.06 |
| F-statistic | 6.45 | 4 |

***Table 12.*** *Longrun Results.*

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(OILP) | 0.859798 | 0.139621 | 6.158098 | 0.0000 |
| OILP_VOL | -2.317798 | 1.320085 | -1.755794 | 0.0814 |
| LOG(INB) | 0.035694 | 0.140297 | 0.254415 | 0.7996 |
| INB_VOL | -271.279436 | 264.386177 | -1.026073 | 0.3067 |
| C | 5.118115 | 1.233766 | 4.148368 | 0.0001 |

For the estimation from the ARDL procedure in Table 11, the bounds test results on interbank exchange rate indicated the existence of co-integration as the bounds F-statistics of 6.45 was greater than the upper bound F-critical values. This means that, Nigeria's export has a long-run relationship with INB exchange rate. Results on the long-run multiplier presented in Table 12 showed that INB exchange rate volatility is negative as expected and it indicates that when volatility rises, export will decline. An assessment of the statistical properties of the interbank exchange rate volatility coefficient shows that volatility is statistically not significant as the probability of 0.3067 is greater than the critical point of 0.05. Furthermore, if the coefficient (-271.279) of the INB exchange rate volatility is divided by its corresponding standard error (264.386), the value (-1.0261) was less than 2. Consequently, the study could not reject the null hypotheses $H_{02,}$ and concludes that INB exchange rate volatility has no significant impact on Nigerian export.

***Table 13.*** *Shortrun error correction results.*

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| DLOG(EX(-1)) | -0.615463 | 0.105045 | -5.859036 | 0.0000 |
| DLOG(EX(-2)) | -0.476036 | 0.090856 | -5.239431 | 0.0000 |
| DLOG(EX(-3)) | -0.255644 | 0.068312 | -3.742267 | 0.0003 |
| DLOG(OILP) | 0.716609 | 0.071372 | 10.040513 | 0.0000 |
| DLOG(OILP(-1)) | 0.005865 | 0.121156 | 0.048407 | 0.9615 |
| DLOG(OILP(-2)) | 0.431468 | 0.099203 | 4.349338 | 0.0000 |
| D(OILP_VOL) | 0.018856 | 0.271845 | 0.069364 | 0.9448 |
| DLOG(INB) | -0.631752 | 0.238773 | -2.645824 | 0.0091 |
| D(INB_VOL) | -48.769233 | 25.620403 | -1.903531 | 0.0591 |
| D(INB_VOL(-1)) | 37.482108 | 26.051695 | 1.438759 | 0.1526 |
| D(INB_VOL(-2)) | 2.117393 | 26.051123 | 0.081278 | 0.9353 |
| D(INB_VOL(-3)) | -55.342651 | 25.666521 | -2.156219 | 0.0329 |
| ECM | -0.247805 | 0.105131 | -2.357105 | 0.0199 |

Results from the short-run estimates and error correction mechanism presented in Table 13 showed that Nigeria's export have a significant and negative inertia with INB exchange rate and it is more probably for a decline in export to continue for 3 consecutive months before it begins to adjust back to equilibrium at a speed of 25% per month. Also, movements in the INB exchange rate showed a net negative sign which is statistically significant (0.0091) in the short run. This means that movements in the INB exchange

rate impacts export significantly in the short run, indicating that depreciation in interbank exchange rate would cause export to rise. Also, volatility of INBER in the short run was statistically not significant on export. Finally, result showed that in Nigeria, returns on oil price is robust and has a positive impact on export. It was also observed that oil price volatility was positive, although it is not statistically significant. This means that volatility in oil price returns has no important role it plays on export in Nigeria with the use of interbank exchange rate.

