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Exchange Rate Volatility and Trade Balance in Nigeria

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Abstract: *International trade has often played a central role in the historical experience of the developing world. Trade has also acted as an engine of growth for many national economies in the 19th century. Exchange rate is the common denominator affecting the quantum of export proceeds and amount spent on total import. Exchange rate volatility characterized by sudden and unpredictable changes in the value of the domestic currency relative to foreign currencies, has profound implications for trade balance. This study explored the effect of exchange rate volatility on trade balance in Nigeria using annual time series from 1981 to 2023. The Autoregressive Distributed Lag Model (ARDL) and Granger Causality test were employed as methods of estimation. Findings reveal that there is short-run and long-run positive relationship between exchange rate and trade balance in Nigeria, and there is also no causal relationship between real effective exchange rate and trade balance in Nigeria. It is therefore recommended that international trade should be strengthened by shifting production from primary products to secondary products by revamping the industrial sector and pursuance of single-digit inflation rate that will engender long-run sustainable trade balance should be utmost goal of monetary authorities.*

1. Background to the Study

International trade has been called the "engine of growth" that propelled the development of today's economically advanced nations during the nineteenth and early twentieth century's. Rapidly expanding export markets provided an additional stimulus to growing local demands that led to the establishment of large-scale manufacturing industries. Together w;:h a relatively stable political structure and flexible social institutions, these increased export earnings enabled the developing countries of the nineteenth century to borrow funds in the international capital market at very low interest rates (Todaro and Smith, 2020).

With the existence of international trade, every country that conducts trade will be mutually beneficial. The form of this advantage is the availability or goods and services at relatively cheaper prices than if all of them were produced by the country" concerned (Suparmoko, 1991). The cooperation between countries usually occurs because of economic integration and creates cooperation in the economic, social and political fields. International trade activities between these countries can be recorded in the trade balance. Every economic activity of a country against other countries is recorded in its trade balance (Puri & Ima Amaliah, 2021). Because it provides information about a country's economic health, the trade balance plays a crucial function in that economy. Exports and imports are the main factors in the trade balance indicator. When exports exceed imports in value, the trade balance is said to be in surplus, and when exports fall short of covering imports, it is said to be in deficit. A trade balance deficit can lead to a crisis for a country's economy.

The trade structure in Nigeria is characterized by heavy dependence on raw materials, with export-destinations principally oriented towards industrialized economies. This statement concurs with that of the United Nations' Conference on Trade and Development (UNCTAD, 2016) who asserted that Nigeria's exports are highly concentrated in a few primary commodities. Recent years have seen Sub-Saharan countries like Nigeria, witnessed a rapid increase on their overall dependence on commodity exports. UNCTAD (2016) stated that primary products accounted for nearly 73% of total exports in Sub-Saharan Africa over the period 2010-2013, against 62% over the 1995-1999 period, with crude oil alone accounting for nearly 45% of total exports. On the other hand, Sub-Saharan Africa imports are largely dominated by manufactured goods, with services also making a notable contribution. According to UNCTAD (2016), manufactured goods accounted for approximately 45% of total imports over the

2010-2013 periods, while services imports reached 31% (Meniago and Eita, 2017). Historically, crude oil has dominated Nigeria's export basket, accounting for a significant portion of total exports. However, efforts to diversify the economy have led to increased non-oil exports including agricultural products, solid minerals, and manufactured goods. On the import side, Nigeria imports a wide range of goods and services to meet domestic demand including machinery, equipment, consumer goods, and raw materials. The composition of imports reflects Nigeria's dependence on foreign goods to supplement domestic production and consumption needs. Nigeria maintains trade relationships with various countries and regions around the world. As a member of regional trade blocs such as the Economic Community of West African States (ECOWAS) and the African Continental Free Trade Area (AfCFTA), Nigeria participates in regional trade agreements aimed at promoting intra-regional trade and economic integration. More so, Nigeria has established bilateral trade agreements with several countries to facilitate trade and investment flows.

The country, Nigeria has significant potential to improve its trade balance and enhance its position in the global marketplace. Her trade potential lays in its rich natural resources, large domestic market, strategic location, human capital, trade agreements, infrastructure development, and policy reforms. By harnessing these strengths and addressing key challenges, the country can unlock opportunities for sustainable economic growth, job creation, and poverty reduction through trade. In international trade, there is a common denominator affecting the quantum of export proceeds and amount spent on total import, i.e., the rate at which a country's currency is traded against that of the other. This refers to the exchange rate of one currency note to the other. Exchange rates are never static. The supply and demand of significant currencies fluctuate overtime. Thus, exchange rate volatility refers to the tendency for foreign currencies to appreciate or depreciate in value, thus affecting the profitability of foreign exchange trades. Okechukwu, Mbadike, Geoffery, and Ozurumba (2019) found high and persistent volatility in the Nigerian stock market returns. Volatility is the measurement of the number of rate changes and the frequency of such changes. There are many instances when exchange rate volatility occurs, including business dealings between parties from two different countries and international investments. Volatility in such circumstances is difficult to avoid. The Nigerian economy is intricately linked to international trade, making it susceptible to fluctuations in exchange rates. Exchange rate volatility, characterized by sudden and unpredictable changes in the value of the domestic currency relative to foreign currencies, has profound implications for trade balance. The trade balance, representing the difference between a nation's exports and imports, is a crucial indicator of economic health and stability. The history of exchange rate fluctuations draws its origin from the breakdown of the Bretton Woods system of fixed exchange rates in the 1970s. Prior to the collapse, the initial idea was that transferring from a fixed to a flexible exchange rate will cause some stability in the exchange rates movements. However, the years ahead revealed a completely different scenario as exchange rates became extremely more changing and volatile than they were in the past. In the light of the above, international transactions became extremely uncertain. Given the riskier atmosphere of economic transactions, many countries felt the impact of the floating exchange rate regime, of which many Sub-Saharan African (SSA) countries were not exempt. The latter statement concurs with the view of Alege and Osabuohien (2015), who asserted that the majority of Nigeria, especially within the context of regional economic integration, have over the years (most notably in the 1980s), undergone some measures of real foreign exchange rate depreciation (Meniago and Eita, 2017).

