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The effect of exchange rate volatility on international trade in Nigeria

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Abstract
The study examined the effect of exchange rate volatility on international trade in Nigeria. The specific objectives were to investigate the impact of exchange rate on import and export in Nigeria. The study employed an ex post facto research design and used monthly data from January 2013 to December 2023. Generalized Autoregressive Conditional Heteroskedasticity (GARCH) methodology was employed in the study to measure exchange rate volatility. Vector Autoregression (VAR) model was used to analyze the relationships between exchange rate volatility and trade variables. While the Impulse Response Function (IRF) was used to examine the impulse responses of trade variables to exchange rate volatility shocks, the Granger Causality test was used to determine the causality between exchange rate volatility and trade variables. Findings showed that exchange rate volatility has a significant negative effect on imports and a positive effect on exports on the Nigeria economy. Based on the findings, it was recommended that exchange rate management is crucial for trade policy decisions in Nigeria.
JEL Classification: C58, F18, F31

Keywords: Exchange rate volatility, export trade, import trade, impulse response function, GARCH, granger causality

1. Introduction
Nigeria's economy has been plagued by persistent exchange rate fluctuations, which have had far-reaching consequences for the country's international trade and economic growth. The exchange rate is a critical determinant of a country's trade competitiveness, investment attractiveness, and overall economic performance. However, Nigeria's exchange rate has been volatile, largely due to factors such as interest rates, inflation, balance of payment dynamics, and government intervention.

Since Nigeria adjusted from the fixed exchange rate to a floating exchange rate regime in 1986, it has led to increased exchange rate volatility, which has continued to pose challenges for policymakers, traders, and investors. In response to the fluctuating exchange rate, the Central Bank of Nigeria (CBN) attempted to stabilize the exchange rate movement by devaluing the naira. However, both the Nominal and Real exchange rates experienced a significant increase between 2000 and 2006, peaking in 2007 before declining. The exchange rate volatility continued to be unpredictable from 2010 till date.

Despite Nigeria's long history of engaging in international trade, the country has struggled to make a significant impact in global trade, with a low level of participation and share. This may be attributed to various factors, including low productivity, reliance on primary products, and adverse exchange rate volatility. This research aims to investigate the impact of exchange rate volatility on international trade in Nigeria.

The adoption of the International Monetary Fund (IMF) Structural Adjustment Programme (SAP) in 1986 led to a transition from a fixed exchange rate regime to a floating exchange rate regime in Nigeria, resulting in exchange rate volatility. Since then, exchange rate fluctuations have posed significant challenges to Nigeria's international trade, with unclear effects on import and export activities. According to Mordi (2006) [6], exchange rate in Nigeria is driven by economic fundamentals such as Gross Domestic Product (GDP), inflation, interest rate and balance of payment among others.

Several studies discuss the relationship between exchange rate volatility and import and

export trades. The basic idea is that, if countries are risk-averse (or even risk-neutral), higher exchange rate uncertainty may lead to a reduction in the volume of trade because they may not want to risk their expected trade profits. Exchange rate volatility can affect import and export trade directly, through uncertainty and adjustment costs, and indirectly, through its effect on the structure of output and investment and on government policy. Brodsky (1984) [7] and Udeh (2010) [17] posit that different schools of thought have a diverse view of the relationship between exchange rate volatility and international trade performances.

While previous studies have shown that exchange rate volatility (ERV) has a negative impact on import and export trade in the short run and positive impact in the long run, there is still a need for more comprehensive and detailed empirical evidence to confirm and expand upon these findings in the context of Nigeria. This study aims to contribute to the existing body of knowledge on the topic by providing additional evidence on the relationship between ERV and international trade in Nigeria, which can inform policy decisions related to international trade and exchange rate management. The broad objective of the study is to investigate the effect of exchange rate volatility on international trade in Nigeria.

The following research hypotheses were formulated in the null form to guide the study.

$H0_1$: Exchange rate volatility has no significant impact on import in Nigeria.

$H0_2$: Exchange rate volatility has no significant impact on export in Nigeria.

The study on the impact of exchange rate volatility on import and export trade in Nigeria is significant because it provides valuable insights for policymakers, traders, and other stakeholders. Findings from the study will contribute to the existing body of knowledge on exchange rate volatility and international trade, helping to identify strategies for promoting sustainable trade growth and economic development in Nigeria.

The study investigates the impact of exchange rate volatility on import and export trades in Nigeria from 2013 to 2023. Specifically, the study examines the relationship between changes in exchange rates and changes in import and export volumes, values, and prices. The study uses a Vector Autoregression (VAR) model to analyze the relationship between exchange rate volatility and import and export activities, and a Generalized AutoRegressive Conditional Heteroskedasticity (GARCH) model to analyze the volatility of exchange rates over time. Simply put, the scope of this study is focused on the relationship between exchange rate volatility and international trade in Nigeria, using a combination of statistical and econometric techniques to analyze the data.

The study has several limitations that may affect the validity and generalizability of the results. Firstly, the study uses monthly data, which may not capture short-term fluctuations in exchange rates or trade flows. Secondly, the models used in the study, the VAR and GARCH models, are based on certain assumptions that may not hold in all circumstances. Thirdly, the study aims to establish a causal relationship between exchange rate volatility and international trade, but there may be other factors that influence this relationship, such as political instability or external shocks. Fourthly, the study is limited to the specific period from 2013 to 2023, and to the specific conditions of Nigeria during that period. The results of the study may not be generalizable to other countries or time periods. Finally, the study relies on publicly available data, which may be incomplete or biased in some way. These limitations should be kept in mind when interpreting the results of the study.

2. Review of related literature

This chapter captures the conceptual review, theoretical review and empirical review of related works on exchange rate volatility and international trade in Nigeria.

2.1 Conceptual Review

The concept of exchange rate and its impact on international trade is a critical aspect of international economics. Exchange rate fluctuations can significantly influence a country's trade balance, economic growth, and overall development. This section provides an overview of the key concepts related to international trade and exchange rate, including the concept of international trade, exchange rate, the historical perspective on Nigeria's exchange rate policy, the nature of exchange rate volatility in Nigeria and the impact of exchange rate volatility on international trade. Understanding these concepts is essential for analyzing the impact of exchange rate on international trade in Nigeria.

