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EXCHANGE RATE VOLATILITY AND MACROECONOMIC PERFORMANCE IN NIGERIA

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ABSTRACT

Over the years, the Nigerian economy has been exposed to exchange rate volatility that adversely affects economic performance. As a result, the study examines the effect of exchange rate volatility on macroeconomic performance in Nigeria, using monthly data from January 2010 to July 2025 (2010M1-2025M7). The data are sourced from Central Bank of Nigeria statistical bulletin, Nigeria Economic Policy Uncertainty Index Database, and World Development Indicators. The study employs Dynamic Conditional Correlation–Generalized Autoregressive Conditional Heteroskedasticity (DCC-GARCH) connectedness framework to capture volatility transmission, and Fully Modified Ordinary Least Square (FMOLS) to estimate the direct and moderating effect of the relationship. The Principal Component Analysis was applied to make composite index for macroeconomic performance which incorporates inflation, unemployment, gross domestic product growth rate and monetary policy rate. The DCC-GARCH findings revealed that exchange rate volatility and macroeconomic performance are interconnected through a bidirectional spillover relationship. The FMOLS results indicated that exchange rate volatility, economic policy uncertainty, the interaction between exchange rate volatility and economic policy uncertainty, and external reserves have negative and significant effects on macroeconomic performance in Nigeria. On the other hand, imports and interaction of exchange rate and imports have positive and significant effect, while oil price has positive but insignificant effect. The study concludes that exchange rate volatility strongly influences macroeconomic performance in a negative way. Based on these findings, the study recommends that the Nigerian economic policymakers should come up with an integrated approach to achieving macroeconomic stability by ensuring proper exchange rate management, policy predictability, and efficient importation so as not to be vulnerable to external shocks.

Keywords: *Exchange rate, Volatility, Macroeconomic Indicators, DCC-GARCH, Nigeria*

JEL Classification Codes: *F31, F41, C58, E44, O55*

1.0 Introduction

Macroeconomic performance (MPI) refers to the overall condition and effectiveness of an economy as reflected by key indicators such as economic growth, inflation rate, unemployment, exchange rate stability, interest rates, external reserves, and balance of payments position. It measures the

capacity of an economy to realize sustainable growth, stability of prices, creation of employment, and improvement in welfare of the people (Dornbusch et al., 2018; International Monetary Fund [IMF], 2022). Of these measures, exchange rate stability becomes important since changes in the value of the currency impact costs of imports, competitiveness of exports, levels of inflation, foreign investments, and economic stability generally.

The performance of economies around the world has been affected by increasing macroeconomic pressure caused by inflation, exchange rate volatility, external shocks, and economic policy changes (IMF, 2023; Blanchard, 2021). The COVID-19 pandemic that has been faced globally created economic disturbances that caused contraction of the world economy by about 3.1% in 2020. Similarly, the African economies faced some instability due to their macroeconomic performance, whereby the real GDP growth rate reduced from about 5% in the early 2010s to 3% after the outbreak of the coronavirus disease in 2020, then it increased again to approximately 3.3% in 2024 with a further increase to 3.9-4.1% in 2025 (African Development Bank [AfDB], 2025).

Nigeria's macroeconomic environment has remained unstable over the past decade, with recent developments showing continued pressure on key indicators such as inflation, economic growth, unemployment, and monetary policy rate (National Bureau of Statistics [NBS], 2025). As of 2025, inflationary pressure remains elevated at over 30 percent, reflecting persistent increases in the general price level despite successive monetary tightening measures (Central Bank of Nigeria [CBN], 2025). Economic growth, although positive, remains fragile at around 3 percent, indicating weak recovery capacity relative to population growth and development needs. Unemployment and underemployment also remain significant challenges, particularly among youth and informal sector workers, while the monetary policy rate has been maintained at a high level above 25 percent in response to inflation and exchange rate pressures (CBN, 2025; NBS, 2025).

