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Balance of Trade, Exchange Rate and Economic Growth in Nigeria

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Abstract

This study delved into the relationship between the balance of trade, exchange rates, and economic growth in Nigeria. Utilizing annual time series data spanning from 1981 to 2021 sourced from the Central Bank of Nigeria (CBN) statistical bulletin and the National Bureau of Statistics (NBS), the investigation employed a Heteroskedasticity Model. Within this framework, GARCH, an expanded version of ARCH, and the Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGACH) were applied. The findings revealed that both trade balance and exchange rates exhibited heightened sensitivity to adverse news, indicating that uncertainties surrounding exchange rates significantly contributed to fluctuations. Moreover, the ARCH effects initially observed in the balance of trade and exchange rates were completely mitigated by the considered heteroskedastic models. Furthermore, the study identified a negative and statistically significant impact of the balance of trade on economic growth. Similarly, exchange rates were found to exert an undesirable significant influence on economic growth in Nigeria. This suggests that unfavorable changes in the Nigerian naira tend to exacerbate its volatility. Notably, while the relationship between trade balance and economic growth was positive, it did not reach statistical significance. In conclusion, the study underscores the critical role of external demand in driving economic growth in Nigeria, particularly highlighting the stimulative effect of a strong depreciation of the domestic currency. As a recommendation, the government is urged to adopt export-driven policies aimed at bolstering trade balance, fostering export, particularly of primary products, to attract foreign exchange inflows and foreign investment, thereby spurring economic growth in Nigeria.

Keywords: *Trade balance, Exchange rate, Economic growth*

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Background to the Study

In recent times, the discussion among policymakers has centered on the current account balance and its implications for economic growth. This focus arises from the increasing global imbalances observed in both developed and developing nations (Olaniran, 2018). For developing countries, the current account holds particular significance in fostering long-term economic growth, largely due to trade serving as a primary source of foreign exchange earnings (Ogunmuyiwa & Adelowokan, 2017). Over the years, developing countries have become increasingly reliant on international trade, driven by factors such as heightened trade openness, advancements in information and communication technology, a global shift towards trade, commodity price fluctuations, and the rising participation of developing nations in the global economy (Moussa, 2016).

To understand the relationship between the balance of trade, exchange rates, and economic growth, it's crucial to gain insight into the factors influencing Nigeria's current account dynamics. However, Nigeria's economic progress has been severely impacted. The country witnessed a significant decline in growth, plummeting from 6.3 percent in 2014 to an anticipated 2.7 percent in 2015. This downturn resulted in a 40% reduction in exports during the same period, leading to a current account deficit of 2.4 percent of GDP, a stark contrast from the 0.2 percent surplus recorded in 2014. By the end of 2015, reserves had dwindled to US$28.3 billion, down from US$34.3 billion the preceding year (World Development Indicator, 2016).

The exchange rate plays a pivotal role in international economic transactions as no nation can remain in autarky, closed off from international trade, due to variations in factor endowment (Nwaolisa, 2017). Movements in the exchange rate have far-reaching effects on other economic variables such as interest rates, inflation rates, unemployment, and money supply (Nwanekezie & Onyiro, 2018). These facts underscore the significance of the exchange rate for the economic well-being of any country engaging in international trade in goods and services. The importance of the exchange rate stems from its function in connecting the price systems of two different countries, facilitating direct comparisons of traded goods (Nwaolisa, 2017). In essence, it links domestic prices with international prices, exerting a powerful influence on a country's balance of payments position through its impact on the volume of imports and exports.

Consequently, nations striving for healthy external balances as reflected in their balance of payments (BOP) position find it imperative to formulate an exchange rate policy (Inam & Oscar, 2017). The balance of payments of a country constitutes a systematic record of all its economic transactions with the outside world in a given year (Jhingan, 2012). These transactions encompass the payment and receipt of real resources, goods, services, and income to and from the rest of the world. Specifically, the balance of payments records transactions in goods, services, and income, as well as changes in ownership and other alterations in an economy's holdings of monetary gold, Special Drawing Rights (SDRs), and liabilities to the rest of the world. It also encompasses unrequited or unilateral transfers, i.e., payments or receipts of economic value without the exchange of something of equal value.

Transactions involving payments to a country by non-residents are classified as credit entries, while those involving payments by a country to non-residents are debit entries. It is crucial for a country to control and regulate its transactions over time, as this significantly influences the level of growth and development of its economy. To achieve this, close attention should be paid to vital macroeconomic variables, especially the exchange rate, as pointed out by Meade (1951), who emphasized that maintaining both internal and external balance requires controlling both aggregate expenditure and the exchange rate (Henry, 2019).

The issue of the exchange rate is perhaps one of the most extensively discussed topics in Nigeria today, given its macroeconomic importance, particularly in a highly import-dependent economy like Nigeria's. However, the balance of payments represents a country's state of affairs in international trade. Since the adoption of the Structural Adjustment Programme (SAP), Nigeria's currency has continued to depreciate without stability. The nation's non-oil imports and exports have also shown limited responsiveness to changes in the exchange rate. In less developed economies, exchange rate policies are often delicate and contentious due to the structural transformations needed, which may involve reducing imports or expanding non-oil exports, implying a depreciation of the exchange rate (Ibrahim & Alagidede, 2017).

This volatility in the exchange rate, among other factors, has consequently affected the current account balance of Nigeria. The Nigerian balance of payments has experienced significant fluctuations over the years. The exchange rate in Nigeria stood at ₦0.61, ₦0.67, and ₦0.72, while the balance of payments stood at (₦3,020.8m), (₦1,398.3m), and (₦301.3m) in 1981, 1982, and 1983, respectively. Since then, the exchange rate has been on the rise, averaging ₦226 from 2018 to 2021. However, the balance of payments has been on an unstable negative trend, averaging (₦1,284m) from 2018 to 2021. A negative current account typically indicates that a country's imports exceed its exports, leading to increased international borrowing to finance consumption, resulting in financial and capital account deficits. In the first quarter, Nigeria's current account deficit decreased by $2 billion to $4.88 billion, aided by a smaller trade deficit, its largest component, despite a larger deficit in services and income accounts. Conversely, the financial and capital account netted -$6.3 billion in the period, compared to $13.24 billion in the fourth quarter of 2019 and $4.82 billion in the corresponding quarter of 2019 (CBN, 2019). It's crucial to note that persistent trade balance deficits exert heavy pressure on the forex market and significantly deplete external reserves (Adams, 2020). In the first quarter of 2021, Nigeria recorded a current account deficit of 1750.64 USD million. In the long term, Nigeria's current account is projected to trend around -4000.00 USD million in 2022 and -4800.00 USD million in 2023 (Trading Economics, 2022).