2.1.1 The Concept of International trade

International trade refers to the exchange of goods, services, and capital between different countries. It is a vital component of international economics and plays a crucial role in shaping the global economy.

Benefits of International trade include: Increased economic growth and development, Improved efficiency and productivity, Enhanced competition and innovation, Access to new markets and customers, and Increased availability of goods and services.

2.1.2 The Concept of Exchange Rate

The exchange rate represents the value at which one nation's currency is traded for another country's currency {Mordi (2006) [14]. It is also defined as the price at which international exchange occurs between two countries (Mankiw, 1997) [13]. Furthermore, the exchange rate serves as an indicator of a currency's strength relative to another country's currency. In essence, it represents the quantity of one currency required to purchase a unit of another country's currency, as determined by market forces in a free market. The exchange rate between the US Dollar (USD) and the Nigerian Naira (NGN) is 1 USD = 450 NGN. This means that one US Dollar can be exchanged for 450 Nigerian Naira. Conversely, if you have 450 Naira, you can exchange it for one US Dollar. In this example, the exchange rate is expressed as a ratio of the two currencies, with the USD as the base currency and the NGN as the quote currency. Exchange rates can fluctuate constantly due to market forces, economic conditions, and other factors, affecting the value of currencies and the cost of international trade.

Exchange rate volatility refers to the fluctuations in the exchange rate, leading to a persistent depreciation of the domestic currency (Kandil and Mirzaie, 2008) [12]. This volatility exposes economic agents to greater exchange rate risk, which can be anticipated or unanticipated. Unanticipated fluctuations have a more significant impact, influencing aggregate demand and supply through exports, imports, and the cost of intermediate goods (Kandil and Mirzaie, 2008) [12]. The Nigerian Naira (NGN) has experienced significant exchange rate volatility against the US Dollar (USD) in recent years. For instance, in 2020, the exchange rate depreciated from 360 NGN/USD to 450 NGN/USD within a few months, representing a 25% decline in the value of the Naira. This sudden change made imports more expensive, affecting businesses and consumers who rely on foreign goods. In this example, the exchange rate volatility is evident in the rapid depreciation of the Naira against the Dollar, highlighting the risks and uncertainties associated with exchange rate fluctuations. Such volatility can impact trade, investment, and economic stability, making it essential for businesses and policymakers to monitor and manage exchange rate risks. Exchange rates are closely tied to cross-border capital movements, and changes in exchange rates have significant effects on trade flows and overall economic growth (Shehu and Youtang, 2012) [16]. A depreciation of the domestic currency can improve exports and lead to a positive trade balance, while changes in the real exchange rate indicate the strength or weakness of the currency and the competitiveness of domestic industries. Exchange rate volatility occurs when there is a deviation from the benchmark rate over time, indicating misalignment and potential currency instability, particularly in flexible exchange rate regimes where demand and supply forces determine the exchange rate (Agbaeze *et al*. 2023) [1].

2.1.3 Types of Exchange Rates

Exchange rates can be classified into three main types based on the degree of government intervention and market forces as follows.

- **Fixed Exchange Rate:** A fixed exchange rate is pegged to a stronger currency or a basket of currencies at a fixed ratio. The government or central bank intervenes to maintain the fixed rate by buying or selling currencies. Example: The Chinese Yuan (CNY) was pegged to the US Dollar (USD) until 2005.
- **Floating Exchange Rate:** A floating exchange rate is determined by market forces, with no government intervention. The exchange rate fluctuates based on supply and demand in the foreign exchange market. Example: The Japanese Yen (JPY) and British Pound (GBP) are floating currencies.
- **Managed Float Exchange Rate:** A managed float exchange rate is a hybrid of fixed and floating rates. The government or central bank intervenes occasionally to influence the exchange rate, but also allows market forces to play a role. Example: The Nigerian Naira (NGN) operates a managed float regime, with the Central Bank of Nigeria intervening to stabilize the currency.

2.1.4 Factors Influencing Exchange Rates

Macroeconomic variables such as demand and supply, growth and inflation rates, and changes in relative rates of return influence exchange rate volatility. Exchange rates are influenced by a complex array of factors, which can be broadly categorized into economic, political e.g. inflation rate, interest rate, balance of payments, gross domestic product, etcetera; political factors e.g. government policies, election and political uncertainty; and external factors such as Global economic trends, oil prices, Central Banks Interventions, among others.

2.1.5 Nature of Exchange Rate Volatility in Nigeria

In Nigeria, exchange rate management has a long history, dating back to 1960, with two distinct periods: pre-Structural Adjustment (1960-1985) and post-Structural Adjustment (1986-present). Exchange rate volatility in Nigeria is unstable and hard to predict in the value of the Naira (NGN) against major international currencies, particularly the US Dollar (USD). This volatility is driven by intricate interplay of factors, including:

1. **Dependence on oil exports:** Nigeria's heavy reliance on oil exports makes its economy vulnerable to global oil price shocks, leading to exchange rate fluctuations.
2. **Fiscal policy inconsistencies:** Frequent changes in government policies and inconsistent implementation of fiscal measures contribute to exchange rate uncertainty.
3. **External shocks:** Global economic downturns, trade wars, and geopolitical tensions can impact Nigeria's exchange rate.
4. **Domestic economic factors:** Inflation, interest rates, and balance of payments dynamics also influence exchange rate movements.

Consequently, the Naira has experienced significant depreciations, with occasional sharp appreciations, making it challenging for businesses and policymakers to predict and plan for future exchange rate movements. This volatility has far-reaching implications for Nigeria's international trade, including:

1. **Reduced competitiveness:** Volatile exchange rates make it difficult for Nigerian businesses to compete in the global market.
2. **Decreased investment:** Uncertainty in exchange rates deters foreign investment and hinders economic growth.
3. **Increased costs of imports:** A depreciating Naira increases the cost of imports, fueling inflation and affecting consumer spending.
4. **Trade balance instability:** Exchange rate volatility affects Nigeria's trade balance, leading to instability in the economy.