***Table 14.*** *Bounds test for Nonlinear cointegration in INB model.*

| Level of Significance | F-Bounds critical values | | t-Bounds critical values | |
|---|---|---|---|---|
| | I(0) | I(1) | I(0) | I(1) |
| 10% | 2.26 | 3.35 | -2.57 | -3.86 |
| 5% | 2.62 | 3.79 | -2.86 | -4.19 |
| 2.50% | 2.96 | 4.18 | -3.13 | -4.46 |
| 1% | 3.41 | 4.68 | -3.43 | -4.79 |
| Note: | | | | |
| (i) F-statistic= 6.882325 | | | | |
| (ii) t-statistic=-6.543097 | | | | |
| (iii) Null Hypothesis: No levels relationship | | | | |

***Table 15.*** *Long run Results.*

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOILP | 0.786796 | 0.128336 | 6.130775 | 0.0000 |
| DLOILP_VOL | -2.0422 | 1.011444 | -2.0191 | 0.0454 |
| LINB | -0.94437 | 0.471202 | -2.00418 | 0.047 |
| DLINB_VOL_POS | 674.2708 | 271.0867 | 2.487288 | 0.0141 |
| DLINB_VOL_NEG | 230.2591 | 254.7927 | 0.903712 | 0.3677 |

Analysis on the nonlinear ARDL co-integration bounds test showed that there was level relationship at 5% significant levels (Table 14). Consequently, further analysis on the long run relationship was carried out to determine if there was a significant asymmetric relationship between export and INB exchange rate. Results showed a negative and statistically significant relationship between export and IMB exchange rate. However, it is the positive change volatilities in the INB exchange rate that was statistically significant on export (Table 15). This means that a positive change in INBER would cause export to rise in the long run.

### *4.3. Results Nominal Effective Exchange Rate (NEER)*

***Table 16.*** *Bounds Test for the model with NEER.*

| Significance | I0 Bound | I1 Bound |
|---|---|---|
| 10% | 2.45 | 3.52 |
| 5% | 2.86 | 4.01 |
| 2.50% | 3.25 | 4.49 |
| 1% | 3.74 | 5.06 |
| F-statistic | 6.52 | 4 |

***Table 17.*** *Long run Results.*

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(OILP) | 0.919 | 0.112 | 8.195 | 0.000 |
| OILP_VOL | -2.011 | 1.001 | -2.009 | 0.046 |
| LOG(NEER) | 0.110 | 0.128 | 0.857 | 0.393 |
| NEER_VOL | -74.365 | 62.253 | -1.195 | 0.234 |
| C | 4.285 | 0.910 | 4.706 | 0.000 |

Using the estimation from the ARDL procedure in Table 16, the bounds test results on nominal effective exchange rate indicated the existence of co-integration as the bounds F-statistics of 6.52 was greater than the upper bound F-critical values. This means that, Nigeria's export has a long-run relationship with NEER. Analysis from the long-run multiplier result presented in Table 17, showed that nominal effective exchange rate volatility is negative as expected, hence when volatility rises in NEER, export will decline. An assessment of the statistical properties of the nominal effective exchange rate volatility coefficient shows that volatility in NEER is statistically not significant at a probability of 0.234. Furthermore, if the coefficient (-74.365) of the nominal effective exchange rate volatility is divided by its corresponding standard error (62.253), the value (-1.195) was less than 2. Thus, the study could not reject the null hypotheses $H_{03,}$ and concludes that nominal effective exchange rate volatility has no significant impact on Nigerian export.

***Table 18.*** *Short run and Error Correction Results.*

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| DLOG(EX(-1)) | -0.553 | 0.107 | -5.174 | 0.000 |
| DLOG(EX(-2)) | -0.466 | 0.094 | -4.982 | 0.000 |
| DLOG(EX(-3)) | -0.239 | 0.069 | -3.482 | 0.001 |
| DLOG(OILP) | 0.741 | 0.071 | 10.401 | 0.000 |
| DLOG(OILP(-1)) | 0.006 | 0.124 | 0.050 | 0.960 |
| DLOG(OILP(-2)) | 0.428 | 0.102 | 4.194 | 0.000 |
| D(OILP_VOL) | 0.082 | 0.275 | 0.297 | 0.767 |
| DLOG(NEER) | 0.032 | 0.035 | 0.917 | 0.361 |
| D(NEER_VOL) | -91.536 | 31.293 | -2.925 | 0.004 |
| ECM | -0.293 | 0.109 | -2.686 | 0.008 |