The true direction of the relationship between trade balance, exchange rate, and economic growth in Nigeria remains unclear due to a dearth of literature on the subject matter. Only a few works, such as that of Ogunniyi et al. (2018), have examined current account balances and economic growth in Egypt, Algeria, Nigeria, and South Africa, among other related studies. Other works, such as those of Nwanekezie and Onyiro (2018), Nwaolisa (2017), and

Oladipupo & Onotaniyohuwo (2011), have used multiple regression analysis of Ordinary Least Squares, which can only demonstrate the impact of a set of independent variables on a dependent variable or show causal direction or correlations, among others, but cannot capture fluctuations in the exchange rate. Consequently, results from such techniques may not truly express the effect of fluctuations in Nigeria's exchange rate. Additionally, no previous works have been able to establish the responsiveness of the exchange rate to its own news (either bad or good), indicating when the exchange rate becomes more or less volatile and experiences more or less movement.

Nigeria's economic growth is significantly influenced by its balance of trade and exchange rate. However, while there has been research and demonstration on trade balance, exchange rate, and economic performance, economic growth indices or elements have not been articulated using the current account balance as a proxy for the balance of trade, alongside exports and imports with the exchange rate in the same model as independent variables. This constitutes a gap in literature and empirical evidence. This study aims to fill this gap by co-compositing the balance of trade, exchange rate, and economic growth, drawing on the components of exports, imports, current account, and exchange rate.

Conceptual Clarification

Exchange Rate

Theoretically, the exchange rate simply represents the cost of one country's currency in relation to another country's currency. In the context of Nigeria, it signifies the amount of naira needed to purchase one unit of another country's currency, such as the Japanese Yen. Various types of exchange rates exist, including nominal exchange rate, real exchange rate, and real effective exchange rate (Fasanya & Adekoya, 2017).

a. **Nominal Exchange Rate**:

This denotes the value of a foreign currency relative to a domestic currency. It is typically expressed as the domestic value of the foreign currency. For instance, if an individual needs to exchange one U.S. dollar for one euro at $1.36, from the perspective of the person holding euros, the nominal exchange rate would be 0.735 (Luis, 2017).

b. **Real Exchange Rate**:

This seeks to estimate the price of a country's goods compared to those of another country, a group of countries, or the rest of the world, using the prevailing nominal exchange rate. It's important to distinguish between nominal and real exchange rates. While the former represents a monetary phenomenon estimating the relative price of two currencies, the latter estimates the relative value of two goods (Sebastian, 1989).

c. **Real Effective Exchange Rate**:

This is the weighted average of bilateral real exchange rates. It reflects the ratio of foreign to local price levels expressed in a common currency through nominal bilateral exchange rates. Some weighting criteria, such as the share of currencies used in foreign trade transactions or the share of foreign countries in a nation's total foreign trade volume, are used to determine

the real effective exchange rate. Real effective exchange rate is commonly used as a rough measure to determine if a currency is misvalued (overvalued or undervalued) and by how much (Luis, 2012).

Current Account Balance and Balance of Trade

When the citizens of a country have enough money to cover all their purchases, the country's current account is in balance. Residents, including individuals, corporations, and the government, contribute to this balance through income and savings. All consumer spending, business investments, and government infrastructure projects fall under purchases (Ademola & Obamuyi, 2018). Most countries aim to accumulate wealth by exporting more goods and services than they import, resulting in a trade surplus. This indicates that a country earns more money than it spends. Conversely, when a country's government, corporations, and citizens import more goods and services than they export, a deficit arises, meaning they receive less foreign capital than they spend.

Nigeria is among the countries whose current account position raises concerns for policymakers. The Nigerian economy relies heavily on the external sector, indicating its dependence on external trade to generate foreign exchange for importing capital goods and driving economic activities in the real sector. Additionally, export earnings, particularly from oil, have accounted for over 60.0 percent of government revenue in the past two decades. Therefore, the government's ability to provide adequate infrastructure, such as roads, railways, and stable power supply, directly impacts the performance of the external sector. This underscores why every nation strives to achieve a favorable balance of payments. However, Nigeria has faced a balance of payments deficit for decades, leading to a weakened economy. The imbalance in the country's balance of payments has raised questions about its causes, its impact on social progress, and the policies needed to achieve a favorable balance of payments position.

Exchange rate is considered a major determinant affecting a nation's balance of payments (Nwanekezie & Onyiro, 2018). Consequently, close attention is paid to a nation's currency both domestically and internationally. According to Englama, Duke, Ogunleye, & Isma (2010), a volatile exchange rate complicates international trade and investments due to increased exchange rate risk. In Nigeria, the exchange rate was relatively stable before the oil boom of the 1970s, with the U.S. Dollar being valued below one naira to a dollar from 1970 to 1985 (Henry, 2019). However, significant volatility in the exchange rate occurred during and after the oil boom, primarily due to fluctuating oil prices caused by the oil glut and OPEC interventions on oil quotas. Oil prices have been recognized as a major determinant of the exchange rate in Nigeria (Adeniyi, Omisakin, & Oyinlola, 2011).

Theoretical Literature

The Elasticity Approach

The elasticity approach elucidates the critical role of exchange rates in determining trade relations and current account balance levels. Marshall (1923) and Lerner (1923) pioneered this approach, further extended by Robinson (1937). The cornerstone of this method lies in

the price elasticity of demand for both imports and exports. It posits that if the elasticity of export demand exceeds that of import demand, the current account balance will improve. However, a fundamental drawback of this approach is its partial equilibrium nature, focusing solely on traded products while disregarding actions in other economic sectors.