2.2 Theoretical Review of Literature

Exchange rate determination is a complex phenomenon that has been explored through various theoretical lenses. This subsection reviews the fundamental theories that explain the dynamics of exchange rate determination, providing a foundation for understanding the underlying mechanisms that influence exchange rate fluctuations. Two prominent theories are discussed in the paper. They are: The Balance of Payments Theory, which emphasizes the role of demand and supply forces in the foreign exchange market, and the Purchasing Power Parity Theory, which highlights the

relationship between exchange rates and relative price levels across countries. These theories offer valuable insights into the factors that shape exchange rate movements and inform the analysis of exchange rate impacts on international trade in Nigeria.

2.2.1 The Balance of Payments Theory

The BOP theory was developed by Sydney Alexander in the 1970s. Also known as the Demand-Supply Theory, posits that a country's exchange rate is determined by its balance of payments position. A favorable balance of payments leads to currency appreciation, while an unfavorable balance results in depreciation. This theory suggests that the exchange rate is determined by the forces of demand and supply in the foreign exchange market, which are influenced by various items in a country's balance of payments. Specifically, a deficit in the balance of payments leads to a depreciation of the exchange rate, while a surplus result in an appreciation of the home currency. This theory highlights the importance of balance of payments in determining the external value of a country's currency.

2.2.2 The Theory of Purchasing Power Parity

In 1920, Gustav Cassel introduced the Purchasing Power Parity (PPP) theory to determine the exchange rate between countries with non-convertible paper currencies. The theory suggests that the equilibrium exchange rate is determined by the relative price movements in both countries. In essence, the exchange rate is influenced by the respective price levels in each nation. The PPP theory aims to explain and quantify the equilibrium exchange rate and its fluctuations based on price levels and their variations across countries. When the purchasing power of two non-convertible paper currencies is equal, the exchange rate is considered to be in equilibrium. The exchange rate is determined by the domestic price levels in both countries. The relative version of exchange rate determination states that the current exchange rate is determined by the equilibrium exchange rate in the base period, adjusted for the ratio of price indices in both countries between the current and base periods. Simply put, the exchange rate represents the ratio of the cost of purchasing a specific set of goods domestically compared to the cost in a foreign country.

2.3 Empirical Review of Literature

This sub-section considers research works earlier undertaken in the area of exchange rate volatility, import and export trades.

Audi (2024) [4] investigated the impact of exchange rate volatility economic growth of Lebanon. Annual time series data spanning 1980 and 2023 were utilized in the study. ARDL model was employed to explore both short run and long run dynamics between variables. Results revealed a positive and significant effect in the long run and a negative and non-significant effect in the short run. Government of Lebanon was advised to adopt efficient macroeconomic policies intended to mitigate the adverse effects of currency volatility.

Agbaeze *et al*. (2023) [1] investigated exchange rate and import volume in Nigeria. The study covered 1981 to 2020 and employed ARDL model in analyzing the variables. Annual time series data on non-oil import, exchange rate volatility, trade openness and inflation rate. Findings revealed that non-oil imports and trade openness endogenously contribute to volume of import in Nigeria more than official exchange rate volatility. It was concluded that official exchange rate volatility has minimal economic influence on the amount of imports in Nigeria.

Barguellil *et al*. (2018) [6] assessed exchange rate volatility and economic growth in 45 sampled developing and emerging countries over the period of 1985 to 2015. The difference and system of Generalized Method of Moments (GMM) estimators were used in the study. It was found that GARCH-based measure of nominal and real exchange rate volatility has a positive impact on economic growth. Besides, exchange rate regimes and financial openness influence exchange rate volatility. It became obvious that volatility was more severe in a flexible exchange rate regime and financial openness.

Ikechi and Nwadiubu (2020) [11], investigated the effect of exchange rate fluctuations on international trade in Nigeria, assumed that exchange rate volatility has an effect on the volume of export and import trading activities using secondary data from 1996 to 2018. Augmented Dickey-Fuller root unit was employed 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 longterm estimation. The estimations of the VAR model suggested a converse relationship between export, import and REER during the current period. The entity increase in exports and imports in a given year contributed 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.

Examined the impact of exchange rate on total export in Nigeria. They used secondary data covering periods of 1981-2019. The study used the Ordinary Least Share method to analyze the short run relationship of the model. And the study found that on the short run, the effect of exchange rate volatility on export in Nigeria was negative. They recommended authority to manage the dynamics in exchange rate and to distort other microeconomics variables stability.

Egedegbe and Eloho (2016) [10], investigated the impact of foreign exchange rate volatility on Nigeria's imports, covering the period from 1970 to 2011. The research employed a comprehensive approach, utilizing ARCH and GARCH models to examine exchange rate volatility and Johansen co-integration technique with Error Correction Model (ECM) to analyze the relationships between variables. The findings revealed a significant negative relationship between exchange rate volatility and imports, indicating that volatility exerts detrimental pressure on import levels. Real Effective Exchange Rate (REER) was found to have a statistically significant effect on imports, while Nominal Effective Exchange Rate (NEER) exhibited a positive and linear relationship with imports. The results suggested that an appreciation of the NEER, resulting from a declining REER, leads to increased import prices and

subsequently decreased local demand for imported goods. The study concluded by recommending a depreciation of the foreign exchange rate to reduce import levels in Nigeria.

Bala and Asemota (2013) [5] employed GARCH to examine exchange rate volatility using monthly data exchange rate return series from January 1985 to July 2011 for US$. January 2004 to July 2011 for both Naira/British Pounds and Naira/Euro returns. It was found that there was volatility in the three currencies. It was recommended that significant events in GARCH models should be incorporated in volatility estimation of some asset prices.

Aliyu (2010) [2], employed the vector error correction model (VECM) and vector autoregression (VAR) model to investigate the impact of exchange rate volatility on Nigeria's non-oil exports between 1986Q1 and 2006Q4. The findings revealed a long-run stable and inverse relationship between the volatility of the Naira exchange rate and non-oil exports in Nigeria, indicating that exchange rate instability negatively affects non-oil exports. Conversely, the study found a positive relationship between US Dollar exchange rate volatility and non-oil exports, suggesting that fluctuations in the US Dollar exchange rate have a positive impact on Nigeria's non-oil exports.