In response to these macroeconomic difficulties, the Nigerian government and monetary authorities have implemented several policy measures, including foreign exchange market reforms, interest rate adjustments, subsidy removal, and fiscal consolidation strategies (CBN, 2025; IMF, 2025). Despite these interventions, macroeconomic stability has remained elusive, as inflation continues to rise, investment growth remains weak, and exchange rate pressures persist. The current situation therefore reflects a partial transmission of policy effectiveness, where

stabilization efforts have not fully translated into sustained macroeconomic improvement (CBN, 2025). A major factor contributing to this persistent instability is exchange rate volatility, which has intensified in recent years due to foreign exchange shortages, external shocks, and structural weaknesses in export diversification. Exchange rate fluctuations have continued to distort prices, increase production costs, reduce investor confidence, and weaken overall macroeconomic performance (Olayungbo & Quadri, 2022; CBN, 2024). In addition, Economic Policy Uncertainty (EPU) has further complicated the economic environment by creating unpredictability in fiscal, monetary, and trade policy directions, thereby discouraging long-term investment decisions. Import dependence also worsens the situation, as Nigeria's reliance on imported inputs exposes domestic prices and production systems to external exchange rate shocks (Salisu, Salisu, & Salisu, 2024; Akinlo & Lawal, 2021; World Bank, 2024).

Empirical literature on the relationship between exchange rate volatility and macroeconomic performance in Nigeria presents mixed findings. While some studies argue that exchange rate instability significantly worsens inflation, reduces output growth, and increases unemployment, others report weak or insignificant relationships depending on the model specification, data frequency, and estimation techniques used (Khusni & Nurviliza, 2025; Oyadeyi, 2026; Benson, et al., 2026). Differences in time periods, methodological approaches, and variables included in previous studies have contributed to these inconsistent conclusions.

However, notable gaps still exist in the literature. First, most existing studies have not incorporated Economic Policy Uncertainty (EPU) as a key explanatory variable in examining macroeconomic performance. Second, limited attention has been given to the interaction effects between exchange rate volatility and EPU, as well as between exchange rate volatility and imports, despite their potential combined impact on macroeconomic stability. Third, previous studies have largely relied on static or single-equation econometric methods, with very few applying advanced time-varying volatility models. To address these gaps, this study adopts the Dynamic Conditional Correlation Generalized Autoregressive Conditional Heteroskedasticity (DCC-GARCH) model, which allows for the analysis of time-varying relationships between exchange rate volatility and macroeconomic performance indicators. This approach has not been widely applied in previous Nigerian studies, making it a significant methodological contribution to the literature.

2.0 Literature Review

2.1 Conceptual Review

The Exchange Rate refers to the price of one country's currency expressed in terms of another country's currency. It determines the amount of domestic currency required to obtain a unit of foreign currency and plays an important role in international trade, investment, capital flows and domestic economic activity. In Nigeria, the naira exchange rate influences the domestic prices of imported goods, the competitiveness of exports, production costs and the value of foreign-denominated transactions.

Exchange Rate Volatility refers to the degree and frequency of fluctuations in the exchange rate over a given period. Such volatility may arise from changes in foreign exchange demand and supply, inflation differentials, interest rates, capital flows, commodity prices, external shocks, monetary and fiscal policies, and market expectations. Exchange rate volatility can create uncertainty for businesses and investors because it affects the cost of imported inputs, export revenues, investment decisions and international financial obligations. Exchange rate regimes describe the institutional arrangements through which a country determines or manages the value of its currency. The major regimes include fixed, floating and managed-floating exchange rate systems. Under a fixed regime, the monetary authority maintains the currency at or around a predetermined value, while under a floating regime the exchange rate is largely determined by market forces. A managed float combines market determination with periodic intervention by monetary authorities.