Exchange rate volatility can affect trade balance through several channels. A highly volatile exchange rate can erode the competitiveness of Nigerian exports by making them more expensive in foreign markets. This could lead to a decline in export volumes, affecting the trade balance unfavourably. It also affects the cost of imported goods and services. A depreciating naira may increase the cost of imports, leading to higher import bills and widening the trade deficit. Exchange rate uncertainty can dampen investor confidence and deter foreign direct investment (FDI) inflows. Reduced investment may limit export capacity and hinder economic growth, further impacting the trade balance. Sharp fluctuations in exchange rates can contribute to inflationary pressures, affecting consumer purchasing power and overall economic stability. Inflation may influence trade patterns and exacerbate trade imbalances. Nigeria operates a managed float exchange rate regime, where the Central Bank of Nigeria (CBN) intervenes in the foreign exchange market to influence the value of the naira. However, despite intervention efforts, the exchange rate has exhibited considerable volatility over the years due to various internal and external factors. These factors include fluctuations in global oil prices (as Nigeria is a major oil exporter), capital flows, macroeconomic policies, and external shocks.

Although, numerous efforts have been made by successive governments in Nigeria to ensure stable trade balance, the researcher will not be wrong to assert that the problems are far from being resolved. It is against this backlog that this, study seeks to ascertain the role of inflation on exchange rate-trade balance nexus in Nigeria. Several studies have examined the relationship between exchange rate volatility and trade balance in various economies. However, there is a dearth of comprehensive research specifically focusing on Nigeria's context. Existing literature provides valuable insights but often lacks specificity to Nigeria's unique economic characteristics, such as its heavy reliance on oil exports and vulnerability to external shocks.lt is against this background that this study seeks to empirically examine the effect of exchange rate volatility on trade balance in Nigeria's economy.

1.1. Statement of the Research Problem

Trade has overtime been discovered as being a catalyst for industrial productivity and the driver of economic growth and veritable instrument nation's use in achieving their development objectives. Trade leads to specialization and increased division of labour which results in an increase in world output. Expansion of exports can lead to growth through stimulating technical change and investment, or spilling demand over into other sectors. Merchandise exports have contributed to 70% of Nigeria's Gross Domestic Product (GDP) but it's usually affected by rapid changes in exchange rates. Through international trade among countries, economies have experienced periods of exchange rate fluctuations, slower growth among others (Todaro and Smith, 2008; Madichie and Ekesiobi, 2019) and this has exposed many developing countries to periods of imbalances. Notwithstanding, exchange rate fluctuations do not only affect economic growth but also the performance of firms. For instance, exchange rate depreciation increases the cost of imported capital goods for manufacturing firms and this result to a fall in domestic investment, among others (Ude and Ekesiobi, 2018). One of the objectives of macroeconomic policy since the 1950s has been to maintain equilibrium in the balance of payments. The achievement of this goal has been necessitated by the phenomenal growth in international trade as against the growth of international liquidity. It is also recognized that deficit in the balance of payments will retard the attainment of other objectives. This is because deficit in the balance of payments leads to a sizeable outflow of economic resources. Deficits in balance of payments are majorly caused by deficits in the current account or trade balance.

Nigeria's economy is significantly influenced by international trade, with trade balance serving as a critical indicator of economic stability and competitiveness. However, the persistent volatility in exchange rate poses a considerable challenge to Nigeria's trade balance dynamics. Fluctuations in exchange rates can impact the competitiveness of exports, the cost of imports, and overall trade flows, thereby affecting the balance of trade. Despite numerous studies on the subject, the specific relationship between exchange rate volatility and trade balance in Nigeria remains inadequately understood. The existing literature provides insights into the theoretical mechanisms through which exchange rate volatility can affect trade balance, but empirical evidence specific to the Nigerian context is limited and often inconclusive. This is one of the reasons why this study examines the long run and short run effects of the exchange rate changes on net trade balance in Nigeria.

Therefore, the primary problem addressed by this study is to empirically investigate the relationship between exchange rate volatility and trade balance in Nigeria. By examining the magnitude, direction, and channels of influence, this research aims to provide a comprehensive understanding of how exchange rate volatility impacts Nigeria trade balance dynamics. More so, the study seeks to identify policy implications and recommendations for mitigating the adverse effects of exchange rate volatility on Nigeria's trade balance and promoting sustainable economic growth.

1.2. Objectives of the Study

The primary objective of this study is to empirically analyze the effect of exchange rate volatility on Nigeria's trade balance. The specific objectives of the study are:

1. To examine the relationship between exchange rate volatility and Nigeria's trade balance;
2. To determine the causal relationship between exchange rate volatility and trade balance in Nigeria.

1.3. Scope of the Study

The study investigated the effect of exchange rate volatility on trade balance in Nigeria, covering the period of 41 years (1981-2020). This scope is considered more encompassing in order to cover different policies made by the government to stabilize exchange rate fluctuations including the Structural

Adjustment Programme (SAP). Furthermore, the scope was considered because the period encompasses the military regime of General Muhammadu Buhari which introduced the Structural Adjustment Programme. Again, the chosen date coincides with period when the external trade and exchange rate were indeed liberalized which, thus, the findings of this study will have good implication for trade growth in Nigeria. The major limitations are human and material resources, difficulties in downloading necessary information from relevant sites. This was solved by using a different device and network. Another challenge that was witnessed in this study centered on finance and time constraint. The researchers decided to take on part-time jobs so as to mitigate this constraint. Lastly, some of the secondary data used in this study were obtained from diversified sources which are also subject to error, hence absolute reliability of the data is not guaranteed. This limitation does not in any form diminish the relevance of the present study since the reliability of the estimates that enter in the regression model was tested using the unit root test.

2. Review of Theoretical Literature

2.1. Review of Basic Theories

The theories that link international trade and exchange rate enable one to understand the theoretical relationship between international trade and exchange rate. These relevant theories may include the J-curve hypothesis, Marshall-Lerner condition, Keynesian Absorption approach, etc.