Arise *et al.* (2000) [3], applied the Johansen's co-integration procedure and ECM to detect a negative effect of real exchange rate volatility on export. Quarterly data spanning from 1973 to 1996 on thirteen Less Developed Countries (LDCs) were used in the analysis. The result revealed that an increase in REER resulted in a significant negative effect on export demand in each of the thirteen (13) countries in both short and long-run.

A study on Mexico, Indonesia, Nigeria, and Turkey used GARCH models, ARDL bound testing, and Granger causality models to analyze the impact of exchange rate volatility on international trade activities. The results showed no long-term linkage between exchange rate volatility and international trade activities, except for Turkey, where a small effect was detected. Short-term causal relationships were found between volatility and import/export demand for Indonesia and Mexico, while Nigeria exhibited unidirectional causality from export demand to volatility.

3. Methodology

This chapter discusses the research method used in the study. It covers the discussion of the Research Design, sources and nature of data, theoretical specification of model, empirical specification of model, and operational measures of variables adopted by the study.

3.1 Research Design

This study employs a quantitative approach and ex-post facto research design. The ex-post facto design is a type of non-experimental research that aims to identify relationships between variables by examining existing data. This design is suitable for this study because it allows for an in-depth examination of the effects of exchange rate volatility on international trade in Nigeria, without manipulating any variables. The qualitative approach is chosen to gain a deeper understanding of the complex interactions between exchange rate volatility and international trade in Nigeria. This approach enables the use of descriptive statistics and content analysis to uncover patterns and themes in the data.

3.2 Source and Nature of Data

This study utilizes secondary data obtained from reputable sources to examine the effects of exchange rate volatility on international trade in Nigeria. The data sources were National Bureau of Statistics and ng.investing.com. The data for Import (IM) and Export (EX) (value) were obtained from the National Bureau of Statistics, while the Exchange rate data (NGN/USD) were obtained from (ng.investing.com). The secondary data covered the period from 2013m1 to 2023m12, allowing for a comprehensive analysis of the relationship between exchange rate volatility and international trade in Nigeria over the past decade.

3.3 Theoretical Specification of Model

This study employed a combination of theoretical models to examine the effects of exchange rate volatility on international trade in Nigeria.

Generalized autoregressive conditional heteroskedasticity (GARCH) model

The GARCH model was used to measure exchange rate volatility (ERV). The model specified the conditional variance of the exchange rate as a function of past variances and errors, allowing for the capture of volatility clustering and leptokurtosis.

$$ERVt = \alpha0 + \alpha1(ERVt\text{-}1) + \beta1(\varepsilon t\text{-}1) + . + \alpha p(ERVt\text{-}p) + \beta p(\varepsilon t\text{-}p)$$

Where ERVt is the exchange rate volatility at time t, α and β are parameters, and ε_t is the error term.

Vector Autoregression (VAR) Model

The VAR model is used to examine the relationships between exchange rate volatility, import, and export. The model specifies each variable as a function of its own past values and the past values of the other variables.

$$IMt = \alpha_1 + \beta_{11}ERVt\text{-}1 + \beta_{12}IMt\text{-}1 + \beta_{13}EXt\text{-}1 + \varepsilon_{1t}$$
$$EXt = \alpha_2 + \beta_{21}ERVt\text{-}1 + \beta_{22}IMt\text{-}1 + \beta_{23}EXt\text{-}1 + \varepsilon_{2t}$$
$$ERVt = \alpha_3 + \beta_{31}IMt\text{-}1 + \beta_{32}EXt\text{-}1 + \beta_{33}ERVt\text{-}1 + \varepsilon_{3t}$$

where IM, EX, and ERV are the import, export, and exchange rate volatility variables, respectively; α and β are parameters; and ε is the error term.

The expected relationships among the variables are:

a) Exchange rate volatility (ERV) is expected to have a negative impact on import (IM) and export (EX).
b) Import (IM) and export (EX) are expected to have a positive relationship.

3.4 Empirical Specification of Model

i. GARCH Model

The GARCH (1,1) model is used to estimate exchange rate volatility (ERV):

$$ERVt = \alpha_0 + \alpha_1(ERV_{t\text{-}1}) + \beta_1(\varepsilon_{t\text{-}1}) + \varepsilon_t$$

Where ERVt is the exchange rate volatility at time t, α0 is the constant term, α1 is the persistence parameter, β1 is the volatility spillover parameter, and εt is the error term.

ii. VAR Model

The VAR (1) model is used to examine the relationships between exchange rate volatility, import, and export:

$$IMt = \alpha_1 + \beta_{11}ERV_{t-1} + \beta_{12}IM_{t-1} + \beta_{13}EX_{t-1} + \varepsilon_{1t}$$
$$EXt = \alpha_2 + \beta_{21}ERV_{t-1} + \beta_{22}IM_{t-1} + \beta_{23}EX_{t-1} + \varepsilon_{2t}$$
$$ERVt = \alpha_3 + \beta_{31}IM_{t-1} + \beta_{32}EX_{t-1} + \beta_{33}ERV_{t-1} + \varepsilon_{3t}$$

where IM, EX, and ERV are the import, export, and exchange rate volatility variables, respectively; α_1, α_2, and α_3 are the constant terms; β_{11}, β_{12}, …. β_{33} are the coefficients; and ε_{1t}, ε_{2t}, and ε_{3t} are the error terms.

The models were estimated using monthly data from 2013 to 2023, obtained from the National Bureau of Statistics and ng.investing.com. The estimation method used was the Maximum Likelihood Estimation (MLE) method, which provides efficient and consistent estimates of the model parameters.

3.5 Operational Measures of Variable: This section defined and operationalized the variables used in the study.

1. **Exchange Rate Volatility (ERV):** ERV is measured using the GARCH (p, q) model, which estimates conditional variance of exchange rate returns.
2. **Import (IM):** IM is measured as the total value of goods imported into Nigeria, in billions of NGN, on a monthly basis.
3. **Export (EX):** EX is measured as the total value of goods exported from Nigeria, in billions of NGN, on a monthly basis.

4. Results presentation, analysis and discussion

This chapter covers mainly the presentation of regression results obtained for the study, analysis of the results (descriptive analysis, unit root analysis and regression analysis), test of research hypotheses and discussion of findings from the study.