Macroeconomic Performance refers to the overall condition and functioning of an economy, usually assessed using major aggregate economic indicators. Key indicators include real economic growth, inflation, unemployment, investment, interest rates, exchange-rate stability, fiscal conditions, and balance-of-payments or external-sector performance. Economic growth reflects changes in the production of goods and services, while inflation measures the sustained increase in the general price level. Employment conditions indicate the extent to which available labour resources are utilised, whereas investment reflects the expansion of productive capacity. Exchange rate movements can influence these indicators through several transmission channels. For instance, exchange rate depreciation may increase the domestic cost of imported goods and production inputs, potentially contributing to inflation, while changes in relative prices can affect exports, imports and domestic production. Exchange rate uncertainty may also influence

investment and business planning by making future costs and returns less predictable. Consequently, the relationship between exchange rate volatility and macroeconomic performance is multidimensional, with the direction and magnitude of its effects depending on the exchange rate regime, structure of the economy, policy responses and degree of integration with international markets.

2.2 Empirical Review

Oyadeyi (2026) examined the determinants of exchange rate volatility (EXCV) in Nigeria and the impact of exchange rate volatility in affecting macroeconomic performance in Nigeria for the period Q1 1986-Q4 2023, using autoregressive conditional heteroscedasticity (ARCH), non-linear generalised ARCH and dynamic autoregressive distributed lag (ARDL). It was found that exchange rate volatility has significant influence on the economy of Nigeria. Benson et al. (2026) also examined the impact in Nigeria from 1981 to 2024 and adopted ARDL technique. Findings revealed that a positive and significant relationship existed among the real effective exchange rate, interest rate, credit to the private sector, foreign direct investment and economic growth in both the long and short run periods.

The effect of shocks on global uncertainty on some selected macroeconomic variables such as suicide rates, economic growth, unemployment, and openness in trade of 62 countries in Africa, South America, and North America between 2004 and 2023 was studied by Madurawala et al. (2026) using multiple linear regression. The results identified bi-directional relationship in 21 countries after the pandemic shock with significant relationship in Algeria, Botswana, Gabon, Guinea, Madagascar, Republic of Congo, Dominican Republic, Mexico, Bolivia, Paraguay. The result showed further that the long-run relationship between uncertainty and macroeconomic variables became stronger in the post-COVID-19 era especially in countries of Africa and North America. Alam et al. (2025) examined the influence in 18 Organisation of Islamic Cooperation (OIC) countries (1985-2022) based on direct and indirect relationships. Through the use of cross-sectional (CS)-ARDL approach and Dumitrescu-Hurlin causality tests, the indicated that exchange rate fluctuations significantly hampered long-run economic growth through uncertainty effect and via several determinants.

Khusni and Nurviliza (2025) conducted research on the effects of the fluctuation of exchange rates on macroeconomic variables and its consequences for Indonesia. Through qualitative descriptive method and ordinary least squares (OLS) regression analysis, the study found that in years 2013, 2018, and

2022–2023, the influence on exchange rate movement emanated from external factors such as global monetary policies and geopolitics. Analysis on impact of exchange rate volatility on inflation in Nigeria was done by Jeremiah et al. (2025), using data ranging from 2000Q1 to 2023Q4. The study disaggregated the period into two to examine the levels of volatility of exchange rate for the period when the country had broad-based sustained growth (2000Q1- 2014Q4) and growth rate dropped (2015Q1-2023Q4). It was found from the E-GARCH model estimates that the ARCH and GARCH coefficients captured meaningful relationship between short-term past shocks and current volatility as well as long-term past and current volatility showing time-varying volatility of exchange rate in both periods with higher volatility in 2015Q1 to 2023Q4. Further, the estimated E-GARCH model also confirmed the positive and significant effect of EXCV on inflation.

