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# Threshold Impact of International Trade on Exchange Rate Volatility in Nigeria

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#### Abstract

Keywords: International trade Exchange rate volatility Nigeria Import Export

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especially over the last one decade. The current study evaluates the threshold impact of Nigeria international trade (IT) on her exchange rate volatility (ERV), and causal relationships. The study used data sourced from the World Development Indicators and Central Bank of Nigeria database from 1981 to 2021. The Generalized Autoregressive Conditional heteroskedasticity (GARCH) and threshold regression were employed for the study's main analysis. The study preliminary analysis for stationarity revealed the study model variables are stationary at the level and first different I(0) and I(1) and the GARCH estimates shows stationarity and volatility clustering, meaning there is evident of volatility. Furthermore, the one-to-one relationships between export and import to ERV in Nigeria showed evidence of different responds of ERV to thresholds of import and export. In addition, it was found that causal relationships exist among import, export, terms of trade and ERV in Nigeria. The study thus recommends that policies should be made to reduce Nigeria's importation by encouraging and promoting local manufacturing industries to produce goods in which the country has resources to make. Also, it is recommended that the export based of Nigeria should be moved beyond oil and non-oil to manufactured goods to increase gains from trade that will ensure favourable term of trade towards reducing ERV.

The Nigeria exchange rate has been associated with too much risk,

### 1. Introduction

Over the years, most countries have adopted the flexible exchange rate system following the collapse of the Bretton Woods system in 1973. However, a traditional criticism of flexible exchange rate regimes is that flexible rates increase the level of exchange rate uncertainty, and thus reduce incentives to trade (Broda & Romalis, 2011). This critique has spawned a large literary contribution that focused on the impact of exchange rate volatility (ERV) on trade. However, Mundell's (1961) optimal currency area hypothesis suggests an opposite direction of causality, where trade flows stabilize real exchange rate fluctuations, thus reducing real ERV. This foundational theory of international trade (IT) suggests that there is a common identification problem: whether trade-ERV correlation indicates that trade is impacted by volatility, or vice versa?

One of the objectives and gain a country could derive from IT is exchange rate stability (Broda & Romalis, 2011; Bisiriyu et al., 2021). This is ensured and made possible when the country exports more of its product abroad and imports less, which gives rise to more receipts over payments and increased demand for its currency at the world market. For countries with natural resource endowment such as Nigeria, it is believed that its exportation of natural resources and products to various countries will stabilize its exchange rate and thereby bring about favourable exchange rate that will make import dependent firms withstand international exchange rate pressure (Osinusi et al., 2022). Unfortunately, some of the cardinal problem Nigeria as a nation had been facing for over three decades is fluctuations in exchange rate, how to reduce import and implement export led-growth policies (Udeh, 2010). Some of the factors contributing to the fluctuation in the exchange rate are the prevailing interest rate, the country's balance of payments, inflation levels, and government monetary policy interventions (Okolo et al., 2016). However, the Nigerian government's enduring dependence on crude oil has prevented it from taking full advantage IT's potential for rapid economic of transformation and high productivity.

The country since inception has been marginalized considering her low degree of participation and share on world trade, especially export volume (Kanu & Nwadiubu, 2020). The Nigeria economy trade has been so loose that the country is one of the world's most import-dependent nation to the extent that its citizen now values foreign made goods than locally produced one mostly caused by quality differences as government export-promotion policies breakthrough are found wanted. A quiet number of the country's populace, including the government officials, largely depend on and import foreign medical services. Furthermore, most manufacturing firms in the country has not been able to produce quality

goods for the local populace while the little ones that produce to gain from foreign trade are faced with competition in terms of quality and world market price variation. In addition, the agricultural product which was the nation's pride and source of revenue and foreign exchange earnings before the discovery of oil has been neglected for years and efforts to revamp it in recent years have not yielded desired results (Bisiriyu et al., 2021). Unfortunately, crude oil, which is the country's main export product has also been challenged over the years due to the failure of the government to build infrastructure that will enable self-processing. This problem has added to and led to increased importation as crude oil needs to be exported in its natural form to foreign countries for processing into finished products (Osinusi et al., 2022).