4.1 Descriptive Statistics

The descriptive statistic technique on the data was conducted using measures of central tendency, measures of dispersion, and data normality measures. The measures of central tendency included the mean and media, while the measures of dispersion were standard deviation, skewness, and kurtosis. The normality measure was the Jarque-Bera statistic and probability. The descriptive statistics are presented in Table 1.

Table 1: Descriptive Statistics

	EXR	IM	EX
Mean	321.656	1209030	14711075
Median	305.81	936546.1	1346084
Maximum	881.03	3485483	4284567
Minimum	157.1	439875.6	428718.5
Std. Dev.	144.549	719771.1	731154.2
Skewness	1.60089	1.230123	1.705253
Kurtosis	6.5123	3.849524	6.807234
Jarque-Bera	124.232	37.25974	143.6962
Probability	0	0	0
Sum	42458.6	1.60E+08	1.94E+08
Sum Sq. Dev.	2737148	6.79E+13	7.00E+13
Observations	132	132	132

Source: Researcher's Eview's computation, 2024

From the above results, Exchange Rate Volatility has the following statistics: Mean (321.66) and median (305.81) values indicate that the average exchange rate volatility is around 321-306. High standard deviation (144.55) suggests significant variability in exchange rate volatility. Positive skewness (1.60) indicates that extreme values are concentrated on the right side, showing occasional high volatility. High kurtosis (6.51) indicates a leptokurtic distribution, meaning extreme values are more common than in a normal distribution. Jarque-Bera test (124.23 and probability (0.0000) suggest that the data is not normally distributed.

Imports has the following statistics: Mean (1,209,030) and median (936,546) values indicate that the average import value is around 1.2-0.9 million. High standard deviation (719,771) suggests significant variability in imports. Positive skewness (1.23) indicates some extreme values on the right side. Kurtosis (3.85) is closer to a normal distribution. Jarque-Bera test (37.26) and probability (0.0000) suggest that the data is not normally distributed.

Exports: Mean (147,107) and median (1,346,084) values indicate that the average export value is around 147-1.3 million. High standard deviation (731,154) suggests significant variability in exports. Positive skewness (1.71) indicates extreme values are concentrated on the right side. High kurtosis (6.81) indicates a leptokurtic distribution. Jarque-Bera test (143.70) and probability (0.0000) suggest that the data is not normally distributed.

4.1.1 Unit Root Test

The unit root analysis was conducted to determine the adequacy of the data collected in this study to be used in regression estimation. The notion is that data with unit root problems may lead to the production of spurious regression results that may not be relied upon for policy decisions. Data that lack unit root are considered appropriate for prediction or estimation while data which are non-stationary (data with unit root) may not be fit for further estimation and will not produce reliable regression results. Given these, and premised on the null hypothesis that each of the variable in this study has a unit root; the analysis was conducted using the Augmented Dickey Fuller (ADF) test. In the test, a unit root exists in a variable if the absolute value of the computed ADF t-statistic value at 5% level of significance is less than the critical value of ADF or the probability value is greater than 0.05. Otherwise, the variable is stated to lack unit root problem. The excerpts from the result are presented in Table 2.

Table 2: ADF unit root test Result

Variable	ADF t-statistic	Test Critical Value @ 5%	P- Value	Order of Integration
EXR	-10.8191	-2.883753	0.0000	1(1)
IM	-8.44443	-2.884291	0.0000	1(1)
EX	-15.6449	-2.883753	0.0000	1(1)

Source: Researcher's computation from Eviews

This was carried out using Augmented Dickey-Fuller unit root tests to ascertain whether the data set is stationary or not and the order of integration. From the Table 2; all the three variables, namely exchange rate (EXR) Import (IM) and Export (EX) became stationary at the first difference.

4.1.2 Generalized Autoregressive Conditional Heteroskedasticity (GARCH): To estimate the volatility of the exchange rate, the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model was employed. The resulting exchange rate volatility series was then used as a variable in the Vector Autoregression (VAR) analysis to examine its relationships with Import (IM) and Export (EX). The result is presented below.

Dependent Variable: EXR Method: ML ARCH - Normal distribution Sample (adjusted): 2013M02 2023M12 Included observations: 131 after adjustments Convergence achieved after 166 Iterations Presample variance: backcast (parameter = 0.7) GARCH = C (3) + C (4)*RESID (-1)^2 +C (5)*GARCH (-1)

Table 3: GARCH model Result

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	7.006801	0.005221	1342.131	0.0000
EXR (-1)	0.972643	5.78E-06	168013.2	0.0000
Variance Equation				
C	0.368194	0.169899	2.167139	0.0302
RESID (-1)^2	-0.0475	0.003465	-13.7112	0.0000
GARCH (-1)	1.110107	0.008253	134.5111	0.0000
R-squared	0.954722	Mean dependent var		322.912
Adjusted R-squared	0.954371	S. D. dependent var		144.378
S. E. of regression	30.84071	Akaike info criterion		7.58816
Log likelihood	-492.024	Schwarz criterion		7.6979
Durbin-Watson stat	1.63857	Hannah-Quinn criter.		7.63275

Source: Researcher's computation from Eviews

The GARCH model estimation revealed significant volatility clustering and persistence in the Exchange Rate (EXR) series. The coefficient for lagged squared residuals (RESID (-1) ^2) is -0.047504, indicating that past volatility shocks have a significant impact on current volatility, although the effect is negative, suggesting a dampening effect. Additionally, the coefficient for lagged volatility (GARCH (1)) is 1.110107, suggesting that past volatility levels strongly contribute to current volatility. These findings imply that EXR volatility is prone to clustering and persistence, making it challenging to predict. The constant term (C) in the variance equation is 0.368194, indicating a non-zero mean volatility. This suggests that there is a baseline level of volatility in the EXR series, even in the absence of external shocks. The significance of the constant term and the lagged squared residuals and volatility terms indicates that the GARCH model is capturing important features of EXR volatility. The diagnostic metrics, such as the AIC (7.588157) and log-likelihood (-492.0243), suggest a relatively good fit of the GARCH model to the data.

4.1.3 Regression Analysis: Vector Autoregression (Var)

The selected lag on this analysis was based on the Akaike criterion which is 6 lags. The results from these analyses are shown in Table 4.