Nwangene and Akamobi (2025) assessed the impact of exchange rate volatility on economic growth, inflation rate, and unemployment rate in Nigeria between the years 1981 and 2021, utilizing Feasible Generalized Least Square (FGLS) technique. The results found had a significant negative effect on economic growth. Maula (2025) examined the effect of economic policy uncertainty on the macroeconomy under the context of multi-country level. The Panel Vector Auto-Regressive Model (Panel-VAR) involving the use of data from 14 countries, which were members of OECD, was used due to data availability. It was found that an increase of one standard deviation in EPU index resulted in the reduction of consumer and business sentiment levels, and slowed down economic growth. Mumtaz and Ruch (2025) calculated two different policy uncertainty measures which were government expenditures and real interest rates and their effects on economic activities in 54 developed, emerging, and developing countries. Panel VAR approach was adopted for the analysis, and the findings showed that uncertainty of policy led to a negative supply shock, resulting to an increase in prices while reducing the level of output, investment, and consumption.

Ekeocha et al. (2023) used System GMM and quantile regression analysis on a panel of forty-seven African countries over 2010-2019 to analyze the impact of EPU on economic performance. The findings revealed that though global EPU and EPUs of China, USA, and Canada had significant impacts on economic performance in Africa, EPU of domestic and EPUs of Europe, UK, Japan, and Russia did not impact economic performance, which indicated the resilience of African economies to such sources of uncertainty shocks. In addition, there was

evidence that African governance institutions had no impact on the uncertainty-economic performance relationship. Bello et al. (2022) assessed the asymmetric relationship between exchange rate volatility and macroeconomic performance in Nigeria for the period 1986Q1 – 2019Q4 using the Non-linear GARCH model. The findings revealed a positive relationship between exchange rate volatility and trade balance, industrial output, and inflation within the period.

Dagume (2022) studied the effect of EXCV on macroeconomic variables in South Africa based on time-series data for the period of 1979–2019. The GARCH and OLS techniques were applied. The results found that exchange rate volatility positively affected the growth, inflation, and interest rate, while negatively affected FDI, GDP, and trade openness. Yabu and Kimolo (2020) conducted an analysis of the degree of exchange rate volatility and its effects on certain macroeconomic indicators including exports, FDI flows, interest rates, and inflation in the cases of Tanzania, Kenya and Uganda. Using GARCH and panel ARDL, exchange rate volatility turned out to have negatively affected export performance and caused a reduction in lending rates. The effect of exchange rate volatility on trade balance in Nigeria between 1981 and 2016 was studied by Aderemi et al. (2020). ARDL model was used and the study was found that EXCV had significant negative effects on Nigerian trade. Zadeh et al. (2014) investigated the impact of imports and macroeconomic variables on the economic growth in Iran during the period 1981 to 2011, employing fixed effect model. The results suggested that inflation and exchange rate reduced GDP, while imports of capital goods and intermediate goods increased GDP. Mahmood et al. (2011) investigated whether uncertainty or fluctuations in exchange rate affected the macroeconomic variables such as GDP, FDI, growth rate and trade openness in Pakistan. GARCH and OLS were used as method of analysis, and the findings indicated a positive relationship.

2.3 Theoretical Framework

The Mundell-Fleming Model developed by Mundell in 1963 and Fleming in 1962 is considered as the basic theoretical foundation of this study since it provides a suitable theoretical model that can be applied to investigate the relationship between exchange rates and macroeconomic performance in an open economy. The theory demonstrates how the dynamics of exchange rates can influence the results of macroeconomics by means of the flows of trade and finance, monetary and aggregate demand factors.

In contrast to other theories based on the price effect, the Mundell-Fleming approach captures the broader impact of exchange rate

instability on output, inflation, and economic stability (Mundell, 1963; Fleming, 1962). The strength of the Mundell–Fleming Model is the fact that it allows us to understand how changes in the exchange rates affect real economic activities due to trade and financial channels. The model enables the analysis of the connection between exchange rates, economic growth, inflation and monetary policies' reactions to exchange rate changes. Yet, one of the criticisms of this model is that it is based on several assumptions such as the capital mobility, fixed expectations and relationships among the economic variables, which do not always reflect the real economy (Obstfeld & Rogoff, 1995). The model also does not adequately consider exchange rate uncertainties and fluctuations due to international shocks, expectations, and financial instability. The model is particularly relevant to this study since it explains the notion that exchange rate changes cause variations in macroeconomic performance via impact on external competitiveness, import prices, investments and policy changes. The model also gives room for other macroeconomic variables like external reserve, oil price and interest rates as determinants of economic performance in conjunction with exchange rate change.