The resultant of these is that the Nigeria economy has always been import-dependent despite its resource endowment and selfsufficient policies put in place by the government. Also, this has made the exchange rate of the country remain volatile over the years as less of its currency is demanded in the world market, because of low export resulting in a balance of trade deficit (Lawal et al., 2021). This is more evident during the severe period of Corona-Virus pandemic when the world oil price was negative (\$-36.98 per barrel) in April 2020 (Badmus et al., 2022). The aftermath of this situation is still prevailing in the country as the exchange rate remain high whereas there are numerous natural and mineral resources the government can tap and develop along heavy investment in agriculture as prevalence in the pre-oil boom era for export to have a favourable balance of trade and stabilize exchange rate. It is in line with the above background and stated problem that the current study evaluates the likely threshold impact of Nigeria IT on her ERV, and causal relationships. The study is organized into five sections, following this introduction, section two covers the conceptual and review of section literature. three covers the methodology, the section four cover the

discussion of findings while the paper is concluded in section five.

### 2. Literature review

# 2.1 Conceptual review

### 2.1.1 International trade

International trade (IT) in its elementary form is the exchange of products and/or services across international borders. IT is frequently used interchangeably with foreign or external trade. IT refers to cross borders or territories trade or the exchange of capital products and/or services between economies. Esezobor (2009) in his conceptual discussion defined IT as a type of trade between sovereign states, that is, the buying and selling of consumer goods and services, and tangible assets, raw materials. and securities across national borders. Furthermore, IT can be conceptualized to be commercial exchanges between residents of different sovereign political units. The involvement of more than one currency distinguished it clearly from internal or domestic trade and thus led to the formulation of commercial and IT policies (Kanu & Nwadiubu, 2020). In simple words, IT means the export and import of goods and services. Thus, imports and exports constitute the main components of IT. Exports are goods and/or services produced in a domestic country but then sold to international destinations or countries. One major fundamental function of IT is to ensure resources are moved from area of abundance to where they are scarce and needed by shipping from one country to another for future sale or production. Exports are, therefore, goods and/or services a country sells abroad, and it leads to an inflow of funds to the domestic country and causes more demand for the domestic currency. Exports are considered as one of the oldest forms of economic transfer. And it occurs on a larger scale between economies having fewer barriers to IT.

According to Lequiller and Blades (2006), the term export derives its meaning from the goods and/or services out of the port of a country, usually the domestic country. The seller of products and/or services is called an exporter, and the buyer of goods and/or services from abroad is called an importer. However, any direct purchases made within domestic territory by non-residents are recorded as service exports in the computation of the national income account. This led to the classification of all foreign visitor spending within an economy's borders as export services. Not only can exports involve the transfer of products and/or services, but they can also involve the dissemination of information via fax, email, or phone calls. From another perspective exports can be defined as surplus goods and/or services of a country that are sold to other countries of the world. It involves the total goods and/or services a country was able to sale to other countries of the world in each period of time (Kanu & Nwadiubu, 2020). However, from this conceptual definition it is worthy to clarify that not all exports are results of surplus goods and/or services in a domestic country as some purposelv export-led/oriented countries produce and render some goods and services basically for exportation.

On the other hand, import refers to the movement of products and services into an economy; it is the exact opposite of exports. Imported goods and/or services are those that citizens of a nation buy from other countries in place of locally produced goods. Since payments to foreign vendors are a part of import operations, money usually leaves the country because of imports. The conceptual definition of the word "import" refers to the movement of goods and/or services into a port in another nation. The person who buys is the "importer", while the person who sells is the "exporter" (Mohan, 2009). Majorly, imports are influenced by differences in resources endowment, technological expertise, excess demand over supply and lower prices at the world market amongst others. For instance, a country may need to import certain products when domestic quantity demanded exceeds domestic supply, hence, importation becomes imperative to meet peoples' demand. Also, when the price of a particular good or service at the world market is less than prevailing price