Table 4: VAR Result for EXR Equation

Vector Autoregression Estimates Included observations: 125 after adjustments sample (adjusted): 2013m08 2023m12				
EXRVOL				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
EXRVOL(-1)	0.125317	0.09943	1.26030	0.2085
EXRVOL(-2)	0.032362	0.09555	0.33889	0.7351
EXRVOL(-3)	-0.086458	0.09774	0.88456	0.3771
EXRVOL(-4)	0.142798	0.09857	1.44872	0.1484
EXRVOL(-5)	0.96481	0.09859	0.97864	0.3285
EXRVOL(-6)	0.222384	0.09908	2.24443	0.0255
D(IM(-1))	2.41E-05	8.40E-06	2.88194	0.0042
D(IM(-2))	2.28E-05	1.20E-05	1.96969	0.0497
D(IM(-3))	3.05E-05	1.30E-05	2.28830	0.0228
D(IM(-4))	2.70E-05	1.40E-05	1.99027	0.0474
D(IM(-5))	3.21E-05	1.20E-05	2.63002	0.0090
D(IM(-6))	-2.95E-07	9.40E-06	-0.03130	0.9750
D(EX(-1))	-1.62E-05	1.00E-05	-1.55090	0.1219
D(EX(-2))	-3.16E-05	1.20E-05	-2.70654	0.0072
D(EX(-3))	-1.21E-05	1.20E-05	0.99809	0.3190
D(EX(-4))	-2.81E-05	-1.20E-05	-2.37321	0.0182
D(EX(-5))	-2.31E-05	-1.20E-05	-1.96459	0.0503
D(EX(-6))	1.45E-05	1.10E-05	1.34834	0.1785
C	2.475108	2.65617	0.93183	0.3521
R-squared	0.293884	Akaike AIC	9.546933	
Adjusted R-squared	0.173977	Schwarz SC	9.976837	
Sum squared resid	75611.98	Mean dependent	5.764240	
S. E of regression	26.70806	S.D. dependent	29.38639	
F-statistic	2.450938	Durbin-Watson stat	1.98646	
Log likelihood	-577.6833			

Source: Researcher's computation from Eviews

From the result above, EXR is significantly affected by its own past values (lags 1-6) and IM's past values (lags 1-5). D(IM(-1)) = 2.41E-05 (p-value = 0.0042): A 1% increase in imports last period is associated with a 0.00241-unit increase in the exchange rate this period. Imports have a positive impact on the exchange rate in the short term, indicating that increased imports lead to a stronger currency. D(EX(-2)) = -3.16E-05 (p-value = 0.0072): A 1% increase in exports two periods ago is associated with a -0.00316-unit decrease in the exchange rate this period. Exports have a negative impact on the exchange rate in the short term, indicating that increased exports lead to a weaker currency. EXRVOL(-6) = 0.222384 (p-value = 0.0255): A 1% increase in the exchange rate six periods ago is associated with a 0.222384-unit increase in the exchange rate this period. The exchange rate has a positive autocorrelation effect in the long term, indicating that past exchange rate movements influence current exchange rates.

Table 5: VAR Result for IM Equation

D(IM)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
EXRVOL(-1)	18557.496	1161.25	1.59956	0.1107
EXRVOL(-2)	229.913	1115.90	2.06105	0.0401
EXRVOL(-3)	-557.5400	1141.48	-0.48844	0.6256
EXRVOL(-4)	468.3285	1151.14	0.40684	0.6844
EXRVOL(-5)	-766.8208	1151.35	-0.66602	0.5059
EXRVOL(-6)	-3375.122	1157.14	-2.91677	0.0038
D(IM(-1))	-0.924194	0.09784	-9.44633	0.0000
D(IM(-2))	0.767697	0.13527	-5.67516	0.0000
D(IM(-3))	-0.497918	0.15559	-3.20016	0.0015
D(IM(-4))	-0.328267	0.15858	-2.07009	0.0393
D(IM(-5))	-0.110494	0.14244	-0.77575	0.4385
D(IM(-6))	-0.202618	0.10988	-1.84403	0.0661
D(EX(-1))	0.353234	0.12172	2.90205	0.0040
D(EX(-2))	0.424399	0.13628	3.11423	0.0020
D(EX(-3))	0.276395	0.14134	1.95555	0.0514
D(EX(-4))	0.301618	0.13832	2.18058	0.0299
D(EX(-5))	0.077275	0.13720	0.56321	0.5737
D(EX(-6))	0.101834	0.12525	0.81307	0.4168
C	37710.75	31020.4	1.21568	0.2250
R-squared	0.575444	Akaike AIC	28.27796	
Adjusted R-squared	0.53349	Schwarz SC	28.70787	
Sum squared resid	1.63E+13	Mean dependent	13588.78	
S. E of regression	311913.0	S.D. dependent	442596.4	
F-statistic	7.981797	Durbin-Watson stat	2.028280	
Log likelihood	-1748.373			

Source: Researcher's computation from Eviews

From the result above, IM is significantly affected by EXR's past values (lags 1-6) and its own past values (lags 1-5). A 1% increase in exchange rate volatility is associated with a 18557.496-unit increase in imports, although this short-term effect is not statistically significant. However, a 1% increase in exchange rate volatility also leads to a 229.913-unit increase in imports, and this short-term effect is statistically significant. In contrast, a 1% increase in exchange rate volatility is associated with a -3375.122-unit decrease in imports in the long term, and this effect is statistically significant. This indicates that exchange rate fluctuations have a significant effect on import.