Similar to the elasticity technique, the absorption approach defines the current account balance as the difference between income and absorption, which also encompasses the disparity between savings and investment. This approach posits that if an economy consumes more than it produces (i.e., absorption exceeds income), it must import the balance from another country, worsening the current account balance. Conversely, if consumption is lower than production, excess production will need to be exported, improving the current account balance. This method is deemed more appropriate and inclusive as it considers all economic agents' activities.

Researchers have found the absorption approach to be more reliable in modeling current account balances (Hung and Gamber, 2010). In assessing the connection between external and internal balances, the absorption approach begins with the framework of national accounts.

$$Y_t = C_t + I_t + C_{t+}(X_t - M_t) \qquad 1)$$

Rearranging the variables in equation 1 we have:

$$(X_t - M_t) = \ Y_t - C_t - I_t - C_t = S_t + I_t \qquad 2$$

Consumption, investment, and government expenditure represent the internal balances of the economy. The external balance is determined by the disparity between exports and imports.

Empirical Literature Review

Ogunniyi, Iwegbu, & Adekoya (2018) investigated the impact of the current account balance on economic growth in SANE countries (South Africa, Algeria, Nigeria, and Egypt). They utilized the ARDL estimation technique for comparative analysis, and the fully modified panel OLS (FMOLS) method to assess the overall impact of the current account balance on economic growth. The findings revealed a substantial negative impact of the current account balance on economic growth in Algeria, Egypt, and Nigeria, while South Africa experienced a considerable positive impact. This underscores the significance of an economy's structure in relation to its primary source of foreign exchange earnings on economic growth, as indicated by the current account balance. Therefore, diversifying the export base is recommended, primarily through technological advancements and agricultural development, to mitigate the impact of any shortfall or negative shock in the oil sector.

Yousif & Musa (2018) analyzed the determinants of Sudan's balance of payments using annual data on the balance of payments (BOP), foreign debt (ED), exchange rate (EX),

inflation (INF), and gross domestic product (GDP) from 1980 to 2016. They employed the VECM Approach and found a direct association between the balance of payments and foreign debt, as well as an inverse relationship between the balance of payments and inflation, GDP, and exchange rate indicators. The study suggests that Sudan should not solely rely on foreign assistance to address its economic challenges, as this would require significant national product transfers to fulfill its obligations to foreign countries.

Nwanosike et al. (2017) utilized a multivariate regression model to assess the consequences of currency devaluation on Nigeria's balance of payments, following the Marshall-Lerner (ML) condition. They used exchange rate, trade openness, and foreign direct investment as independent variables and the balance of payments as the dependent variable. The findings indicated that a unit depreciation of the exchange rate leads to a 2.28138 percent decrease in the balance of payments (BOP) through the balance of trade mechanism. Additionally, the analysis revealed that the Marshall-Lerner criterion was not satisfied in the short run in the Nigerian context between 1970 and 2014.

Nwanekezie & Onyiro (2018) investigated the impact of exchange rate volatility on Nigeria's balance of payments using aggregate annual data from 1981 to 2016. They employed the co-integration/error correction model (ECM) method and found a long-run relationship between exchange rate volatility and the balance of payments. The study concluded that discouraging over-reliance on imported goods and promoting domestic exports are essential, emphasizing the need for economic diversification and entrepreneurial development.

Uduakobong & Williams (2018) examined the relationship between exchange rate volatility and non-oil exports in Nigeria using annual data from 1970 to 2015. They employed the Johansen test of Cointegration, Error Correction Model (ECM), and Granger Causality test. The results indicated a long-run relationship between exchange rate and non-oil exports, with unidirectional causality from exchange rate to non-oil exports.

Adaramola (2016) investigated the effect of real exchange rate volatility on export volumes in Nigeria using quarterly data from 1970Q1 to 2014Q4. They employed econometric techniques including the Johansen Multivariate approach to co-integration, Error Correction Mechanism (ECM), and ARCH and GARCH models. The study found a long-run relationship between real exchange rate volatility and export volumes, concluding that real exchange rate uncertainty significantly and positively impacted Nigeria's trade volume.

Evaluation of the Literature Review

The study conducted by Ogunniyi et al. (2018), which examined the balance of trade using current account balances and economic growth in Egypt, Algeria, Nigeria, and South Africa, serves as the closest literature to this research. However, this current study focuses solely on the Nigerian situation, but with an expanded scope and more appropriate techniques to handle the volatility associated with exchange rates and external imbalances.

Other studies that bear resemblance to this research have yielded conflicting results regarding the impact of exchange rate volatility, balance of payments, and economic growth in Nigeria. Only a few works, such as those by Nwanekezie and Onyiro (2018) and Nwaolisa (2017), utilized multiple regression of Ordinary Least Squares. However, this method might not fully capture fluctuations in the exchange rate, thus potentially limiting the expression of the effect of such fluctuations in the Nigerian exchange rate. Moreover, none of the previous works have successfully established the responsiveness of the exchange rate to its own news, whether positive or negative, indicating the level of volatility experienced.

With this perspective in mind, the researcher aims to assess the link between external imbalances, exchange rate fluctuation, and economic growth in Nigeria by employing Autoregressive Conditional Heteroskedastic (ARCH) family models. These models are considered more appropriate for estimating volatility and are suitable for discussing changes in currency trends. Through this approach, the study seeks to achieve a more comprehensive understanding of the dynamics between external imbalances, exchange rate fluctuations, and economic growth in Nigeria.

Methodology

This section outlines the methodology employed to gather data and investigate the research problem. It encompasses research design, data collection sources and methods, model specification, variables included in the model, expected outcomes, and data analysis techniques.

Research Design

The research design utilized in this study is the ex-post facto research design. This type of research involves analyzing events that have already occurred, utilizing existing data, without any attempt to control or manipulate relevant independent variables, as they cannot be manipulated.

Data Collection and Sources

Data for this study covers the period from 1986 to 2021 and was sourced from the Central Bank of Nigeria (CBN) statistical bulletin for the years 2009 and 2021 editions, as well as the World Bank Financial Outlook. Various statistical and econometric tools were employed to explore the relationship between trade balance, exchange rate, and economic growth in Nigeria.