J-Curve Theory: J-Curve theory was suggested initially by the author, Ian Bremmer, in his book, "The J-curve: A New way to understand why nations rise and fall". A J-curve is any of a variety of J-shaped diagrams where a curve initially falls, then steeply rises above the starting point. The J-curve is the time path of a country's trade balance following a devaluation or depreciation of its currency under a certain set of assumptions. The J-curve theory suggests that the short-term response of trade balance to changes in exchange rates may be different from the long-term response. In the short run, a depreciation or devaluation of the domestic currency may initially worsen the trade balance as the volume of imports does not immediately decrease, and the value of exports takes time to adjust. However, over the long term, the trade balance is expected to improve as exports become more competitive and imports become relatively more expensive.

The Marshall-Lerner Condition: Marshall-Lerner condition was coined after Alfred Marshall and Abba P. Lerner who developed it in the early 20th century, Marshall-Lerner condition refers to the proposition that the devaluation of a country's currency will lead to an improvement in its balance of trade with the rest of the world, only if the sum of the price elasticities of its exports and imports is greater than one. This means that the responsiveness of export and import volumes to changes in exchange rates determines the effectiveness of exchange rate changes in improving the trade balance. It is a criterion that determines whether a country's balance of trade will improve or worsen in response to a change in the exchange rate. It is based on the idea that devaluation or depreciation of the currency (a decrease in the exchange rate) will lead to an improvement in the balance of trade if the sum of the price elasticities of demand for the country's exports and imports is greater than one. In other words, if the demand for a country's exports and imports is more sensitive to changes in price than the supply of these goods, the balance of trade will improve after the currency depreciates. Assumptions of the Marshall-Lerner condition include the following:

1) The Marshall-Lerner condition assumes that all analysis must start with a balanced trade position, i.e. that the value of imports equals the value of exports. However, this is not realistic in the real world.
2) It sometimes assumes that following a devaluation or depreciation, the price received by the exporter falls.

Essentially, the Marshall-Lerner condition is an extension of Marshall's theory of the price elasticity of demand to foreign trade, the analog to the idea that if demand facing a seller is elastic, he can increase his revenue by reducing his price. Empirical evidence suggests that the elasticity of demand for exports and imports tends to be inelastic in the short-run, but more elastic in the long-run. Therefore, devaluation often worsens the current account on the short-term but improves it on the long term.

Keynesian Absorption Approach to Balance of Payments: The Absorption Approach to balance of payments states that a country's balance of trade will only improve if the country's output of goods and services increases by more than its absorption, where the term 'absorption' means expenditure by

domestic residents on goods and services. This approach was first put forward by Alexander (1952, 1959), and this was later extended by Johnson (1958). According to them, a deficit in a country's balance of payment implies that the citizens are "absorbing" (consuming) more than they produce. Invariably, domestic expenditure on consumption and investment is higher than national income. Conversely, a surplus in the balance of payment show that they are absorbing less which means that expenditure on consumption and investment is less than national income. The approach introduces the income effects to the analysis of the devaluation effects. The proponents of this approach posit that devaluation would only have positive effects on trade balance if the propensity to absorb is less than the rate at which devaluation will induce increases in the national output of goods and services. There is therefore a need to achieve a conscious reduction of absorption capacity to accompany devaluation.

2.2. Empirical Literature Review

Kofoworade (2023) estimated the effect of exchange rate on the balance of trade and economic growth in Nigeria for the period of 1986 to 2026 using annual time series data. The study employed the Ordinary Least Squares (OLS) and Error Correction Mechanism (ECM) to investigate the relationship amongst variables employed in the model. The co-integration test confirms that there is a long-run relationship between economic growth, trade balance and the exchange rate. The estimated result shows that the exchange rate has a significant negative influence on trade balance but a positive relationship with the GDP during the period. Ouattara (2023) examined how exchange rate volatility affects international trade in developing countries, particularly for Turkey. The study employed GARCH model in order to estimate the conditional volatility of the exchange rate and consumer price index on the trade volume. The analysis reveals export volume is influenced by exchange rate -volatility. For portfolio managers and policy makers seeking to understand the patterns of global capital flows, these findings have significant implications.

Oyegun and Ofie (2022) explored the relationship between exchange rate volatility and trade balance in Nigeria using GARCH (1,1) as their estimation technique. The findings revealed that exchange volatility positively impacts on the balance of trade account, imports, and exports in Nigeria with a very close magnitude. Inflation was very responsive in reducing trade account j balance, imports, and exports while interest rate did not impact on balance of trade and imports but showed a positive effect on exports. Ijirshar, Okpe, and Andohol (2022) examined the impact of exchange rate on trade flow in Nigeria from 1986 to 2021 by utilizing linear and non-linear autoregressive distributed lag (ARDL and NARDL) models to test the J-curve hypothesis and the Marshall-Lerner condition. Findings reveal the existence of symmetric effects of exchange rate on trade balance, exports, and imports; real exchange rate depreciation has a strong negative influence on trade balance and exports in the short-run, but positive in the long-run, exhibiting the shape typology of the J-curve. Furthermore, the study reveals evidence of the Marshall-Lerner condition since the sum of the elasticities of export and import is greater than unity. Osinusi, Lawal and Bisiriyu (2022) examined the impact of trade balance, exchange rate and money supply on economic growth in Nigeria using the ARDL estimation technique. Cointegration result showed that there is a long-term relationship among trade balance, exchange rate, broad money supply, interest rate, inflation rate and economic growth in Nigeria. Effiong, Udonwa, and Udofia (2022) assessed the influence of trade balance and exchange rate movement on economic growth in Nigeria, as well as the determinants of the exchange rate using ARDL approach. Results reveal that total trade have a positive and significant effect on economic growth, while the exchange rate exerts a negative and significant effect; oil trade balance and exchange rate exert a negative and significant effects on the economy. Non-oil trade exerts a negative and significant effect on economic growth. Results obtained show that economic growth, external reserves, inflation, and trade balance are the major drivers of the exchange rate in Nigeria since they exert a significant effect. Nwagu, Orji, Ikubor, Ogbuabor, Anthony-Orji, and Nwufo (2022) analyzed the impact of fiscal and monetary policy instruments on trade balance in Nigeria using cointegration method and Ordinary Least Squares estimation techniques. The cointegration test confirms the existence of a long-run relationship between monetary policy as measured by broad money supply and fiscal policy as measured by government spending, taxation, and trade balance. The empirical findings revealed that the selected monetary and fiscal policy variables did not improve Nigeria's trade balance during the study period. Nurradden, Ibrahim and Mukhtar (2021) provided empirical evidence of the link between real exchange rate volatility and the trade balance in Nigeria in the light of financial development. The study employed threshold autoregressive non-linear co-integration and nonlinear ARDL estimation techniques. Findings