in the domestic market, buyers tend to import in as much the barrier(s) to IT is/are fair. Finally, when the quality of domestic product or service is of less quality while foreign market offers same product or service at same price or even a bit higher price, the passion for importation begins to arise. Notably, what constitutes exports to country "A" may be imports for country "B", and the interplay of these two elements give rise to other concepts of utmost importance in IT such as terms of trade and balance of trade which are accounted for in a country's current account in the balance of payments (Kalu & Anyanwaokoro, 2020). Summarily, IT means economic transactions that are made between countries and without IT, nations would be limited to the goods and services produced within their own borders (Wonnacott et al., 2019).

## 2.1.2 Exchange rate volatility

Exchange rate volatility is defined as the risk associated with the unexpected movement in the exchange rate (Oztuk, 2006). From another strand, volatility in the exchange rate is the risk associated with changes (appreciation and depreciation) in the currency. In economic literature, the term "volatility" takes a very specific meaning. Volatility is the day to day, month to month or year to year variability, in exchange rate volatility is the unpredicted variability caused quick changes that are associated with currency (Oloba & Abogan, 2013). In other words, volatility is a high frequency concept referring to movements in the exchange rate over a relatively short period of time. ERV also refers to a situation in which a country's actual exchange rate deviates from such an unobservable equilibrium, an exchange rate is said to be "undervalued" when it depreciates more than its equilibrium, and "overvalued" when it appreciates more than its equilibrium (Aliyu, 2008). However, unless the "equilibrium" is explicitly specified, the concept of ERV remains subjective. The ERV can arise from two broad different factors: nominal shocks on monetary growth or relative prices (e.g., money supply changes, interest rate differentials), and real shocks on level of output, the openness of an economy, and the government spending (e.g., productivity differentials, trade openness, terms of trade, government spending, capital flows) (Tadesse, 2009).

# 2.2 Empirical review

Adeove and Atanda (2010) studied the consistency, persistency, and degree of ERV in Nigeria, using monthly time series data from 1986 to 2008. The authors of the research adopted a purchasing power parity model, ARCH and Generalized Autoregressive Heteroskedasticity (GARCH) Conditional models to analyze the long-run consistency of ERV in Nigeria. The findings showed that in Nigeria, both nominal and real ERV persisted. The findings also showed that nominal ERV in Nigeria was not consistent with purchasing power parity. Englama et al. (2010) examined the relationship between oil price, demand for foreign exchange, external reserve, and ERV in Nigeria. Monthly series spanning the years 1999-2009 were employed. The short- and long-term relationships were examined using the Vector Autoregressive (VAR) model, Vector Error Correction Model (VECM), and cointegration. The findings demonstrated that changes in oil prices in the overseas market had a significant impact on ERV in both the shortand long-term.

Aliyu (2011) empirically investigated real exchange rate misalignment in Nigeria based on behavioral equilibrium exchange rate (BEERs) approach. From 1986Q1 to 2006Q4, quarterly time series data were employed. Using the Johansen error correction model and cointegration test, the findings revealed that while government spending and foreign reserves had a negative relationship with the index of crude oil volatility, real exchange rate behavior terms of trade, the index of monetary policy performance, and net foreign assets all had a positive impact on the real exchange rate's long-term behavior. The findings also indicated that Nigeria's real exchange rate may be overvalued or undervalued in response to rising oil revenues and strong macroeconomic performance. Zakaria (2013) used monthly

data for 152 months with the application of the least square regression on the relationship between export and ERV revealed an ambiguous relationship between the variables. Ajao and Igbekovi (2013) used the error correction model to investigate the determinants of real ERV using annual data from 1981 to 2008. Their findings showed that the main significant determinants influencing real ERV in Nigeria were government spending, interest rate changes, openness of the economy, and a lag in the exchange rate.