Model Specification

For this study, the elasticity approach to balance of payments is utilized. This theory is grounded in the Marshall-Lerner condition, which posits that the combined elasticity of demand for a country's exports and imports must exceed unity for a devaluation to positively impact the country's balance of payments. If this sum is less than unity, the country may improve its balance of trade through revaluation instead. The model is founded on several elasticity approach models, such as the monetary and absorption views. Given Nigeria's import-dependent economy, the devaluation of its currency has been a significant factor.

However, the effectiveness of this strategy warrants examination, aligning with the essence of the Marshall-Lerner condition.

The model for this study is specified based on economic theory and previous research, such as that conducted by Cota, Erjavec, & Bogdan (2017). We have selected current account balance (balance of trade), exchange rate (EXCHR), exports (EXPT), and imports (IMPT) as macroeconomic determinants relevant to explaining GDP growth rate.

$$(\text{GDPgr}).\ \text{GDPgr} = f(\text{BOT}, \text{EXCHR}, \text{EXPT}, \text{IMPT}) \quad - \quad - \quad 3$$

Where:
GDPgr = Gross Domestic Product Growth Rate
BOT = Balance of trade (Current Account)
EXCHR = Exchange rate
EXPT = Export
IMPT = Import
f = Functional notation

GDPgr is the dependent variable, while BOT, EXPT, EXCHR and IMPT are the independent variables.

The OLS multiple regression equation based on the above mathematical form equation is expressed as:

$$\text{GDPgr} = \Omega_0 + \Omega_1\text{BOT} + \Omega_2\text{EXCHR} + \Omega_3\text{EXPT} + \Omega_4\text{IMPT} + \mu \quad - \quad - \quad 4$$

Where: Ω_0= Constant term/ Intercept.
$\Omega_{1>0}\ \Omega_{2<0}\ \Omega_{3>0\text{and}}\ \Omega_{4<0}$ = Apriori expectations and parameters. μ = Error term

Estimation Technique
The Heteroskedasticity Model was employed in this investigation, utilizing GARCH (p, q), an extended framework of ARCH (q), and the Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGARCH). This technique offers several advantages: The log value of volatility is utilized as an explanatory variable, eliminating the need to impose nonnegative constraints on the variance dynamics parameters. The EGARCH model can account for the asymmetric influence of volatility. The persistence of volatility shocks is determined solely by the coefficients of the GARCH term. Due to these merits, the EGARCH approach is effective for estimating the volatility of exchange rates and macroeconomic variables. The aim of this research is to provide empirical evidence on the relationships between trade balance, exchange rates, and economic growth.

Autoregressive Conditional Heteroskedastic (ARCH) Effects
Before delving into heteroskedastic models, it is imperative to assess the residuals for evidence of heteroskedasticity. To accomplish this, the Lagrange multiplier (LM) test

proposed by Engle (1982) was employed. The process involves obtaining residuals from the ordinary least squares regression of the conditional mean equation, which may be an autoregressive (AR) process, moving average (MA) process, or a combination of AR and MA processes (ARMA). Using EViews software, if considering an ARMA (1, 1) process, for instance, whose conditional mean equation is:

$$r_t = \theta_t r_{t-1} + \varepsilon_t + \theta_t \varepsilon_{t-1} \quad 5$$

Once the residuals are obtained, the next step is to regress the squared residual on a constant and its q lags as in the following equation:

$$\varepsilon_t^2 = \alpha_t + \alpha_t \varepsilon_{t-1}^2 + \cdots + \alpha_q \varepsilon_{t-q}^2 = \alpha_0 + \sum_{t-1}^{q} \alpha_t \varepsilon_{t-1}^2 \quad 6$$

The ARCH model (q) is

$$\sigma_t = \alpha_0 + \alpha_t \varepsilon_{t-1} + \cdots + \alpha_q \varepsilon_{t-q} = \alpha_0 + \sum_{t-1}^{q} \alpha_t \varepsilon_{t-i} + \varepsilon_t \quad 7$$

Where σ_t is the unconditional variance, α_0 is the constant term, α_1 is the coefficient of the ARCH term, ε_{t-i} is the corresponding lags of the errors at time, q is the length of ARCH lags and ε_t is the error term. The hypothesis is.

$H_0 : \alpha_1 = \ldots = \alpha_q = 0$ (Absence of ARCH effect up to order q)

$H_a : \alpha_{11} \neq 0 \; for \; some \quad i \quad \in \{1, 2, 3, \ldots, q \; (at \; least \; one \; has \; presence \; of \; ARCH \; effect)$

The test statistic for the joint significance of the q-lagged squared residuals with q degrees of freedom is obtained by multiplying the number of observations by the R-squared (TR^2). TR^2 is then compared against the $\chi^2(q)$ distribution. If TR^2 is greater than the tabulated $\chi^2(q)$, we reject the null hypothesis and infer the presence of an Autoregressive Conditional Heteroskedastic (ARCH) effect in the ARMA model.

Generalize Autoregressive Conditional Heteroskedasticity

The Generalized Autoregressive Conditional Heteroskedastic (GARCH) model, denoted as GARCH (p, q), extends the framework of ARCH (q) by incorporating p lags of past conditional variance into equation. The GARCH (p, q) model accommodates both autoregressive and moving average components in the heteroskedastic variance. It is represented as:

$$\sigma_t^2 = \sigma_0 + \sum_{i=1}^{q} \alpha_i \, \varepsilon_{t-i}^2 + \sum_{j=1}^{p} \beta_j \gamma_{t-j}^2 \qquad 8$$

Where: all the parameter

$\alpha_0, \alpha_i, \beta_j \geq 0$; σ_t^2 is the conditioonal variance α_0 is constant term α_i and β_j are coefficients of the ARCH and GARCH term respectively, ε_{t-i}^2 *and* γ_{t-j}^2 are the squared errors at lag $_{t\text{-}I}$ and $_{t\text{-}j}$ respectively.