Results from the short-run estimates and error correction mechanism presented in Table 18 showed that Nigeria's

export have a significant and negative inertia with NEER and it is more probably for a decline in export to continue for 3 consecutive months before it begins to adjust back to equilibrium at a speed of 29% per month. Movement in the nominal effective exchange rate showed a positive sign which is statistically not significant (0.361) in the short run. This means that movements in nominal effective exchange rate does not impact export in the short run, indicating that appreciation or depreciation in the exchange rate would cause no impact on export. Also, volatility of NEER in the short run was statistically significant on export. Finally, result showed that in Nigeria, returns on oil price is robust and has a positive impact on export. It was also observed that oil price volatility was positive, although it is not statistically significant. This means that volatility in oil price returns has no important role it plays on export in Nigeria.

***Table 19.*** *Bounds test for Nonlinear Cointegration for NEER model.*

| Level of Significance | F-Bounds critical values | | F-Bounds critical values | |
|---|---|---|---|---|
| | I(0) | I(1) | I(0) | I(1) |
| 10% | 2.26 | 3.35 | -2.57 | -3.86 |
| 5% | 2.62 | 3.79 | -2.86 | -4.19 |
| 2.50% | 2.96 | 4.18 | -3.13 | -4.46 |
| 1% | 3.41 | 4.68 | -3.43 | -4.79 |
| Note: | | | | |
| (i) F-statistic=5.796007 | | | | |
| (ii) t-statistic=-6.01032 | | | | |
| (iii) Null Hypothesis: No levels relationship | | | | |

Analysis on the nonlinear ARDL co-integration bounds test showed that there was level relationship at 5% significant levels (Table 19). Consequently, further analysis on the long run relationship to determine if there was a significant asymmetric relationship between export and NEER showed a positive but statistically not significant relationships for both the positive and negative changes (Table 20). Also, Wald Test analysis for asymmetric parallel market exchange rate showed a similar result of no statistical significance along these corridors (Table 21).

***Table 20.*** *Long run results.*

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOILP | 0.980478 | 0.153023 | 6.40738 | 0.0000 |
| DLOILP_VOL | -2.66999 | 1.572683 | -1.69773 | 0.092 |
| LNEER | 0.954153 | 1.19012 | 0.801728 | 0.4242 |
| DLNEER_VOL_POS | 447.5366 | 618.9701 | 0.723034 | 0.471 |
| DLNEER_VOL_NEG | 698.0388 | 548.9765 | 1.271528 | 0.2058 |

***Table 21.*** *Wald test for Asymmetry.*

| Test Statistic | Value | df | Probability |
|---|---|---|---|
| t-statistic | -0.766883 | 129.00 | 0.4446 |
| F-statistic | 0.588109 | (1, 129) | 0.4446 |
| Chi-square | 0.588109 | 1 | 0.4432 |
| | | Value | Std. Err. |
| DLNEER_VOL_POS - DLNEER_VOL_NEG | | -59.88 | 78.08111 |
| Restrictions are linear in coefficients. | | | |

### *4.4. Real Effective Exchange Rate (REER)*

***Table 22.*** *Bounds test for the model with REER.*

| Significance | I0 Bound | I1 Bound |
|---|---|---|
| 10% | 2.45 | 3.52 |
| 5% | 2.86 | 4.01 |
| 2.50% | 3.25 | 4.49 |
| 1% | 3.74 | 5.06 |
| F-statistic | 7.39 | 4 |