The study of Odili (2015) on the interaction among real ERV, economic growth, and emerging market IT with Nigeria as country case study was carried out using annual data that spanned 1971 to 2012 with error correction model and the granger causality test. The results of the causal analyses showed unidirectional causality from export to ERV and from ERV to import. In addition, Danladi et al. (2015) used data from 1980 to 2013 to study exchange rate volatility and international trade in Nigeria using the cointegration and Granger causality econometric techniques. Their findings established causal relationship between IT and ERV in Nigeria. Oaikhenam and Aigheyisi (2015) gave empirical evidence of factors explaining Nigeria ERV using data from 1970 to 2013. The Ordinary Least Square (OLS) estimate results revealed net capital flows, global market integration, financial market deepening, crude oil price, external reserves and economic growth were significant to reduce ERV in Nigeria.

Ajao (2015) gave similar result in the analysis of the determinants of real ERV in Nigeria. The study's scope covers 1981 to 2008 and the analyses revealed trade, government expenditures, interest rate movement, and exchange rate lag are among the significant macroeconomic variables that influenced ERV over the period of study. In contrary to the result of Ajao (2015) from Nigeria, Okolo et al. (2016) in their study on determinants of ERV and its effect on the Nigeria manufacturing vector sector using the autoregression technique and vector error correction mechanism revealed that trade balance, trade

openness, and net international investment are not significant factor determining exchange rate in Nigeria. In a study on the determinant of exchange rate in Nigeria for possible potentiality of non-oil export economic diversification by Musa et al. (2024) using the ARDL and NARDL models, they revealed that oil price and import are negative and significantly affecting Nigeria's exchange rate. From the above reviews, it is evident that there are sparse or no categorical studies that have modeled trade as a determinant of exchange rate volatility in Nigeria as viewed from the Mundell's optimal currency area hypothesis. Furthermore, the literature evident that majority of studies on the determinants of exchange rate volatility that included trade as a control variable has been linear without checking for the the non-linearity impact of trade on exchange rate volatility. Thus, to bridge these gaps, this study examines the threshold impact of trade on exchange rate volatility in Nigeria. In addition, the study examines the separate component impacts of exports, imports, and terms of trade on exchange rate volatility in Nigeria.

### 3. Methodology

Quantitative research method was used to achieve the objective of the research with secondary annual data sourced from the Nigeria central bank and the world development indicator database of the World Bank from 1981 to 2021. The study baseline model is thus specified based on the broad objective as:

$$REERV = f(INTTRADE)$$
 1

where REERV = real effective ERV and INTTRADE = IT. We thus explicitly specified the equation 1 as given below:

$$REERV = f(IMP, EXP, TOT) \qquad 2$$

where REERV = real effective ERV, IMP = import (oil and non-oil), EXP = oil export (oil and non-oil), and TOT = terms of trade. The choice of TOT as the control variable was

informed by existing literature as extensively discussed in section 2 as well as its relevance to the analysis of IT in the present study. The econometric form of equation 2 is thus specified as:

$$REERV = \alpha_0 + \alpha_1 IMP + \alpha_2 EXP + \alpha_3 TOT + \mu \qquad 3$$

Where  $\alpha_0$  is the intercept,  $\alpha_1 - \alpha_3$  are slope of the coefficients to be estimated, and  $\mu$  is the error term.

The study employed the threshold regression and granger causality estimation methodologies to obtain the parameter estimates of the specified model. In addition, the Generalized Autoregressive Conditional heteroskedasticity (GARCH) model was used to ascertain the volatility of exchange rate along the descriptive statistics and unit root test in the preliminary analysis.