Table 6: VAR Result for EX Equation

D(EX)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
EXRVOL(-1)	1879.507	959.292	1.95927	0.0510
EXRVOL(-2)	2137.173	921.822	2.31842	0.0211
EXRVOL(-3)	1347.144	942.957	1.42864	0.1541
EXRVOL(-4)	1616.371	980.939	1.69976	0.0902
EXRVOL(-5)	1489.672	951.115	1.56624	0.1183
EXRVOL(-6)	-456.955	955.897	-0.47804	0.6330
D(IM(-1))	0.120810	0.08082	1.49108	0.1369
D(IM(-2))	0.297192	0.11175	2.65951	0.0082
D(IM(-3))	0.313129	0.12853	2.43620	0.0154
D(IM(-4))	0.312217	0.13100	2.38339	0.0177
D(IM(-5))	0.228332	0.11766	1.94046	0.0532
D(IM(-6))	-0.039535	0.09077	-0.43556	0.6635
D(EX(-1))	-0.495338	0.10055	-4.92629	0.0000
D(EX(-2))	-0.246464	0.11288	-2.18930	0.0293
D(EX(-3))	-0.178576	0.11676	-1.52946	0.1271
D(EX(-4))	-0.167860	0.11426	-0.94396	0.3459
D(EX(-5))	-0.154204	0.11334	-1.36053	0.1746
D(EX(-6))	0.001915	0.10346	0.01851	0.9852
C	-13946.09	25625.4	-0.54423	0.5867
R-squared	0.303129	Akaike AIC	27.89584	
Adjusted R-squared	0.184793	Schwarz SC	28.32575	
Sum squared resid	7.04E+12	Mean dependent	25239.33	
S. E of regression	257666.0	S.D. dependent	285379.8	
F-statistic	2.561589	Durbin-Watson stat	2.004316	
Log likelihood	-1724.490			

Source: Researcher's computation from Eviews

As seen in the table above, in EXRVOL(-1) a 1% increase in exchange rate volatility is associated with a 1879.507-unit increase in exports, but this effect is not statistically significant (0.0510). In EXRVOL(-2), a 1% increase in exchange rate volatility is associated with a 2137.173-unit increase in exports, and this effect is statistically significant (0.0211). While in EXRVOL(-6), a 1% increase in exchange rate volatility is associated with a -456.955-unit decrease in exports, but this effect is not statistically significant (0.6330). Overall, this indicates that exchange rate volatility has a significant impact on exports.

4.1.4 Impulse Response Analysis

The impulse response analysis helps us understand how one variable responds to a shock or impulse in another variable over time. Table 7 shows how imports and exports respond to shocks in exchange rates.

Table 7: Impulse Response Analysis Result

Period	D (IM)	D (EX)
1	-43432.61 (27762.8)	49654.82 (22831.4)
2	107289.9 (39864.7)	20368.00 (27198.9)
3	26659.02 (40224.7)	37585.61 (26297.7)
4	-59784.06 (39561.2)	29586.57 (26127.1)
5	51859.76 (39527.2)	30409.55 (25998.3)
6	-24866.81 (39149.0)	22499.64 (25857.2)
7	-35711.34 (39185.7)	-8929.441 (25962.2)
8	58868.52 (32037.4)	-12785.64 (20450.5)
9	-5844.906 (22297.9)	-1439.388 (17707.0)
10	-7953.865 (19210.1)	18157.50 (15948.8)
Cholesky One S. D. (d.f. adjusted) Cholesky ordering: EXRVOL D(IM) D(EX) Standard errors: Analytic		

Source: Researcher's computation from Eviews

From the analysis above, IM responds negatively to exchange rate shocks in Period 1 (-43432.61), but then switches to positive responses in Periods 2 (107289.9), period 3 (226659.2) and period 5 (51859.76). In the long run (Periods 4-10), the impact of the exchange rate shock on imports fluctuates, but remains negative, indicating a persistent negative effect. EX responds positively to exchange rate shocks in all periods. The analysis shows that a shock to the exchange rate has a significant positive impact on exports in the short run (Periods 1-3). In the long run (Periods 4-10), the impact of the exchange rate shock on exports fluctuates, but remains positive, indicating a persistent positive effect in period 10 (18157.80).

4.1.5 Causal Effect

The causal effect helps to determine whether one variable predict another. The result of of this test is presented on the table below.

Table 8: Granger causality Result

Var Granger Causality Sample: 2013M01 2023M12 Included observations: 125			
Dependent variable: EXRVOL			
Excluded	**Chi. sq**	**df**	**Prob.**
D (IM)	19.07444	6	0.0040
D (EX)	18.78246	6	0.0045
All	34.82195	12	0.0005
Dependent variable: D(IM)			
Excluded	Chi. sq	df	Prob.
D (EXR)	15.32131	6	0.0179
D (EX)	15.00908	6	0.0202
All	36.22997	12	0.0003
Dependent variable: D(EX)			
Excluded	Chi. sq	df	Prob.
D (EXR)	15.74171	6	0.0152
D (IM)	14.46049	6	0.0249
All	30.69536	12	0.0022

Source: Researcher's computation from Eviews

The results of the Granger causality test reveal significant relationships between the variables. For Exchange Rate (EXR), the excluded variables are Import (IM) and Export (EX), with Chi-Square statistic values of 19.0744 and 18.78246, respectively, and p-values of 0.0040 and 0.0045, indicating statistical significance at a 5% level. This suggests that both IM and EX Granger-cause EXR, meaning that past values of IM and EX significantly predict future values of EXR. Similarly, for Import (IM), the excluded variables are EXR and EX, with Chi-Square statistic values of 15.32131 and 15.00908, respectively, and p-values of 0.0179 and 0.0202, indicating statistical significance at a 5% level, suggesting that both EXR and EX Granger-cause IM. Lastly, for Export (EX), the excluded variables are EXR and IM, with Chi-Square statistic values of 15.74171 and 14.46049, respectively, and p-values of 0.0152 and 0.0249, indicating statistical significance at a 5% level, suggesting that both EXR and IM Granger-cause EX.

4.2 Test of Hypothesis.

Each of the research hypotheses was tested based on the outcomes of the results from the regression estimation.

H_{01}: Exchange rate volatility has no significant impact on imports in Nigeria

VAR results: Based on the Import (IM) equation results, we can conclude that the coefficient of EXRVOL(-2) is statistically significant (p-value = 0.0401), indicating that exchange rate volatility has a significant impact on imports.

Impulse Response Results: Revealed that a shock to the exchange rate has a significant impact on imports as seen in period 2 (107289.9).

Granger Causality Test results: Exchange rate volatility Granger-causes imports (Chi-Square = 19.0744, p-value = 0.0040)

Based on these results, we reject H_{01}.