reveal that financial development magnifies the beneficial benefits of the real exchange rate on Nigeria's foreign trade. It also states that the uncertainty in foreign capital flows has a negative impact on Nigeria's international trade. Ahmad and Saad (2021) investigated the impact of trade openness on Nigeria's trade balance by employing Vector Autoregression (VAR) methodology to analyze annual time series on balance of payment, trade openness, exchange rate and foreign direct investment for the period 1981-2018. Cointegration test confirms the absence of long-run association among the variables while analysis of the variance decomposition shows that trade openness has fewer effects on balance of trade in Nigeria. Exchange rate, however, exerts a steady positive but little impact on balance of trade. Ikechi and Nwadiubu (2020) investigated the impact of exchange rate volatilities on international trade in Nigeria. VAR, ARCH, and ARCH models were employed as estimation techniques. The VAR model estimates indicate an inverse relationship between export, import and real effective exchange rate in current periods. Variance decomposition analysis suggests that the shocks partially explain fluctuations in Real Effective Exchange rate (REER), as well as exports and imports. The impulse response analysis indicates a negative association between export and real effective exchange rate while it was majorly positive for imports throughout the periods. The causal effect reveals that import causes exports but that exports do not granger cause imports. The ARCH modeling approach suggests the existence of first-order ARCH effect and a significant GARCH term. Results show evidence of volatility of real effective exchange rate clustering on import and export trading activities in Nigeria. Mohammed and Abdulrasheed (2020) assessed the impact of exchange rate on the trade balance of five African countries using both linear and non-linear autoregressive distributed lag models to analyze data. The linear model revealed that the J-curve holds in Uganda in the short-run, whereas evidence of long-run J-curve effect was found only in Algeria. However, non-linear analysis showed that the short-run J-curve holds for South Africa and Uganda whereas long-run J-curve effect was found in Algeria and Uganda. The results make a case for modeling asymmetries as the non-linear model performed relatively better.

Ewubare and Uzoma (2019) examined the effects of Stabilization policy measures on balance of trade. Stabilization policy measures were segmented into money supply, interest rate, exchange rate, government expenditure and government tax. The study employed the Autoregressive distributed lag model (ARDL) approach. Evidence from the study showed that most of the stabilization policy indicators had significant negative impact on balance of trade in both the long-run and the short-run contrary to theoretical expectation, save for interest rate which the inverse relationship was expected a priori. Jadoon and Guang (2019) evaluated exchange rate fluctuations and its impact on trade balance in Pakistan using ARDL approach. Results revealed that Exchange rate has positive and significant relationship with balance of trade in long-run and short-run. Devaluation of Pakistani rupees against United States dollars (USD), would increase the exports and ultimately trade balance will enhance. The inflation and money supply has negative and significant relationship with balance of trade in long-run in Pakistan. The excess of money supply will increase inflation which reduces the exports and consequently, balance of trade would decrease.

Etale and Ochuba (2019) assessed the effect of exchange rate volatility and trade balance on Economic growth in Nigeria, employing descriptive statistics and Ordinary Least Squares (OLS) as estimation techniques. The empirical results showed that exchange rate had a significant positive influence on economic growth while trade balance had an insignificant effect on economic growth. Okonkwo (2019) evaluated the relationship between exchange rate variation and Nigeria's trade balance between 1988 and 2018. He employed the Ordinary Least Squares (OLS) as method of analysis. Findings based on analysis showed that there is a significant relationship between exchange rate and trade balance. Aidi, Suleiman, and Saidu (2018) examined the relationship amongst exchange rate, inflation and balance of payment in Nigeria by adopting the Ordinary Least Squares (OLS) multiple regression technique for analysis. Result revealed that exchange rate has a negative impact on balance of payment while domestic credit, money supply and real gross domestic product are the drivers of balance of payments in Nigeria. Meniago and Eita (2017) investigated the impact of exchange rate changes on imports, exports and trade balance in Sub-Saharan Africa (SSA). The results indicate that there is a positive relationship between exchange rate changes and imports, albeit the degree of responsiveness was extremely low. Significant negative relationship was found between exchange rate changes and exports. This suggests that the policy of exchange rate depreciation may not have the desired effects of boosting exports. Import result was inconsistent with economic theory, and this can be attributed to the fact that many African countries largely depend on imports, and tend to be invariant to exchange rate changes. Hence, a depreciation of exchange rates of these nations may have little or no effect on imports.

Musibau (2016) examined the effects of oil price shocks on the external trade balance in Nigeria. Findings revealed the existence of long-run relationship between real oil prices and external balances. In addition, the real oil price was found to improve the external balances. Positive oil price shocks, negative oil price shocks and net oil price increase were found to improve the total trade balance and the oil trade balance. However, positive oil price shocks and net oil price were found to generate sustained trade deficit in the Nigeria's economy. The variance decomposition error suggested that real oil prices had forecasting power for external trade balances. Mohammed and Ali (2016) focused on the analysis of the main determinants that have an impact on trade balance. The study focused on the main cause of trade deficit in Somalia by analyzing the impact of Foreign direct Investment (FDI), exchange rate and inflation rate. Ordinary Least Squares Method (OLS) has been used for the econometric analysis. The regression result showed that there is only foreign direct investment variable impact on trade balance in Somalia. Foreign Direct Investment had negative impact on trade balance in Somalia. The other factors include exchange rate and inflation rate had no impact on trade balance in Somalia. Vural (2016) investigated the links between the real exchange rate and the balance of trade by employing cointegration technique and error correction model. The study employed disaggregated data on commodity level. Use of disaggregated bilateral trade data avoids any aggregation bias. Furthermore, disaggregation at commodity level permits to weigh the effect of changes in real exchange rate on the individual industry trade balance. Empirical results provide some support for the existence of J-curve effect. Nevertheless, no single pattern of exchange rate-trade balance relationship is found to exist.