The threshold regression equation of Equation 1 is explicitly expressed equations 4 and 5. Equation 4 is the lower threshold regime, 5 is the upper threshold regime,  $q_t$  is the threshold variable to be deployed to decompose IT (export and import) into different regimes (i.e., upper and lower),  $\gamma$  is the threshold point, and  $Z'_t$  represents other control variables of the study model.

$$\begin{aligned} REERV_t &= \beta_{\theta 0} + \beta_{\theta 2} INTTRADE_t(q_t > \gamma) \\ &+ Z'_t \varphi + \mu_{2t} \end{aligned}$$

To evaluate the threshold level at which export makes exchange rate volatile in Nigeria, we specify the equation as:

$$\begin{aligned} REERV_t &= \beta_{\theta 0} + \beta_{\theta 1} EXP_t(q_t \le \gamma) \\ &+ Z'_t \varphi + \mu_{1t} \end{aligned}$$
$$\begin{aligned} REERV_t &= \beta_{\theta 0} + \beta_{\theta 2} EXP_t(q_t > \gamma) \end{aligned}$$

and

Furthermore, to ascertain the one-to-one relationship between import and ERV in Nigeria, we specify the equation as:

$$REERV_t = \beta_{\theta 0} + \beta_{\theta 1} IMP_t (q_t \le \gamma)$$
$$+ Z'_t \varphi + \mu_{1t}$$

and

$$REERV_t = \beta_{\theta 0} + \beta_{\theta 2}IMP_t(q_t > \gamma) + Z'_t \varphi + \mu_{2t}$$
7

The Granger causality estimate is stated below:

$$Y_t = \alpha_0 + \sum_{j=1}^m \beta_i Y_{t-j} + \sum_{i=1}^n \delta X_{t-i} + \mu_t \qquad 8$$

According to Granger, if  $X_t$  Granger causes  $Y_t$ , then it means the current values of  $Y_t$  are determined by past values of  $X_{t-1}$ . The test of  $H_0$ :  $\delta i = 0$ , is carried out using the F- test.

### 4. Results and Discussion

#### Preliminary Analysis

The descriptive statistics of all the variables in the research models are displayed in Table 1, with an emphasis on the Jarque-Bera probability value, skewness, kurtosis. maximum, minimum, mean, and median. The analysis reveals that the mean values of all the data series are positive meaning all the variables have increased over the period of analysis (1981 - 2021), this is complemented by the standard deviation of all variables. Similarly, the difference between the maximum and minimum values of each variable shows wide variation of the variables over the years under consideration. The skewness value. which measures the asymmetrical distribution of the variables from a normal distribution with an expected value of zero, indicates that all the variables are positive. The results of the kurtosis statistics, which measure the peakedness or flatness of the distribution of the series, indicate that the terms of trade (TOT) and export (EXP) are platykurtic relative to the normal, while the real

effective exchange rate (REER) and import (IMP) are highly leptokurtic for their values exceeding 3, and the inequality between the mean and median of each variable further demonstrates the asymmetric and skewed nature of the data series. To conclude from the table, because of Jarque-Bera probability that is higher than 5 per cent led to normal distribution in trade and export.

Variables	REER	ТОТ	IMP	EXP
Mean	147.3824	67.67598	4646005	5715124
Median	100.6310	67.08457	1358180.	1867954.
Maximum	536.9112	113.4042	22394498	19910534
Minimum	49.77635	26.74887	5983.600	7502.500
Std. Dev.	115.78	22.498	6244170.	6515761.
Skewness	1.9418	0.1204	1.4316	0.7878
Kurtosis	6.0133	2.1442	4.1612	2.2167
Jarque-Bera	41.279	1.3501	16.309	5.2890
Prob.	0.0000	0.5091	0.0002	0.0710
Obs.	41	41	41	41

Table 1: Descriptive Statistics

Source: Author's Computation, 2024

Before proceeding with the main analysis, it is necessary to generate volatility series for the real effective exchange rate. As stated in the methodology, the real effective ERV series was generated using the GARCH approach. Figure 1 shows volatility of the real effective exchange rate series over the period of 1981 – 2021. The series as evident from the figure exhibits stationarity and volatility clustering, where periods of large changes are followed by further large changes and periods of small changes are followed by further small changes.