***Table 23.*** *Long run results.*

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(OILP) | 0.867 | 0.078 | 11.152 | 0.000 |
| OILP_VOL | -1.506 | 0.616 | -2.443 | 0.016 |
| LOG(REER) | 0.598 | 0.226 | 2.641 | 0.009 |
| REER_VOL | -8.191 | 2.573 | -3.183 | 0.002 |
| C | 2.271 | 0.954 | 2.381 | 0.019 |

Using the estimation from the ARDL procedure in Table 22, the bounds test results on parallel market exchange rate indicated the existence of co-integration as the bounds F-statistics of 7.39 was greater than the upper bound F-critical values. This means that, Nigeria's export has a long-run relationship with real effective exchange rate in the long run. Analysis from the long-run multiplier result presented in Table 23, showed that real effective exchange rate volatility is negative as expected, hence when volatility rises in REER, export will decline. This is intuitively plausible since exchange rate volatility measures the uncertainty surrounding the value of a currency, hence when volatility of REER rises, the international price of domestic goods become volatile, thus reducing export demand. An assessment of the statistical properties of the real effective exchange rate volatility coefficient shows that volatility in REER is statistically significant at 5%. Furthermore, if the coefficient (-3.153) of the real effective exchange rate volatility is divided by its corresponding standard error (0.876), the value (-3.600) was greater than 2. Therefore, based on the aforementioned, the study rejected the null hypotheses $H_{04,}$ and conclude that real effective exchange rate volatility has significant impact on Nigerian export. This is expected, since the REER captures the naira exchange rate with a basket of currencies of her major trading partners as against the INB and PM exchange rates. Also, the REER accounts for domestic inflation as well as inflation in trading partner economies, which makes it more susceptible to conditions in the internal goods market as against the nominal effective exchange rate. This finding is similar to Bah and Amusa [25] and Aziakpono et al. [26] both for South Africa, and Isitua and Igwe [27] for Nigeria's export to the US, but differ from Todani and Munyama [28] who showed positive relationship between South African export and the Rand volatility.

***Table 24.*** *Short run error correction results.*

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| DLOG(EX(-1)) | -0.521 | 0.099 | -5.240 | 0.000 |
| DLOG(EX(-2)) | -0.462 | 0.089 | -5.221 | 0.000 |
| DLOG(EX(-3)) | -0.259 | 0.066 | -3.904 | 0.000 |
| DLOG(OILP) | 0.724 | 0.070 | 10.396 | 0.000 |
| DLOG(OILP(-1)) | -0.024 | 0.121 | -0.197 | 0.845 |
| DLOG(OILP(-2)) | 0.388 | 0.098 | 3.953 | 0.000 |
| D(OILP_VOL) | 0.025 | 0.266 | 0.094 | 0.925 |
| DLOG(REER) | -0.066 | 0.201 | -0.326 | 0.745 |
| D(REER_VOL) | -3.153 | 0.876 | -3.600 | 0.000 |
| ECM | -0.385 | 0.100 | -3.857 | 0.000 |

Results from the short-run estimates and error correction mechanism presented in Table 24 showed that Nigeria's export have a significant negative inertia with REER, indicating that it is more probably for a decline in export to continue for 3 consecutive months before it begins to adjust back to equilibrium at a speed of 39% per month. Also, movements in the PM exchange rate showed a net negative sign which is statistically not significant (0.745) in the short run. This means that movements in the real effective exchange rate has no impact on export in the short run.