Ho_2: Exchange rate volatility has no significant impact on export in Nigeria

VAR results: Based on the Export (EX) equation results, we can conclude that the coefficient of EXRVOL(-2) is statistically significant (p-value = 0.0211), indicating that exchange rate volatility has a significant impact on exports.

Impulse Response Results: revealed that a shock to the exchange rate has a significant impact on exports as seen in period 1 (49654.82).

Granger Causality Test results: Exchange rate volatility Granger-causes exports (Chi-Square = 15.74171, p-value = 0.0152)

Based on these results, we reject Ho_2.

By rejecting both null hypotheses, we conclude that exchange rate volatility has a significant impact on both imports and exports in Nigeria.

4.3 Discussion of Findings

This study investigated the impact of exchange rate

volatility on imports and exports in Nigeria. The results showed that exchange rate volatility has a significant impact on both imports and exports in Nigeria. Specifically, in the short run, exchange rate volatility leads to a decrease in imports (-43432.61) and an increase in exports (49654.82), while in the long run, exchange rate volatility leads to a decrease in imports (-7953.865) and an increase in exports (18157.50). These findings suggest that exchange rate volatility plays a crucial role in shaping Nigeria's trade dynamics. The positive impact on exports may be attributed to the competitiveness of Nigerian products in the global market, as a volatile exchange rate can make Nigerian exports more attractive to foreign buyers. On the other hand, the negative impact on imports may be due to the increased cost of imported goods resulting from exchange rate volatility, leading to reduced demand for imports. These findings align with Egedegbe and Eloho (2016), who found a significant negative relationship between exchange rate volatility and imports. Unlike Salaam and Ifeanyi (2021), who reported a negative effect of exchange rate volatility on export in Nigeria, our study finds a positive and significant impact. The findings have important implications for trade policy and management in Nigeria, as policymakers should consider exchange rate volatility when designing trade strategies to capitalize on its positive effects.

5. Conclusion and Recommendations

5.1 Conclusion

This study investigated the impact of exchange rate volatility on imports and exports in Nigeria. The main findings revealed that exchange rate volatility has a significant impact on both imports and exports in Nigeria, with a positive effect on exports and a negative effect on imports. The study contributes to the existing literature by providing new insights into the relationship between exchange rate volatility and trade dynamics in Nigeria, highlighting the importance of exchange rate management in trade policy decisions. The study's findings have significant implications for trade policy and management in Nigeria, emphasizing the need for policymakers to consider exchange rate volatility when designing trade strategies. However, the study has limitations, such as the use of monthly data and the focus on aggregate imports and exports. Future research should explore the sector-specific effects of exchange rate volatility on trade and examine the role of other macroeconomic variables in the relationship. Overall, the study contributes to the understanding of the complex dynamics between exchange rate volatility and trade in Nigeria.

5.2 Recommendations

Based on the findings from the study, the following recommendations are made.

1. Policymakers should consider exchange rate volatility when designing trade strategies to capitalize on its positive effects on exports.
2. The Central Bank of Nigeria should implement measures to mitigate the negative effects of exchange rate volatility on imports, such as hedging instruments or exchange rate stabilization policies.
3. Further research should be conducted to explore the sector-specific effects of exchange rate volatility on trade and examine the role of other macroeconomic variables in this relationship.
4. Stakeholders should prioritize trade diversification and export promotion strategies to reduce Nigeria's dependence on imports and enhance the competitiveness of Nigerian products in the global market.

6. References

1. Agbaeze CC, Alamba SC, Ejelonu HO. Exchange rate volatility and import volume: X-raying Nigeria’s economic dependence. Nigerian Journal of Management Sciences. 2023;24(1b):321-33.
2. Aliyu SUR. Exchange rate volatility and export trade in Nigeria: An empirical investigation. Applied Financial Economics. 2010;20(13):1071-84.
3. Arise AC, Osang T, Slottje DJ. Exchange rate volatility and international trade: Evidence from thirteen LDCs. Journal of Business & Economic Statistics. 2000;12(1):10-7.
4. Audi M. The impact of exchange rate volatility on long-term economic growth: Insights from Lebanon. Munich Personal RePEc Archive. 2024;121634:1-17.
5. Bala DA, Asemota JO. Exchange rates volatility in Nigeria: Application of GARCH models with exogenous break. CBN Journal of Applied Statistics. 2013;4(1):89-116.
6. Barguellil A, Ben-Salha O, Zmami M. Exchange rate volatility and economic growth. Journal of Economic Integration. 2018;33(2):1302-36.
7. Brodsky DA. Fixed versus floating exchange rates and the measurement of exchange rate instability. Journal of International Economics. 1984;16(3-4):295-306.
8. Central Bank of Nigeria (CBN). The exchange rate management. Available from: https://www.cbn.gov.ng/IntOps/ExchRatePolicy.asp# [accessed 30 Apr 2023].
9. Dornbusch R. Expectations and exchange rate dynamics. Journal of Political Economy. 1976;84:1161-76.
10. Egedegbe ME. Impact of foreign exchange rate on Nigeria’s imports (1970-2011). Delta State University; 2016.
11. Ikechi KS, Nwadiubu A. Exchange rate volatility and international trade in Nigeria. International Journal of Management Science and Business Administration. 2020;6(5):56-72.
12. Kandil M, Mirzaie IA. Comparative analysis of exchange rate appreciation and aggregate economic activity: Theory and evidence from Middle Eastern countries. Bulletin of Economic Research. 2008;60(1):45-96.
13. Mankiw NG. Principles of economics. 1st ed. New York: Dryden Press; 1997.
14. Mordi NO. Challenges of exchange rate volatility in economic management in Nigeria. In: The dynamics of exchange rate in Nigeria. Central Bank of Nigeria Bulletin. 2006;30(3):17-25.
15. Sanni HT. The challenges of sustainability of the current exchange rate regime in Nigeria. In: The dynamics of exchange rate in Nigeria. Central Bank of Nigeria Bulletin. 2006;30(3):26-37.

16. Shehu AA, Youtang Z. Exchange rate volatility, trade flows, and economic growth in a small open economy. International Review of Business Research. 2012;8(2):118-31.
17. Udeh VU. Globalization, exchange rate volatility, and international trade performance in Nigeria: An empirical analysis. A mimeograph submitted to the University of Nigeria, Nsukka; c2010.