The GARCH (p, q) with z_t is a discrete time stochastic process defined as: $\varepsilon_t = z_t \sigma_t$, and is weakly stationary with $E(\varepsilon_t) = 0$ and

$$Var\,(\varepsilon_t) = \alpha_0[\,1 - \left(\sum_{i=1}^{p} \alpha_t + \sum_{j=1}^{q} \beta_j\right)]^{-1} \qquad 9$$

$$cov(\varepsilon_t \varepsilon_t for\ t \neq s, if\ and\ only\ if \sum_{i=1}^{p} \alpha_i + \sum_{j=1}^{q} \beta_j < 1,\ \alpha_0 > 0 \qquad 10$$

The exponential GARCH (EGARCH) model, introduced by Nelson (1991), is capable of illustrating asymmetry in volatility concerning the direction of real growth. The EGARCH (p, q) model is formulated as:

$$log\infty_t^2 = \partial + \sum_{i=1}^{p} (\varphi_i \, |z_{i-1}| + \pi_{i-1}) + \sum_{i=1}^{q} \beta_i \, log\varphi_{t-1}^2 \qquad 11$$

Where:

$$z_t = {}^{\varepsilon_t}/_{\varphi_t} \qquad 12$$

And ε_t is an error term. Note that the left-hand side of equation (1) represents the logarithm of the conditional variance. The logarithmic form of the EGARCH (p, q) model guarantees the non-negativity of the conditional variance without requiring constraints on the model's coefficients. The inclusion of the term z_(t-1) represents the asymmetric effect of positive and negative shocks. If π_t > 0 (<0), fluctuations tend to increase (decrease) when the lagged standardized shock, z_(t-1), is positive.

$$z_t = {}^{\varepsilon_{t-1}}/_{\varphi_{t-1}}\ is\ positive$$

The persistence of shocks to the conditional variance is given by $\sum_{i=1}^{q} \beta_t$. As a special case, the EGARCH (1, 1) model is given in equation (14) as follows

$$z_t = {}^{\varepsilon_{t-1}}/_{\varphi_{t-1}}\ is\ positive$$

The persistence of shocks to the conditional variance is given by $\sum_{i=1}^{q}\beta_t$. As a special case, the EGARCH (1, 1) model is given in equation (13) as follows

$$log\pi_t^2 = \infty + \varphi_1|z_{t-1}| + \pi_{t-1} + \beta_1 log\pi_{t-1}^2 \qquad 13$$

For positive shock (z_{t-1} ($z_{t-1} > 0$), equation (13) will be transformed as

$$log\pi_t^2 = \infty + z_{t-1}(\varphi + \gamma) + \beta_1 log\pi_{t-1}^2 \qquad 14$$
$$log\pi_t^2 = \infty + z_{t-1}(\varphi - \gamma) + \beta_1 log\pi_{t-1}^2 \qquad 15$$

Therefore, the presence of a leverage effect can be examined through the hypothesis that γ_i=0. The effect is considered asymmetric if γ_i≠0. Additionally, the parameter β controls the persistence of volatility shocks in the EGARCH (1, 1) model. Utilizing the EGARCH model offers several advantages.

Goodness of Fits Criteria

Akaike Information Criteria (AIC) and Schwarz Criteria (SIC) are the most commonly used model selection criteria (Vee et al, 2009).

$$AIC = 2K - 2In(LL) = 2K + In\left(\frac{RSS}{n}\right) \qquad 16$$

Where K represents the number of parameters in the model, L denotes the maximized value of the likelihood function for the model, and RSS=Σ_(t=1)^n▒ε^2 represents the residual sum of squares.

After fitting a model to a time series, it is essential to assess the adequacy of the estimated ARCH and GARCH models by investigating the presence of autocorrelation in the residuals, which determines if the model provides a sufficient description of the study variables α_t. The Lagrange Multiplier of α_t is employed to evaluate the adequacy of the mean equation, while that of α_t^2 is utilized to assess the validity of the volatility equation (Peter and Richard, 2002).

Jarque-Bera Normality Test

Jargue-Bera is a skewness and kurtosis joint test that determines whether data series have a normal distribution or not.

$$\frac{N}{6}\left(S^2 + \frac{(K-3)^2}{4}\right) \sim \chi^2 \qquad 17$$

The test statistic is expressed as: where S, K, and N represent skewness, kurtosis, and the size of the macroeconomic variables respectively. Under the null hypothesis of a normal distribution, Jarque-Bera statistic is $\chi 2$ distributed with 2 degrees of freedom.

The Stationary Test (Augmented Dickey Fuller Test) is crucial for verifying the stationarity of data series, which is one of the key assumptions in time series analysis. This assumption can be assessed using a unit root test, specifically the Augmented Dickey Fuller test (ADF), which employs a parametric autoregressive structure to capture serial correlation. If the data series is found not to be stationary, it may require transformation or differencing to achieve stationarity by determining the order of integration (i.e., the number of times they need to be differenced). The unit root test, proposed by Dickey and Fuller (1979), is expressed as:

Null hypothesis as $H_0 : \varphi_1 = 1$ and Alternative hypothesis as $H_0 : \varphi_1 < 1$

Test Statistic (t-ratio):

$$= \frac{\varphi_1^n - 1}{std(\varphi_1)} = \frac{\sum_{t=i}^{t} P_{t-1} e_t}{\sqrt[\propto 2]{\sum_{t=1}^{t} P_{t-1}^2}} \qquad 18$$

Equation 4 can be translated as

$$\varphi_t = \frac{\sum_{t=1}^{T} P_{t-}1P_t}{\sum_{t=1}^{T} P_{t-1}^2} \qquad 19$$

P_t is present data series, P_{t-1} is previous data series, e_t is the error term at time t, $P_0 = 0$ and T is the sample size. The null hypothesis is rejected if the t calculated value is greater than t critical value.

Results and Discussions

This section presents the estimated results of the study, tests the hypotheses guiding the study, and provides a detailed discussion on the findings of the study.

Data Presentation

Descriptive statistics

Descriptive statistics was further used to describe the trend behavioural pattern of the data set.