Eke, Eke and Obafemi (2015) estimated the effect of exchange rate on balance of trade of Nigeria. Estimated result shows that the exchange rate has a significant negative influence on trade balance in Nigeria during the period; hence devaluation of the domestic currency does not lead to improvement in the balance of trade and balance of payment of the country. Ibrahim, Akinbobola, and Ademola (2015) investigated the effect of exchange rate on the trade balance in Nigeria using cointegration and Error correction model as methods of estimation. The findings that emerged from the study were: the levels of income of the country as well as its trading partners were strong determinants of the trading activities in Nigeria's economy; the effect of exchange rate on trade balance was significant in the long-run, but contrary to the aspiration of policy makers and in contrast to the J-curve hypothesis, the exchange rate had an inverse relationship with the trade balance in Nigeria. Khanom, Emu, Vddin and Farhana (2014) identified the relationship between the exchange rate and trade balance in Bangladesh by employing the cointegration technique. Findings of the study reveal that real exchange rate is an important variable to the trade balance, and devaluation will improve trade balance in the long-run, thus consistent with the Marshall-Lerner condition. Increase in real exchange rate can make Bangladesh's products competitive in the world market.

2.3. Summary of Literature Review

In the course of this research work, effort was made to review both theoretical and empirical literatures that are related to trade balance, exchange rate volatility, fiscal and monetary policies. The purpose of the theoretical literature is to familiarize ourselves with the theories that link trade balance with exchange rate volatility that have been developed by scholars on the issue we are investigating. For instance, J-curve theory suggests that the short-term response of trade balance to changes in exchange rates may be different from the long-term response. A depreciation or devaluation of the domestic currency may initially worsen the trade balance as the volume of imports does not immediately decrease, and the value of exports takes time to adjust. However, over the long term, the trade balance is expected to improve as exports become more competitive and imports become relatively more expensive. A survey of the empirical literature revealed that there is a good number of literatures on exchange rate volatility and trade balance. Ouattara (2023), Oyegun and Ofie (2022), Jadoon and Guang (2019), Etale and Ochuba (2019), Ikechi and Nwadiubu (2020), Ahmad and Saad (2021), Sanusi et al (2023), Adu-Gyamfi et al (2020) and Khanom et al (2014) found that exchange rate volatility positively affect Trade balance. However, Kofoworade (2023), Ewubare and Uzoma (2019), Eke et al (2015), Ibrahim et al (2015), Aidi et al (2018), Udonwa et al (2022) and Ijirshar et al (2022) found that exchange rate volatility has significant negative relationship with trade balance. The divergent results from the empirical literatures may not be unconnected with different techniques of analysis adopted by various authors.

2.4. Justification of the Study

International trade has often played a central role in the historical experience of the developing world. Trade has also acted as an engine of growth for particular national economies- in the 19th century,

Canada and Australia, and in the 20th century, Japan. In recent years, trade has acted as an engine of growth to the newly industrializing countries of South-East Asia, the so-called Miracle Economies, namely, South Korea, Taiwan, Hong Kong, and Singapore. The dynamic gains from trade arise from the effects of trade on the level of investment, and on the state of technical knowledge in the country. The increase in investment and improvements in innovations and technical progress will then lead to increased productivity and competitiveness, and trigger a further increase in trade. This positive feedback effect continues and brings about a "virtuous circle" of increased trade and economic growth (lyoha, 2004). Previous studies examined the effect of exchange rate volatility on trade balance. None of these studies took into account the effect of monetary and fiscal policy on trade balance together with exchange rate. More so, those studies fail to examine direct impact not partial impact of exchange rate volatility on trade balance in Nigeria. Sequel to that, the study departs from other studies by the examining the direct effect of real effective exchange rate on trade balance in Nigeria. Thus, this study attempts to fill aforementioned gap in the existing literature.

This study employs the Granger causality test to resolve the conflict among researchers as regards to whether the exchange rate volatility is the cause of fluctuations in trade balance or trade balance is the rationale behind the rapid changes in the rate of exchange. The study intends to fill the gap in the existing literature by analyzing the causal relationship between trade balance and exchange rate volatility in Nigeria. It should be noted that some studies used panel data regression model in their analysis but this study will adopt the Autoregressive distributed lag model. The rationale behind the use of Autoregressive distributed lag model is because it models relationship among variables as best linear unbiased estimators (BLUE) despite their order of integration. Other researchers produced spurious result in their modeling approach because they used Ordinary least squares and generalized least squares to model relationship among variables despite their order of integration.

3. THEORETICAL FRAMEWORK

This study hinged on J-Curve theory which suggests that the short-term response of trade balance to changes in exchange rates may be different from the long-term response. In the short-term, a depreciation of the domestic currency may initially worsen the trade balance as the volume of imports does not immediately decrease, and the value of exports takes time to adjust. However, over the long-term, the trade balance is expected to improve as exports become more competitive and imports become relatively more expensive. This theory thus captures the relationship between trade balance and exchange rate volatility which has large influence on stabilization measures or policies aimed at promoting economic growth and development.

3.1. Model Specification

The main objective of this study is to examine the effect of exchange rate volatility on trade balance in Nigeria. To clearly assess the impact of exchange rate volatility on trade balance in Nigeria, the research adapted the model of Ewubare and Uzoma (2019) which is predicated on the theoretical framework of J-curve hypothesis, and thus modified the model;

The functional form of this relationship is stated below:

NX = f(REER, RGDP,INF,MS,GEXP).

Using Autoregressive Distributed Lag model, the empirical model is adapted as follows:

$$\Delta lnNX_t = \Phi_0 + \sum_{i=1}^{q} \Phi_1 \Delta\, ln\, NX_{t-i} + \sum_{i=1}^{q} \Phi_2 \Delta lnREER_{t-i} + \sum_{i=1}^{q} \Phi_3 \Delta lnRGDP_{t-i} + \sum_{i=1}^{q} \Phi_4 \Delta lnINF_{t-i} + \sum_{i=1}^{q} \Phi_5 \Delta lnMS_{t-i} + \sum_{i=1}^{q} \Phi_6 \Delta lnGEXP_{t-i} + \gamma_1 lnNX_{t-1} + \gamma_2 lnREER_{t-1} + \gamma_3 lnRGDP_{t-1} + \gamma_4 lnREER_{t-1} + \gamma_5 lnINF_{t-1} + \gamma_6 lnMS_{t-1} + \gamma_7 lnGEXP_{t-1} + \mu_t$$