Figure 1: Real Exchange Rate Volatility Graph Source: Author's Computation, 2024

In confirming the stationarity of the data series employed, the Augmented Dickey Fuller (ADF) unit root test was adopted. Table 2 presents the result of the test at levels and first difference. The results of the ADF test show that the variables had a mixture of integration of level and first difference (i.e., I[0] and I[1]). Categorically, the series of real effective exchange rate volatility (REERV), import (IMP) and terms of trade (TOT) are stationary at level using the 5% significance while others are stationary at their first difference form at 5% significance level.

Variables	ADF	Prob.	Remarks
EXR	-2.0500	0.5563	I(1)
ΔEXR	-4.3356	0.0073***	First difference
ERV	-6.644	0.0000***	I(0)
$\Delta \text{ERV}$	-7.8661	0.0000***	Level
EXP	-1.0635	0.9227	I(1)
ΔΕΧΡ	-5.6591	0.002***	First difference
IMP	-4.1022	0.0131**	I(0)
$\Delta$ IMP	-5.7524	0.0001***	Level
ТОТ	-7.5881	0.0000***	I(0)
ΔΤΟΤ	-9.8790	0.0000***	Level

Table 2: Unit Root Test

\*\*\*, \*\* & \* significance at 1%, 5%, and 10% respectively. Source: Author's Computation, 2024.

The achievement of the effect of Nigeria export on its ERV over the years of analysis is anchored on threshold regression. The results in Table 3 thus present the effect of the employed trade variables across different export thresholds, the threshold value is set at 10.2516 with a slope of 7.8726. From the result it is evident that export has a negative insignificant effect on real ERV at the linear part while import and terms of trade have positive insignificant effects. These results imply export reduces real ERV while import and terms of trade increase it at the linear part. On the other hand, the non-linear part shows a contrary result. The result shows that exports have an insignificant positive effect while imports and terms of trade have an insignificant negative effect of real ERV. These results connote that rejection of null hypothesis that Nigeria ERV does not respond differently to various thresholds of export. The alternative hypothesis is thus accepted that real ERV in Source: Author's Computation, 2024

Nigeria responds differently to export threshold levels.

Table 4 ascertains the objective of one-toone relationship between import and ERV in Nigeria. Using 9.4302 threshold value of import with 4.1917 slope, results in Table 4 show that import and export have positive insignificant relationship with ERV while the coefficient of terms of trade exhibits insignificant negative relationship at the linear part. Further, the non-linear coefficients of import and export show contradictory results. Imports and exports were found to have a negative insignificant relationship and impact on ERV while the relationship of terms of trade remains unchanged, i.e., positive, and insignificant. Invariably, the result implies that at linear threshold part of import, import, export, and terms of trade will insignificantly increase ERV while import and export will decrease the volatility at the non-linear threshold part of import.

Dependent Variable. REERV	Theshold variable. EAT			
Variables	Coefficient	Standard Error (Prob.)		
Threshold Variable (linear part)				
EXP	-2.3073	9.8482 (0.8163)		
IMP	5.7230	0.7009 (0.4886)		
ТОТ	0.1689	0.2351 (0.4779)		
С	-28.596	43.120 (0.5121)		
Threshold Variable (non-linear part)				
EXP	1.7316	9.9373 (0.8628)		
IMP	-5.1347	8.2616 (0.5388)		
ТОТ	-0.1545	0.2358 (0.5173)		
С	35.216	43.266 (0.4219)		
<u>Slopes</u>				
Slope	7.8726	49.359 (0.8743)		
<b>Thresholds</b>				
Threshold	10.251	0.4942 (0.0000)		

Table 3: Threshold Results of one-to-one relationship between EXP and REERVDependent Variable: REERVThreshold Variable: EXP

The one-to-one relationship null hypothesis between import and ERV in Nigeria is thus rejected while the alternative is accepted that the relationship between import and ERV in Nigeria is linear.

From the study analysis, the empirical results reveal that ERV in Nigeria responds to differently to threshold of import and export. This implies sensitivity of ERV to IT activities in the country. At the linear level of both export and import, all variables (export, import, and terms of trade) coefficients are positive except export which is negative while at the non-linear part all are negative except export and terms of trade all of which are insignificant. This result is similar to the findings of Musa et al. (2024) who found that domestic currency responds differently to changes in oil price and non-oil export.