***Table 25.*** *Bounds test results for REER model.*

| Level of Significance | F-Bounds critical values | | t-Bounds critical values | |
|---|---|---|---|---|
| | I(0) | I(1) | I(0) | I(1) |
| 10% | 2.53 | 3.59 | -3.13 | -4.37 |
| 5% | 2.87 | 4 | -3.41 | -4.69 |
| 2.50% | 3.19 | 4.38 | -3.65 | -4.96 |
| 1% | 3.6 | 4.9 | -3.96 | -5.31 |
| Notes: | | | | |
| (i) F-statistic=7.03 | | | | |
| (ii) t-statistic=-7.17 | | | | |
| (iii) Null Hypothesis: No levels relationship | | | | |

Analysis on the nonlinear ARDL co-integration bounds test showed that there was level relationship at 5% significant levels (Table 25). Consequently, further analysis on the long run relationship was carried out to determine if there was a significant asymmetric relationship between export and REER. Results showed a negative but statistically significant relationships for both the positive and negative changes between real effective exchange rate and export (Table 26).

***Table 26.*** *Long run multipliers.*

| LEXP | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LREER | 0.91 | 0.56 | 1.64 | 0.10 |
| LOILP | 0.84 | 0.08 | 11.07 | 0.00 |
| DLOILP_VOL_POS | -2.37 | 1.11 | -2.14 | 0.03 |
| DLOILP_VOL_NEG | -2.03 | 1.15 | -1.76 | 0.08 |
| DLREER_VOL_POS | -5.71 | 2.00 | -2.86 | 0.00 |
| DLREER_VOL_NEG | -4.29 | 1.46 | -2.95 | 0.00 |

# 5. Conclusion

This study examined the impact of exchange rate volatility on Nigeria's export. The study was guided by four hypotheses in line with the four objectives stated. Four models were estimated using volatility from real effective exchange rate, nominal effective exchange rate, interbank exchange rate and the parallel market exchange rate. The models correspond to each of the objectives. The study used the bounds testing ARDL modelling approach and found that bounds test results for each of the four models, showed long-run relationship among the variables. In the long-run all the exchange rate volatility measures showed negative sign as expected. However, the study could not reject hypotheses $H_{01}$, $H_{02}$, and $H_{03}$ since the coefficients on the parallel market

exchange rate, interbank exchange rate and nominal effective exchange rate were all statistically not significant but concludes that volatility in the parallel market exchange rate, interbank exchange rate and nominal effective exchange rate has no significant impact on Nigeria's export in the long-run. Also, volatility in the real effective exchange rate turned out to be statistically significant at the conventional 5 percent critical level as the coefficient divided by the standard error is greater than 2. The study therefore rejected $H_{04}$ and conclude that real effective exchange rate has significant impact on Nigeria's export in the long-run.

In the short-run, the average impact of exchange rate volatility was negative in all the four models as expected. However, it was volatility in interbank, real effective, and nominal effective exchange rates that were statistically significant. The study therefore rejected the hypotheses that interbank exchange rate volatility, nominal effective exchange rate volatility and real effective exchange rate volatility has no significant impact on Nigeria's export, respectively. Finally, the speeds of adjustment for the parallel market exchange rate, interbank exchange rate, nominal effective exchange rate, and the real effective exchange rate are 0.28, 0.38, 0.25 and 0.29 respectively. This means that if the Nigeria's export deviates from its long-run path due to short-run perturbations, the tendency is for it to return to long-run equilibrium at the speed of 28%, 38%, 25% and 29% in the PM, INB, NEER and REER models, respectively. The study concludes that exchange rate volatility, irrespective of the exchange rate used has negative effect on Nigeria's export. However, real effective exchange volatility has a more debilitating effect in the long-run compared to other exchange rates' volatilities and in the short-run only the parallel market exchange rate volatility does not have serious impact on Nigeria's export. The study recommends, that efforts to improve Nigeria's trade with other countries should consider stabilizing the Naira exchange rate. To achieve this, the Central Bank of Nigeria should shore up reserve accretion. Diversification of the country's export basket and sourcing of new export destinations would also be useful. Irrespective of the exchange rate used, exchange rate showed a negative sign, though, it was real effective exchange rate that was statistically significant in the long-run. Interbank rate and nominal effective exchange rate became significant in the short-run in addition to real effective exchange rate.

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