Where:
Θ = Constant Intercept term
NX_t = Net Exports at time t
$REER_t$= Real Exchange Rate at time t
$RGDP_t$ = Real Gross Domestic Product at time t

INF_t= Inflation rate at time t.
MS_t= Money Supply at time t.
$GEXP_t$ = Government Expenditure at time t
μ= Stochastic error term(the stochastic error term represents other determinants of trade balancenot explicitly taken into account by the above model)

3.2. Evaluation of Estimates

Evaluation of estimates consists of deciding whether the estimated coefficients are theoretically meaningful and statistically satisfactory. For this study, there is need for all the results to satisfy both economic, statistical criteria (First order test) and econometric criteria (second order test). **Evaluation Based on Economic Criterion:** This criterion evaluates the generalized least squares regression results based on theoretical expectation concerning the relationship under review. This is to determine if the sign(s) associated with the estimated parameters conform to a priori expectations as noted earlier. Moreover, this has to do with the sign expectation set by economic theory. It looks at the signs and sometimes sizes of parameters of economic relationships. According to Koutsoyiannis (1979), the parameters in a given model are expected to have signs and sizes that conform to economic theory. If they do, they are accepted, otherwise they are rejected.

Evaluation based on Statistical Criterion: Three tests are conducted under the statistical criteria: namely the r-squared (R^2) test, Z-test, and F-test.

Evaluation Based on Econometric Criteria: The serial correlation test (or autocorrelation), heteroskedasticity test, multicollinearity test, and normality test would be conducted under econometric criteria. These are set by the theory of econometrics, and are aimed at investigating whether the assumption of the econometric method employed is satisfied or not.

3.3. Causality Test

According to Madueme (2010), a causality test is undertaken to investigate the degree of causation of one variable on the other. The test is conducted here to show whether it is infrastructural development that is causing net exports, whether it is net exports that are causing infrastructural development, or whether both are causing each other or whether both are independent of each other. According to Gujarati and Porter (2003), certain assumptions must be fulfilled for a causality test to be conducted. The assumptions include:

- The disturbance term in the equation is uncorrelated.
- That the two variables are stationary
- The number of lagged terms expected to be included in the model should be determined.

The test expectations are:

i. Unidirectional causality from NX to REER if $\sum\alpha_i \neq 0$ and $\sum\delta_j = 0.$
ii. Unidirectional causality from REER to NX if $\sum\alpha_i = 0$ and $\sum\delta_j \neq 0.$
iii. Feedback or bi-directional causality if $\sum\alpha_i \neq 0$ and $\sum\delta_j \neq 0.$ in this case, the sets of NX and REER coefficients are statistically significant in both regressions.
iv. Independence if $\sum\alpha_i = 0$ and $\sum\delta_j = 0.$ in this case the set of NX and REER coefficients are not statistically significant in the both regressions.

3.4. Test of Research Hypothesis

The hypothesis will be tested at a five percent (5%) level of significance. The null hypothesis will be rejected if the probability at which the t-value is significant is less than the chosen level of significance, otherwise, the alternate hypothesis will be accepted.

1. If the probability (sig.) > 0.05, we will accept the null hypothesis and reject the alternate hypothesis.
2. If the probability (sig.) < 0.05, we will accept the alternate hypothesis and reject the null hypothesis.

3.5. Description and Sources of Data

The study will employ secondary time series data which were obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin of 2024, and World Development Indicator (WDI). It covers the period of 42

years that is, 1981 to 2023. The research resorted to the use of secondary data to avoid the likely problems associated with primary data collection. To this respect, secondary data have the following advantages over the primary data: they are processed data which have undergone auditing verification, testing and approval before publication; it provides means for the researcher to compute figures collected over a long period of time; secondary data collection is time and cost saving and it affords the researcher the opportunity to carry out a time series study and examine relationship that existed over time.

Table 3.1. *Variables, their Nature and Sources of Data.*

Variable	Data Sources
Net Exports	World Bank Development Indicator (2023 edition)
Real Effective Exchange Rate	World Bank Development Indicator (2023 edition)
Real Gross Domestic Product	Central Bank of Nigeria Statistical Bulletin (2024 edition)
Inflation Rate	World Bank Development Indicator (2023 edition)
Money Supply	World Bank Development Indicator (2023 edition)
Government Expenditure	Central Bank of Nigeria Statistical Bulletin (2024 edition)

4. Result Presentation and Analysis

Analysis of Result

Prior to data analysis, the time series properties of the series such as stationarity and cointegration are investigated. The results of the stationarity and cointegration are presented in the following sub-sections.

Stationarity Test

Stationarity test was conducted using two traditional unit root tests to side step spuriousness of the regression result. The traditional test employed is Phillips-Perron (PP) test. Phillips-Perron test was chosen as a test of consistency because PP test have been made robust to serial correlation by using the Newey-West (1987) heteroscedasticity and autocorrelation consistent covariance matrix estimator. One advantage of Phipps-Perron over the Augmented Dickey-Fuller is that PP tests are robust to general forms of Heteroskedasticity in the error term. Another advantage is that the user does not have to specify a lag length for the test regression. The results are presented in table 4 of the appendix.

Table 4.2. *Test on Stationarity*

Augmented Dickey-Fuller (ADF) Test				Philips-Perron (PP) Test			
Variable	ADF Statistic	ADF Critical Value	Level of Integration	Variable	PP Statistic	PP Critical Value	Level of Integration
NEX	-7.197300	-2.938987	I(1)	NEX	-5.713052	-2.936942	I(1)
REER	-4.398820	-2.936942	I(1)	REER	-4.294881	-2.936942	I(1)
RGDP	-3.440661	-2.936942	I(1)	RGDP	-3.440661	-2.936942	I(1)
INF	-3.050465	-2.935001	I(0)	INF	-10.66377	-2.936942	I(1)
MS	-3.614639	-2.935001	I(0)	MS	-3.403671	-2.935001	I(0)
GEXP	-4.268640	-2.957110	I(0)	GEXP	-6.105724	-2.936942	I(1)
REGQ	-5.985310	-2.986225	I(1)	REGQ	-5.983170	-2.986225	I(1)

Cointegration Test

The next task of this study, having established the order of integration, is to establish long run relationship among the variables. Thereafter, the ARDL bounds' testing approach is used to determine whether a long run cointegration relationship exists between trade balance and real effective exchange rate. The result of the cointegration test is presented in table 4.3.