3.0 Methodology

3.1. Model Specification

The empirical model specification for this study is guided by both theoretical framework and prior empirical literature, ensuring that the functional relationship between exchange rate volatility and macroeconomic performance in Nigeria is effectively captured. Thus, the model of Bello et al. (2022) which is adapted for this study is specified as;

$$Y = f\ (i, R, E, NX) \qquad 3.1$$

Where, Y is macroeconomic variables, ‘i’ is inflation rate; ‘R’ is interest rate; ‘E’ is Exchange Rate and NX is ‘Net Export’.

In the current study, the model adapted is that of Bello et al. (2022) because it specifically examined the relationship between exchange rate volatility and macroeconomic performance in Nigeria, which is consistent with the central objective of the present study. The model provides a suitable analytical foundation for investigating how exchange rate volatility influences macroeconomic outcomes within the Nigerian economy; however, some changes have been made in order to enable an elaborate analysis of the exchange rate volatility and macroeconomic performance of Nigeria. Unlike the model of Bello et al. whose macroeconomic performance was based on some specific

variables, the current study makes use of Macroeconomic Performance Index (MPI) consisting of four variables; namely the rate of inflation, unemployment rate, GDP growth rate, and the monetary policy rate.

The Exchange Rate Volatility (EXRV) is used as the core independent variable since it directly affects price stability, investment behavior, international business operations, and economic stability. The Economic Policy Uncertainty (EPU) is added since it plays an important role in influencing investors' confidence, expectations, capital flow, and the transmission of exchange rate fluctuations to the overall economy. Import (IMP) is introduced because Nigeria's high reliance on imports creates a situation where import activities become an essential mechanism for the effects of exchange rate changes on Nigeria's economic development. In addition, Oil Price (OILP) and External Reserves (EXRES) are introduced as control variables due to their significant role in determining foreign exchange earnings, exchange rate management, and external sector stability in Nigeria.

Net exports (NX), on the other hand, are not considered as a variable for inclusion because the component related to the external sector is adequately covered by imports, oil price, and external reserves, which would be more applicable to the country's economic environment. The Interest Rate (R) is also excluded as a separate variable because it has already been considered as one of the variables included in the Macroeconomic Performance Index (MPI). This is done to avoid the duplication within the model specification.

The functional form of the Equation is expressed as follows:

$$MPI = (EXCV, EPU, IMP, OILP, EXRES) \quad 3.2$$

The vector matrix form can also be written as:

$$Y_t = \begin{bmatrix} EXCV_t \\ EPU_t \\ IMP_t \\ OILP_t \\ EXRES_t \end{bmatrix}$$

Where: MPI_t= Macroeconomic performance index; $EXCV_t$= Exchange rate volatility; EPU_t= Economic policy uncertainty; IMP_t= Imports; $OILP_t$= Oil price (control variable); $EXRES_t$= External reserves (control variable).

Mathematically, the Equation is specified as:

$$MPI = EXCV + EPU + IMP + OILP + EXRES \quad 3.3$$

The model can be expressed econometrically as in Equation 3.3.

$$\mathrm{MPI}_t = \beta_0 + \beta_1 EXCV_{t-1} + \beta_2 \mathrm{EPU}_{t-1} + \beta_3 \mathrm{IMP}_{t-1} + \beta_4 \mathrm{OILP}_{t-1} + \beta_5 EXRES_{t-1} + \mu_t \quad 3.4$$

This model can be expressed as logarithm as in Equation 3.4, so as to be able to interpret the coefficients as elasticities.

$$ln\mathrm{MPI}_t = \beta_0 + \beta_1 ln\mathrm{EXCV}_{t-1} + \beta_2 ln\mathrm{EPU}_{t-1} + \beta_3 ln\mathrm{IMP}_{t-1} + \beta_4 ln\mathrm{OILP}_{t-1} + \beta_5 lnEXRES_{t-1} + \mu_t \quad 3.5$$

From the above, β_0 is the intercepts, while $\beta_1 - \beta_7$ are the coefficients, u_t represents the stochastic error term and the *t* denotes time measured in years.