Table 4: Threshold Results of one-to	o-one relationship between IMP and REERV
Dependent Variable: REERV	Threshold Variable: IMP

VariablesCoefficientStandard Error (Prob.)Threshold Variable (linear part)IMP $7.3310$ IMP $7.3310$ EXP $1.6816$ 19.140 (0.9306)TOT $0.1248$ $0.3287$ (0.7068)C $-76.8689$ Threshold Variable (non-linear part)IMP $-6.8694$ IMP $-6.8694$ 10.875 (0.5322)EXP $-2.1469$ 19.264 (0.9120)TOT $0.1248$ $0.3287$ (0.7068)C $83.900$ TA.11 (0.6333)SlopesSlope $4.1917$ Slope $4.1917$ ThresholdThreshold9.4302 $0.8911$ (0.0000)	Dependent variable. REEK v Threshold variable. hvir			
$\begin{tabular}{ c c c c c c } \hline Threshold Variable (linear part) \\ \hline IMP & 7.3310 & 10.902 (0.5063) \\ \hline EXP & 1.6816 & 19.140 (0.9306) \\ \hline TOT & 0.1248 & 0.3287 (0.7068) \\ \hline C & -76.8689 & 175.04 (0.6636) \\ \hline Threshold Variable (non-linear part) \\ \hline IMP & -6.8694 & 10.875 (0.5322) \\ \hline EXP & -2.1469 & 19.264 (0.9120) \\ \hline TOT & 0.1248 & 0.3287 (0.7068) \\ \hline C & 83.900 & 174.11 (0.6333) \\ \hline Slopes & \\ \hline Slope & 4.1917 & 5.4153 (0.4448) \\ \hline Threshold & \\ \hline Threshold & 9.4302 & 0.8911 (0.0000) \\ \hline \end{tabular}$	Variables	Coefficient	Standard Error (Prob.)	
IMP       7.3310       10.902 (0.5063)         EXP       1.6816       19.140 (0.9306)         TOT       0.1248       0.3287 (0.7068)         C       -76.8689       175.04 (0.6636)         Threshold Variable (non-linear part)       IMP       -6.8694         IMP       -6.8694       10.875 (0.5322)         EXP       -2.1469       19.264 (0.9120)         TOT       0.1248       0.3287 (0.7068)         C       83.900       174.11 (0.6333)         Slopes       Slope       4.1917       5.4153 (0.4448)         Threshold       9.4302       0.8911 (0.0000)	Threshold Variable (linear part)			
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IMP       -6.8694       10.875 (0.5322)         EXP       -2.1469       19.264 (0.9120)         TOT       0.1248       0.3287 (0.7068)         C       83.900       174.11 (0.6333) <u>Slopes</u> 5.4153 (0.4448) <u>Threshold</u> 9.4302       0.8911 (0.0000)	Threshold Variable (non-linear part)			
EXP       -2.1469       19.264 (0.9120)         TOT       0.1248       0.3287 (0.7068)         C       83.900       174.11 (0.6333)         Slopes       5.4153 (0.4448)         Threshold       9.4302       0.8911 (0.0000)	IMP	-6.8694	10.875 (0.5322)	
TOT       0.1248       0.3287 (0.7068)         C       83.900       174.11 (0.6333) <u>Slopes</u> 5.4153 (0.4448) <u>Threshold</u> 9.4302       0.8911 (0.0000)	EXP	-2.1469	19.264 (0.9120)	
C     83.900     174.11 (0.6333) <u>Slopes</u> 4.1917     5.4153 (0.4448) <u>Threshold</u> 9.4302     0.8911 (0.0000)	ТОТ	0.1248	0.3287 (0.7068)	
Slopes         4.1917         5.4153 (0.4448) <u>Threshold</u> 9.4302         0.8911 (0.0000)	С	83.900	174.11 (0.6333)	
Slope         4.1917         5.4153 (0.4448) <u>Threshold</u> 9.4302         0.8911 (0.0000)	<u>Slopes</u>			
Threshold         9.4302         0.8911 (0.0000)	Slope	4.1917	5.4153 (0.4448)	
Threshold         9.4302         0.8911 (0.0000)	Threshold			
	Threshold	9.4302	0.8911 (0.0000)	