Table 4.3. *Result of ARDL Bounds' Test of Cointegration Null Hypothesis: No long run relationship exists*

Test Statistic	Value	K
F- Statistic	7.350136	5
Critical Value Bounds		
Significance	Lower Bound	Upper Bound
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	4.68

Source: Researcher's Compilation from Eviews 12.0

Decision Rule: Reject Ho if Fcal > Lower and Upper Bound; otherwise do not reject. The cointegration test result shows that the F-statistic is greater than the lower and upper bound critical value at the 5% significance level. Thus, the null hypothesis of no long run relationship is rejected at the 5% significance level. It can therefore be inferred that the variables are cointegrated.

Short run Dynamics

The result of the short run dynamics of the variables is presented in Table 4.4 below.

Table 4.4. *Results of Estimation of Error Correction and Long run Models Dependent Variables: D(NEX) Selected Model: ARDL (4,4,4,3,1,4). Cointegrating Form*

Variable	Coefficient	t-statistic	Prob.
D(NEX(-1), 2)	1.072572	1.865696	0.0890
D(NEX(-2), 2)	0.716795	1.545466	0.1505
D(NEX(-3), 2)	0.413306	1.422471	0.1826
D(REER,2)	36890507.76	0.000000	0.0000
D(REER(-1), 2)	-11140899.15	0.000000	0.0000
D(REER(-2), 2)	-19849991.61	0.000000	0.0000
D(REER(-3), 2)	-45080866.89	0.000000	0.0000
D(RGDP,2)	453643.57	0.000000	0.0000
D(RGDP(-1), 2)	-4244843.06	0.000000	0.0000
D(RGDP(-2), 2)	1242961.07	0.000000	0.0000
D(RGDP(-3), 2)	2062894.89	0.000000	0.0000
D(INF,2)	-135259330.75	0.000000	0.0000
D(INF(-1), 2)	-132083126.11	0.000000	0.0000
D(INF(-2), 2)	-102865070.2	0.000000	0.0000
D(MS, 2)	105431404.24	0.000000	0.0000
D(GEXP, 2)	100613.19	0.566161	0.5827
D(GEXP(-1), 2)	-157477.81	-0.847036	0.4150
D(GEXP(-2), 2)	21233405.44	0.000000	0.0000
D(GEXP(-3), 2)	29262260.15	0.000000	0.0000
CointEq(-1)	-2.74	-4.306348	0.0012

Source: Researcher's Compilation from Eviews 12.0

The estimated ECM shows that real effective exchange rate positively affect trade balance. The short run effect of real effective exchange rate on trade balance is significant at the 5% level of significance. This finding is not in conformity with the theoretical prediction. Real Gross Domestic Product, Broad Money Growth and Government Expenditure are positively related to Trade Balance in the short run. By implication, a unit increase in Real Gross Domestic Product, Broad Money Growth, and Government Expenditure will result in 453643.57, 105431404.24 and 100613.19 increase in Trade balance. Inflation rate is negatively related to the level of trade balance, and coefficient of inflation rate is statistically significantly different from zero at 5% level of significance. A unit increase in inflation rate will result in 135259330.75 decreases in trade balance in Nigeria. The error correction term is as expected, negatively signed and is statistically significantly at five (5) percent level. This is a further indication of the existence of long run relationship between the dependent variable and the regressors. The absolute value of the coefficient lies between zero (0) and one (1), and it indicates that about 2.74% of the short run deviation from the equilibrium (long run) position is corrected annually to maintain the equilibrium. This shows high speed of adjustment to equilibrium.

Long run Estimates

In order to obtain quantitative estimates of the link between trade balance and real effective exchange rate in Nigeria, a long run model estimated by E-views during the cointegration equation form with the standard errors presented in brackets as follows.

Table 4.5. *Summary of Long run Estimates*

Variable	Coefficient	Standard Error	t-statistic
D(REER)	41906878.22	22938358.54	1.826934
D(RGDP)	2178372.73	797702.33	2.730809
D(INF)	98215623.33	111543349.94	0.880515
D(MS)	133720570.21	49525113.98	2.700056
D(GEXP)	-18171939.68	6511259.41	-2.790849
C	-1049210205.7	877627595.02	-1.195507

Source: Researcher's Compilation from Eviews 12.0

As shown in table 4.5, real effective exchange rate entered the model with a positive sign in line with apriori expectation. The coefficient of 41906878.22 indicates that 1% change in real effective exchange rate could lead to 41906878 .22 improvement in trade balance. On the contrary, 1% rise in Government Expenditure will lead to 18171939.68 decreases in trade balance which is not in conformity to a priori expectation. Exchange rate depreciation (or devaluation) raises trade balance in the long run which is in line with J-Curve hypothesis. Economic theories argue that devaluation could promote trade balance, alleviate balance of payment difficulties and accordingly expand output and employment.

Evaluation of Estimates

The estimates obtained from the model of the study are evaluated as follows using economic criteria, statistical criteria, and economic criteria.

Evaluation of Economic Criteria

The economic criteria are used to evaluate the model estimates based on theoretical or a priori expectations concerning the relationships between the hypothesized variables in the model. The model is estimated with Autoregressive Distributed Lag Model (ARDL). Result indicates that all the variables conform to economic expectations.

Evaluation based on Statistical Criteria

The robustness of the hypothesized model and the validity of the research hypotheses are evaluated on the following statistical criteria. The overall test of statistical robustness and reliability was executed using the F-statistic (F-test). The test is implemented under the null hypothesis that the model is not statistically significant. The null hypothesis can only be rejected if F-statistic is less than F-critical value, otherwise do not reject.

Table 4.1. *Summary of F-statistic*

Prob F-statistic	F-critical Value	Decision
0.000988	0.05	Reject the null hypothesis

Source: Researcher's Compilation from Eviews 12.0

Table 4.2 indicates that the null hypothesis of no statistical significance is rejected. This implies that the model has good fit or is statistically significant, hence reliable for inference purposes. Also, it also indicates that the values of the parameters (coefficients) maximize value of the likelihood function.