Table 1: Descriptive Statistic

VARIABLE	GDPGR	BOT	EXPT	IMPT	EXCHR
Mean	0.034829	17.36220	5715124.	4646005.	105.3832
Median	0.032001	17.50000	1867954.	1358180.	111.9400
Maximum	0.153292	29.80000	19910534	22394498	358.8100
Minimum	-0.109241	7.750000	7502.500	5983.600	0.610000
Std. Dev.	0.045614	4.583592	6515761.	6244170.	103.5989
Skewness	-0.260407	0.281599	0.787808	1.431646	0.805520
Kurtosis	4.528678	3.619795	2.216757	4.161221	2.711227
Jarque-Bera	4.455508	1.198121	5.289057	16.30924	4.576348
Probability	0.107770	0.549327	0.071039	0.000287	0.101452

Source: Eviews Output

From the descriptive statistics table, it is evident that Nigeria's exports for the period under review averaged approximately 5,715,124 billion naira, with a minimum value of 7,502 billion naira denoting a deficit. The maximum recorded for the period stood at 4,473.20 billion naira. The exchange rate records a minimum of 0.610, with an average of 100.87 and a maximum value of 358.8, which occurred in 2021. GDP growth rate (GDPgr) has an average value of approximately 55.36. The maximum was approximately 78.40, with a minimum value of 41.88. Balance of trade, on the other hand, recorded mean, median, minimum, and maximum values of 17.36, 17.53, 7.75 percent, and 29.80 percent, respectively. Imports recorded mean, median, minimum, and maximum values of 4646, 1358, 5983, and 2239, respectively. The skewness statistics show that all the variables are positively skewed. The Jarque-Bera statistics values of the variables and their corresponding probability values show that all the variables are diagnostically stable, with the exception of inflation rate data, which is either trendy or unstable.

Analysis of Results

The analytical section of this chapter is centered on two main techniques used, namely the ECM and the GARCH and EGARCH econometric techniques, and other pre- and post-estimation tests for a robust discussion.

Error Correction Model (ECM)

Table 2: Augmented Dickey-Fuller test

Variable	Dickey-Fuller		Critical Value (5%)		~I(d)
	Level	1st Order	Level	1st Order	
EXPT	-3.5494	-9.2966	-3.5297	-3.5330	I(1)
IMPT	-3.4104	-4.8857	-3.5330	-3.5442	I(1)
EXCHR	-0.4494	-4.7188	-3.5297	-3.5330	I(1)
BOT	-3.2993	-6.2556	-3.5297	-3.5366	I(1)
GDPgr	-1.2135	-5.6166	-3.5366	-4.2268	I(1)

Source: Author's Computation

The results of the Augmented Dickey-Fuller unit root test in Table 2 indicate that all the selected variables in the study are non-stationary at the level but become stationary after undergoing first-order differencing. This validates the common assumption that many time series variables exhibit stationarity after a single differencing step, indicating a stationary of order one (I(1)). Thus, the condition for applying the conventional Johansen test for cointegration of the variables is satisfied, as the Johansen cointegration test is most appropriate when all variables are stationary at the same order (i.e., of I(1)).

Table 3: Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.692087	105.2470	62.99	70.05
At most 1 **	0.481985	61.66331	42.44	48.45
At most 2 **	0.448594	37.32653	25.32	30.45
At most 3 *	0.338696	15.30104	12.25	16.26

Trace test indicates 4 cointegrating equation(s) at the 5% level
Trace test indicates 3 cointegrating equation(s) at the 1% level
*(**) denotes rejection of the hypothesis at the 5%(1%) level

Source: EViews Output

The Unrestricted Cointegration Rank Test (Trace) above indicates the presence of four (4) co-integrating equations at the 5% significance level and three (3) co-integrating equations at the 1% significance level. Meanwhile, the Max-eigen value test reveals one (1) co-integrating equation at the 5% significance level. These findings suggest that the variables are co-integrated, signifying a long-run or equilibrium relationship among the variables used in the model. Consequently, employing the Error Correction Model (ECM) is considered an appropriate technique for examining the relationship between the selected dependent variable and the independent variables in this study.

Table 4: Error Correction Model (ECM)

Dependent Variable: D(GDPgr)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.341300	2.304946	1.015772	0.3169
D(EXCHR)	-1.624839	7.543984	-2.153820	0.0384
D(IMPT)	-2.201490	1.661411	-1.325072	0.1940
D(BOT)	0.371224	0.099224	3.741265	0.0007
D(EXPT)	0.081980	0.012621	6.495701	0.0000
ECM(-1)	-0.600610	0.150942	-3.979088	0.0003

R-squared	0.754895	Mean dependent var	-333.7946
Adjusted R-squared	0.746647	S.D. dependent var	16239.47
S.E. of regression	12080.17	Akaike info criterion	21.75573
Sum squared resid	4.96E+09	Schwarz criterion	21.96900
Log likelihood	-419.2367	Hannan-Quinn criter.	21.83225
F-statistic	8.668077	Durbin-Watson stat	1.931721
Prob(F-statistic)	0.000062		

Source: EViews Output

The adjusted coefficient of determination, R-squared (R^2), of the model indicates that 74.66% of the observed variations in economic growth in Nigeria were jointly explained by export, balance of trade, exchange rate, and import, while the remaining 25.34% unexplained variance is assumed to be captured by the error term, μ. Therefore, approximately 54.66% of the growth of the Nigerian economy can be attributed to changes in the explanatory variables.

Export demonstrates a positive relationship with the economic growth rate, with a coefficient of 0.0819. This implies that a unit increase in exports, with all other variables held constant, would lead to a 0.018 unit increase in economic growth. The associated t-stat and probability values are 6.4957 and 0.0007, respectively, indicating statistical significance at the 0.05 significance level (with a t-stat greater than 2 and prob less than 0.05). Similarly, the balance of trade exhibits a positive relationship with economic growth, with a coefficient value of 0.3712. This suggests that if Nigeria's external trade is positive (i.e., export earnings exceed import earnings), the economy will grow by 0.3712 percent. The t-stat is greater than 2, and the probability value is less than 0.05, signifying the statistically significant impact of the balance of trade on economic growth.

Conversely, the coefficient of exchange rate is negative (-1.6248), indicating that a unit increase in the exchange rate would result in about a 1.6248 unit decrease in economic growth in Nigeria. This implies that the exchange rate has a negative and statistically significant impact on economic growth, as indicated by the t-stat and probability values.

Moreover, the coefficient of imports is -2.201, suggesting that a unit increase in imports would lead to about a 2.201 unit decrease in GDP growth. Similarly, the coefficient of the interest rate is -2.207, indicating that a unit increase in the interest rate would result in a 2.207 unit decrease in economic growth. Both coefficients are statistically significant, as demonstrated by their respective t-stat and probability values.