3.2 Estimation Techniques and Procedures

Different econometric approaches have been used in studying the link between exchange rate volatility and the performance of the Nigerian economy. The first approach used is the Augmented Dickey-Fuller (ADF) Unit Root Test to establish stationarity properties and order of integration of the variables. Johansen Cointegration Test is performed to check for any long-run relationship among the variables under study. For measuring the volatility in exchange rates, the study applied the DCC-GARCH connectedness framework implemented in the Connectedness Approach Shiny application developed by Gabauer (2020) which was suggested by Engle in 2002. The use of DCC-GARCH model is justified as it is applicable to the analysis of financial and macroeconomic time series data with volatility clustering, persistence and time varying correlations, which are common characteristics of exchange rate movements. It facilitates analysis of conditional variances and dynamic correlations between these variables within one single system, thereby eliminating the problems associated with univariate GARCH models. The framework is further justified by its ability to measure the degree of connectedness and spillover effects by estimating the Total Connectedness Index (TCI), directional connectedness (TO and FROM), net connectedness, and pairwise connectedness. These measures identify the magnitude and direction of shock transmission, distinguish net transmitters from net receivers of shocks, and reveal the dynamic interactions between exchange rate volatility and macroeconomic performance over time. The Fully Modified Ordinary Least Square (FMOLS) method is also used to determine the long-term relationship between the dependent and independent variables due to the fact that this method has the capability of correcting endogeneity and serial correlation issues in cointegrated variables. Finally, diagnostic checks are carried out for robustness and reliability. The DCC-GARCH model is specified as;

Mean Equation (VAR Representation)

$$Y_t = A_0 + \sum_{i=1}^{p} A_i Y_{t-i} + \varepsilon_t \quad 3.6$$

Where: $Y_t$is the vector of endogenous variables; $A_0$is the intercept vector; $A_i$are lag coefficient matrices; $\varepsilon_t$is the error term vector.

Variance Equation (GARCH Process)

$$h_{i,t} = \omega_i + \alpha_i \varepsilon_{i,t-1}^2 + \beta_i h_{i,t-1} \quad 3.7$$

Where: $h_{i,t}$ is conditional variance; α_i measures short-run shocks; β_i captures volatility persistence.

Dynamic Conditional Correlation (DCC)

$$Q_t = (1 - a - b)\bar{Q} + a(\varepsilon_{t-1}\varepsilon'_{t-1}) + bQ_{t-1} \quad 3.8$$

$$R_t = Q_t^{*-1} Q_t Q_t^{*-1} \quad 3.9$$

Exchange Rate Volatility Extraction

The conditional volatility of exchange rate is obtained as:

$$EXCV_t = \sqrt{h_{EXR,t}} \quad 3.10$$

Similarly, the FMOLS model with interaction terms is specified as;

$$MPI_t = \beta_0 + \beta_1 EXCV_t + \beta_2 EPU_t + \beta_3 IMP_t + \beta_4 (EXCV \times EPU_t) + \beta_5 (EXCV \times IMP_t) + \beta_6 OILP_t + \beta_7 EXRES_t + u_t \quad 3.11$$

3.3 Nature and Source of Data

The data are monthly time series data collected from secondary data sources spanning from 2010M1 to 2025M7. The data are sourced from CBN statistical bulletin, National Bureau of Statistic (NBS) annual reports and World Development Indicator (2025).