Source: Author's Computation, 2024

The study objective to capture the direction of causality between IT and ERV in Nigeria was achieved using the Granger causality test. The test report presented in Table 5 shows the direction of causality between IT variables (export, import, and terms of trade) and ERV in Nigeria. From the result it is evident that there is a unidirectional causality from export and import to ERV while a bidirectional causality exists between terms of trade and Nigeria ERV. The result further shows that a unidirectional causality exists from import to export trade in Nigeria with no evidence of causation between terms of trade and export as well as import over the years under the study consideration.

The causality result confirms that trade (import, export, and terms of trade) in Nigeria are causing volatility in the exchange rate. The bidirectional relationship between terms of trade and ERV implies that as terms of trade influences ERV, so as the latter causes changes in the former. The granger causality empirical result is in line with the findings of Danladi et al. (2015) who found that causal relationship exists between IT and ERV. Also, the result corroborates the submission of Odili (2015) who established a unidirectional causality from export to ERV but not in conformity with the other submission of one-way causality from ERV to import. The contradiction in this result could be attributed to differences in study period and estimation procedures.

Table 5: Pairwise Granger Causality Tests

Null Hypothesis:	Obs	<b>F-Statistic</b>	Prob.	Causality
EXP does not Granger Cause REERV		6.05934	0.0186	Unidirectional
REERV does not Granger Cause EXP	40	0.68160	0.4143	
IMP does not Granger Cause REERV		4.97970	0.0318	Unidirectional
REERV does not Granger Cause IMP	40	1.07917	0.3056	
TOT does not Granger Cause REERV		5.45352	0.0251	Bidirectional
REERV does not Granger Cause TOT	40	5.27660	0.0274	
IMP does not Granger Cause EXP		1.4E-06	0.9991	Unidirectional
EXP does not Granger Cause IMP	40	4.53776	0.0399	
TOT does not Granger Cause EXP		0.05876	0.8098	No causality
EXP does not Granger Cause TOT	40	0.00692	0.9342	
TOT does not Granger Cause IMP		2.77816	0.1040	No causality
IMP does not Granger Cause TOT	40	0.01185	0.9139	
Source: Author's Computation, 2024				

#### 5. Conclusion and Recommendations

The study examines the threshold effects of IT (import and export) on the Nigeria ERV over the period of 1981 to 2021. The study objectives on threshold impact of trade on ERV in Nigeria showed evidence of different responds of ERV to thresholds of import and export. This is because of the significant role that IT plays in the growth, development, and achievement of the country's macroeconomic objectives, as well as the high risk associated with the Nigerian exchange rate. Also, the

existence of causality between IT and ERV in Nigeria support the findings of the threshold regression and revealed that causal relationships exist among import, export, terms of trade and ERV in Nigeria. The study thus concludes that IT has impact and explains volatility in the Nigeria exchange rate.

To reduce the volatility in the Nigeria exchange rate, the study recommends that policies should be made reduce the country's importation. This can be achieved by encouraging and promoting local manufacturing industries that can produce goods in which the country has resources to make. Such policy will clamp down pressure on demand for foreign goods and subsequently reduces dollar demand and thus lower the rate of volatility in the Nigeria exchange rate. Similarly, based on the study findings, it is recommended that the export based of Nigeria should be moved beyond oil and non-oil. Currently, the country's exports are highly primary product or raw materials oriented, in this regard the country's gains from trade are minimal as compared to countries exporting manufactured products. Shifting the export based of the country to secondary product while local industries are encouraged to compete with foreign products for the citizen will ensure a favourable term of trade and thereby reduce volatility of the exchange rate.

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