Furthermore, the F-test value of 8.668 indicates that the overall test is significant, implying that the explanatory variables are simultaneously significant in forecasting trade balances and economic growth in Nigeria. Additionally, the Durbin-Watson statistics value of 1.93 suggests that there is no evidence of autocorrelation in the model.

The GARCH/EGARCH models

The empirical findings from the GARCH model provide valuable insights into the dynamics of exchange rates concerning macroeconomic uncertainties. Overall, the study reveals that the GARCH model serves as an effective tool for capturing the enduring volatility inherent in trade balances and exchange rates.

Table 5: The Experiential GARCH models

Dependent Variable: GDPgr
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
GARCH = C(4) + C(5)*RESID(-1)^2 + C(6)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
D(EXCHR)	0.266030	0.118539	2.244243	0.0445
D(IMPT)	-7.067330	3.240436	-2.180981	0.0498
D(BOT)	809.7113	254.3961	3.182876	0.0015
D(EXPT)	0.048475	0.051942	0.933271	0.3584
Variance Equation				
C	1.11E+08	3.10E+08	0.357768	0.7205
RESID(-1)^2	0.115711	0.246253	0.469887	0.6384
GARCH(-1)	0.287947	1.778577	0.161897	0.8714

R-squared	0.184778	Mean dependent var	6304.915
Adjusted R-squared	0.140712	S.D. dependent var	15345.22
S.E. of regression	14224.68	Akaike info criterion	22.16112
Sum squared resid	7.49E+09	Schwarz criterion	22.41445
Log likelihood	-437.2224	Hannan-Quinn criter.	22.25272
Durbin-Watson stat	1.102015		

Source: EViews Output

Past volatilities and errors emerge as significant determinants of the variance of futures prices, while past prices play a significant role in determining the expected price. However, the residual of the prediction error on balance of trade and exchange rate movement does not exhibit significance in the mean equation and remains insignificant at the five percent level in the variance equation. This suggests that uncertainties surrounding the balance of trade contribute significantly to the observed fluctuations.

The results indicate that the ARCH effects initially observed in the balance of trade were entirely eliminated by each of the heteroskedastic models considered. The z-statistic for all models was notably low, and the probability values exceeded the 0.05 significance level for all fitted models. Therefore, it can be inferred that the initial heteroskedasticity has been completely eradicated by each of the heteroskedastic models employed.

Table 6: EGARCH

Dependent Variable: GDPgr				
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)				
LOG(GARCH) = C(4) + C(5)*ABS(RESID(-1)/@SQRT(GARCH(-1))) + C(6) *RESID(-1)/@SQRT(GARCH(-1)) + C(7)*LOG(GARCH(-1))				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
D(EXCHR)	-27.76727	4.241477	-6.546603	0.0000
D(IMPT)	-27.34847	0.758897	-36.03711	0.0000
D(BOT)	0.208512	0.082770	2.519186	0.0168
D(EXPT)	0.005864	0.002363	2.481266	0.0191
Variance Equation				
Ω	0.546724	0.306232	1.785323	0.0834
∞	-18.90866	0.002529	-7475.730	0.0000
Φ	-0.663513	0.467341	-1.419761	0.1557
ϒ	1.921551	0.125572	15.30237	0.0000
B	0.011904	0.020479	0.581268	0.5611
R-squared	-0.022406	Mean dependent var		6304.915
Adjusted R-squared	-0.077671	S.D. dependent var		15345.22
S.E. of regression	15930.02	Akaike info criterion		21.60797
Sum squared resid	9.39E+09	Schwarz criterion		21.90352
Log likelihood	-425.1594	Hannan-Quinn criter.		21.71483
Durbin-Watson stat	1.008513			

Source: EViews Output

The parameter estimation for the EGARCH (1, 1) model is presented in Table 6. The results indicate that the leverage effects are positive and significant at the 5% significance level. This suggests that bad news (favoring the dollar) leads to greater trade imbalances than good news (favoring the naira) for Nigerian economic growth. It is noteworthy that the coefficient of the exchange rate (EXCHR) is negative. This implies that a negative change in the Nigerian naira has a larger impact on its fluctuation, indicating that during an appreciation (negative change), the currency tends to be more volatile. Considering the significance of the exchange rate in the model, negative changes in the naira may be directly associated with negative changes in Nigeria's economic growth balance. When the exchange rate increases in favor of the dollar, its fluctuation decreases as well. Therefore, among the selected macroeconomic variables (exchange rate, trade balances, export, and import), the exchange rate and trade balances movement are more sensitive to bad news.

Table 7: Heteroskedasticity Test: ARCH

F-statistic	0.040474	Prob. F(1,37)	0.8417
Obs*R-squared	0.042615	Prob. Chi-Square(1)	0.8365

Table 8: Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.472116	Prob. F(2,32)	0.6280
Obs*R-squared	1.117799	Prob. Chi-Square(2)	0.5718

Source: EViews Output

The result in Table 7 demonstrates the absence of heteroskedasticity, indicating that the residuals are homoscedastic. This instills confidence in our estimates, suggesting that they possess minimum variance and that the standard errors (S.E), t-tests, confidence intervals, and prediction intervals are accurate.

Additionally, the result in Table 7 from the serial correlation test reveals no serial correlation in the residuals. This is evident from the insignificant observed R-squared (Obs*R-squared) with a probability Chi-square (2) value of 0.5718. This implies that the error terms of our variables are independent, signifying that the residuals of the series are not influenced by one another.

Hypothesis Testing

To test the hypotheses of the study, t-tests were conducted, as presented previously in Table 4 and 5. We will discuss them here as they relate to each of our hypotheses. The hypotheses were formulated in the null form.

Decision Rule: Accept the null hypothesis if the prob. value is greater than 0.05 significant level. Reject the null hypothesis if the prob. value is less than 0.05 significant level.

Hypothesis 1: The balance of trade has no significant impact on economic growth in Nigeria. This hypothesis will be tested with the results of the EGARCH model presented in Table 5, which was specifically estimated to examine fluctuations or volatility in the balance of trade.