Evaluation based on Econometric Criteria

The robustness, appropriateness, and predictive power of the estimated econometric model is evaluated based on Ramsey Reset specification test, serial correlation test, multicollinearity variance inflation factor test, optimal lag length model selection criteria, and heteroskedasticity test.

Evaluation of Research of Hypotheses

Having established the robustness, predictive power and appropriateness of the model for inferences, we proceed to test the hypotheses of the study. The hypotheses are generally stated in the null form. The test of hypothesis is implemented using t-test at 5% level of significance. We reject the null hypothesis if and only if: the t-statistics of Xj ≥ 0.05, otherwise do not reject. The null hypotheses are restated as follows:

Hypothesis One (Ho_1): Exchange rate volatility do not have any significant effect on Trade Balance in Nigeria's economy.

Table 4.7. *Summary of Real Effective Exchange Rate and Trade Balance Model (ARDL)*

Dependent Variable: D(NEX)				
Sample: 1985 to 2023				
Variable	Coefficient	Standard Error	t-statistic	Prob.
D(NEX(-1))	-0.365004	0.169077	-2.158798	0.0382
D(NEX(-2))	-0.424911	0.179153	-2.371771	0.0237
D(NEX(-3))	-0.380651	0.178048	-2.137915	0.0400
D(REER)	7681934	22469395	0.341884	0.7346
C	9.32E+08	1.37E+09	0.682384	0.4998

Source: Researcher's Compilation from Eviews 12.0

Table 4.7 shows that there is no statistically significant effect of real effective exchange rate on trade balance in Nigeria. Moreover, the relationship between trade balance and real effective exchange rate is in accordance with long run a priori expectation; a unit increase in real effective exchange rate will lead to 7681934 rises in trade balance of our country, Nigeria.

Hypothesis Two (Ho_2): There is no causal relationship between real effective exchange rate and trade balance in Nigeria.

Table 4.8. *Granger Causality Test*

Null Hypothesis	Obs.	F-statistic	Prob
PDI does not granger cause RGDP	39	0.05137	0.9500
RGDP does not granger cause PDI		0.06384	0.9383

Source: Researcher's Compilation from Eviews 12.0

Decision Rule: Reject the null hypothesis if Prob. is less than critical P value of (0.05), otherwise do not reject. Since the Prob. is not less than at 5% confidence interval in two models, we do not reject the null hypotheses and conclude that there is no causal relationship between real effective exchange rate and trade balance in Nigeria.

5. Discussion of Findings

The main focus of the study is to examine the role of exchange rate volatility on trade balance in Nigeria. The study shows that real effective exchange rate is negatively related to trade balance in Nigeria, at least in the short run, which suggests that as real effective exchange rate rise, trade balance falls. This is in line with theoretical prediction of J-Curve hypothesis. In consonance, this study is in line with the studies that found a negative relationship between trade balance and real effective exchange rate which were conducted in Nigeria, example, Kofoworade (2023), Ewubare and Uzoma (2019), Eke et al (2015), Ibrahim et al (2015), Aidi et al (2018), Udonwa et al (2022), and Ijirshar et al (2022). More so, the long run estimates shows that real effective exchange rate is positively related to trade balance. Devaluation of currency may not have much effect in the short run but will positively affect trade balance in the long run. This is in conformity with Ouattara (2023), Oyegun and Ofie (2022), Jadoon and Guang (2019), Etale and Ochuba (2019), Ikechi and Nwadiubu (2020), Ahmad and Saad (2021), Sanusi et al (2023), Adu-Gyamfi et al (2020) and Khanom et al (2014).

6. Summary

The study was basically undertaken to examine the role of exchange rate volatility on trade balance in Nigeria from 1981 to 2022. Since the analysis is based on time series data and in order to avert the occurrence of spurious results and to determine the order of integration, the variables were investigated for their stochastic properties using two modern unit root tests i.e. Augmented Dickey-Fuller Test (ADF) and Phillips-Perron Test (PP). The results of the unit root tests indicate that all the variables tend to be stationary in first difference except Money Supply (MS) which tend to be stationary at level in PP tests. The findings of the study suggest that real effective exchange rates are negatively related to trade balance in the short run but positively related to trade balance in the long run as postulated by the J-curve hypothesis. Devaluation of the domestic currency has no significant effect in the short run but positively drives trade balance in the long run. Inflation rate has a negative but insignificant relationship with trade balance while Government expenditure and Money supply, the instruments of fiscal and monetary policies are positively related to trade balance. Fiscal and monetary policies serve as stabilization tool for maintaining the external balance of an economy.

In addition, the findings of this study also reveal that there is no causal relationship between Real Effective Exchange Rate (REER) and Trade balance in Nigeria since Prob. is less than F-critical value at 5% level of significance.

7. Conclusion

The main conclusion of the study is that real effective exchange rate is negatively related to trade balance in the short run but positively related to trade balance in the long run as shown in the regression result. This implies that devaluation will only produce significant improvement in the trade balance of Nigeria in the long run. The study also concludes that there is no causal relationship between trade balance and real effective exchange rate in Nigeria.

8. RECOMMENDATIONS

The one of the aims of macroeconomic policy is the maintenance of balance of payments equilibrium (i.e. eliminating or minimizing current account and balance of payments deficits) in the long run. This can be achieved through prudent control and management of the exchange rate. The recommendations include the following:

- International trade should be strengthened by shifting production from primary products such as crude oil and agricultural produce to secondary products such as refined petroleum and industrial products by revamping the industrial sector;
- Single-digit inflation rate should be pursued which is believed to engender long-run sustainable trade balance;
- Monetary policy makers and other stakeholders should harness all pointers of inflation movements and/or expectations in order to ensure relative stability of general price changes due to seasonality and business cycles;
- Monetary authority should monitor and limit the activities of illegal exchange of foreign currencies, particularly the United States dollars;
- A deliberate policy action to diversify the structural base of the economy should be pursued in order to enhance an all-inclusive growth and development;
- Government should encourage trade policies that increase exports to attract foreign exchange inflows and foreign investments;
- Fiscal policies set by the Treasury regarding Real Effective Exchange Rate should have a bias towards improving the current account balance by devaluing the currency at times so as to improve the trade balance.

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