The coefficient of balance of trade fluctuation is positive, with a statistically significant t-stat value of 2.5191, exceeding the tabulated value of ± 2.06, and a significant probability value of 0.0168, which is less than 0.05. This indicates that a change in Nigeria's balance of trade has a considerable impact on the economic growth rate. Therefore, we reject the null hypothesis and conclude that balance of trade fluctuations has a significant impact on economic growth in Nigeria.

This finding is further supported by the ECM results in Table 4. The t-value of the balance of trade from Table 3, in absolute terms, is 3.7412, with a probability value of 0.0007, which is less than the 0.05 significance level. Thus, the impact of trade balance on economic growth is negative and statistically significant, leading to the rejection of the null hypothesis and acceptance of the alternative. Therefore, this study confirms that the balance of trade in Nigeria has a significant impact on economic growth.

Hypothesis 2: Export does not significantly impact economic growth in Nigeria.

The absolute t-value of export (EXPT) from Table 4 is 6.4957, with a probability value of 0.0000, exceeding the 0.05 significance level. This implies that the relationship between exports and economic growth is positive and statistically significant. Therefore, we reject the null hypothesis and conclude that an increase in exports can positively impact Nigeria's economic performance.

Hypothesis 3: Import has no significant impact on economic growth in Nigeria.
The absolute t-value of import (IMPT) is 1.325, with a probability value of 0.1940, which is greater than the 0.05 significance level. This suggests that the relationship between imports and economic performance is negative but not statistically significant. Therefore, we accept the null hypothesis and conclude that an increase in imports may not significantly improve Nigeria's economic performance.

Hypothesis 4: Exchange rate has no significant impact on economic growth in Nigeria.
This hypothesis will be tested with the results of the EGARCH model in Table 6, specifically estimated to examine fluctuations or volatility in the exchange rate. The coefficient of exchange rate fluctuation is negative, with a statistically significant t-stat value of 6.5466 and a probability value of 0.000, indicating significance at the 0.05 level. Thus, we reject the null hypothesis and conclude that exchange rate fluctuation has a significant impact on economic growth in Nigeria.

This finding is further supported by the ECM results in Table 4, where the absolute t-value of the real exchange rate is 2.153, with a probability value of 0.0000, indicating significance at the 0.05 level. Therefore, the impact of the exchange rate on economic growth is negative and

statistically significant, leading to the rejection of the null hypothesis and acceptance of the alternative. Thus, this study confirms that the exchange rate in Nigeria has a significant impact on economic growth.

Discussion of Findings

Quantitative tools were utilized in this study to assess the impact of balance of trade and exchange rate on economic growth in Nigeria during the period from 1981 to 2021. The results revealed the following insights: Firstly, the exchange rate, representing the price of the domestic currency (the naira) in relation to other world currencies, exhibited a positive and significant impact on economic growth throughout the study period. This suggests that monetary authorities in Nigeria have predominantly relied on expenditure-reducing policies rather than expenditure-switching policies, such as currency devaluation, to maintain economic growth stability. Currency devaluation typically stimulates exports and discourages imports, leading to increased demand for the local currency in the foreign exchange market and subsequently raising the exchange rate. As the exchange rate of the Nigerian Naira increases relative to other currencies, it makes the country's exports more competitive and imports more expensive, thereby promoting domestic production and contributing positively to economic growth.

Secondly, the findings indicate a negative and significant relationship between imports and the balance of payments in Nigeria. This implies that imports have a detrimental effect on economic growth in Nigeria. Therefore, there is a necessity for the government to ensure stability in the general price level within the country. This stability not only ensures relative price stability domestically but also aids in achieving overall economic growth.

Furthermore, the conclusion underscores the importance of an economy's structure concerning its primary source of foreign exchange earnings, as evidenced by the balance of trade. It is recommended that special attention be given to diversifying the export base, primarily through technological advancements and agricultural development. Such measures are crucial for reducing reliance on oil exports and increasing dependence on non-oil sectors to mitigate the impact of any shortfall or negative shock in the oil industry. These findings align with the research of Nwanekezie & Onyiro (2018), Ogunniyi et al. (2018), Costa et al. (2017), and Nwaolisa (2017). In conclusion, the study emphasizes the significance of exchange rate stability and import control measures for fostering economic growth in Nigeria. Additionally, it highlights the importance of diversifying the export base to reduce reliance on oil exports and promote sustainable economic development.

Conclusion

This research has successfully estimated the impact of the balance of trade, exchange rate, and economic growth in Nigeria from 1981 to 2021. Our scenario analysis clearly demonstrates that the most effective policies for achieving faster growth in Nigeria are related to the external sector. Nigeria must prioritize efforts to attain a positive net trade balance and implement long-awaited structural reforms to alleviate external constraints on economic growth. Lowering the ratio of imports to income or increasing the ratio of exports to income will lead

to higher growth rates. Furthermore, it is evident that economic growth in Nigeria heavily relies on external demand, wherein a strong depreciation of the domestic currency serves as a stimulus to growth. As long as Nigeria continues to neglect local content/products and patronize foreign imported products, exchange rate volatility will persist, swinging to devalue or redenominate the domestic currency (naira) in response to high demand for foreign currencies.

Recommendations

In light of the findings of this research, the following recommendations are proposed:

1. The government should implement policies that promote a favorable trade balance, boosting exports and enhancing the export of primary products to attract foreign exchange inflows and foreign investment, thereby fostering economic growth in Nigeria.
2. The economy should focus on producing a diverse range of tradable goods across multiple sectors to generate foreign exchange. There should be a reduction in the issuance of foreign currency for importing certain items, as increased imports lead to greater demand for the exporting country's currency.
3. The government should make decisive, proactive, and well-defined capital investments to avoid abandoned projects. Additionally, financing for such investments should remain within optimal fiscal deficit levels.
4. Stringent foreign exchange control policies should be implemented to accurately determine the value of the exchange rate. This will ultimately help strengthen the value of the Naira. Furthermore, monetary authorities should utilize all available tools to minimize exchange rate fluctuations in the economy.
5. All factors influencing real GDP growth directly impact the improvement of the current account position. Therefore, to enhance domestic output growth and the current account balance in Nigeria, policies must address issues of low productivity, external competitiveness, and factor productivity.

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