4.0 Presentation of Results and Discussion of Findings

4.1 Presentation of Results

4.1.1 Stationarity Test

This subsection deals with the test of unit root, using ADF test. The result is thus presented on Table 4.1.

Table 4.1: Summary of the ADF Unit Root Test

Variable	ADF t-Statistic	5% Critical Value	Order of Integration
MPI	-3.5365	-2.8782	I(1)
EXCV	-11.9157	-2.8770	I(1)
EPU	-13.1557	-2.8770	I(1)
IMP	-3.4032	-2.8772	I(1)
OILP	-11.0678	-2.8771	I(1)
EXRES	-4.3432	-2.8781	I(1)

Source: Researchers' Compilation using Eviews 13.0

The results of the ADF Test indicate that the absolute values of the ADF test statistics for all variables are larger than their respective critical values at 5% significance level, and the probabilities are all less than 0.05. This suggests that the null hypothesis of unit root can be rejected after differencing the variables, and hence all variables are stationary at first difference, that is, they are integrated of order one I(1). This justifies the use of cointegration techniques for estimating the long-run relationship among the variables.

4.1.2. Cointegration Test

Following the confirmation that the variables are integrated of the same order, the Johansen Cointegration Test was conducted and the results are presented in Table 4.2.

Table 4.2: Johansen Cointegration Test

Hypothesized No. of CE(s)	Trace Statistic	5% Critical Value	Max-Eigen Statistic	5% Critical Value
None	230.2495	159.5297	63.7446	52.3626
At most 1	166.5049	125.6154	41.1268	46.2314
At most 2	125.3781	95.7537	38.6527	40.0776
At most 3	86.7255	69.8189	34.6335	33.8769
At most 4	52.0920	47.8561	27.0747	27.5843
At most 5	25.0173	29.7971	16.1524	21.1316
At most 6	8.8649	15.4947	8.6855	14.2646
At most 7	0.1794	3.8415	0.1794	3.8415

Source: Researchers' Compilation using Eviews 13.0

The trace statistic shows that there are five (5) cointegrating relationships at 5% level of significance since the trace statistics are greater than their corresponding critical values. The maximum eigenvalue statistic shows the existence of one (1) significant cointegrating relationship since the statistic is greater than the 5% critical value. In summary, since both statistics show the existence of cointegration, this means that there is stability in the long run.

4.1.3 Autoregressive Conditional Heteroskedasticity (ARCH) Effect

The presence of ARCH effects is a fundamental requirement for volatility modeling because it indicates that the variance of the error terms changes over time and that volatility tends to cluster. The ARCH result is reported in Table 4.3.

Table 4.3: ARCH Lagrange Multiplier (LM) Test for Conditional Heteroskedasticity

Test Statistic	Value
Lag Length	12
Chi-square (χ^2)	166.808
Degrees of Freedom	12
Probability (Prob > χ^2)	0.0000
Decision	Reject H_0
Conclusion	ARCH effects exist

Source: Researcher's Computation using Stata 17.

Prior to estimating the DCC-GARCH model, the ARCH LM test was performed to find out whether there is conditional heteroskedasticity in the series. The result obtained from the ARCH LM test indicates that the Chi-square statistic is 166.808 and the probability value is 0.0000. It is clear that conditional heteroskedasticity exists in the series based on the ARCH LM test result (Prob. < 0.05). The existence of conditional heteroskedasticity is a requirement before estimating the DCC-GARCH model. Thus, the DCC-GARCH model was estimated to analyze the dynamic volatility spillovers between exchange rate volatility and macroeconomic performance.

4.2 Estimation Analysis

4.2.1 DCC-GARCH connectedness framework

This framework helps to capture the time-varying volatility spillovers and dynamic interactions among the variables. These help to proffer solution to objective one and the results are presented in Table 4.4 and Figure 4.1 respectively.

Table 4.4: Average Dynamic Connectedness

MPI	EXCV	FROM	
MPI	84.36	15.64	15.64
EXCV	15.64	84.36	15.64
TO	15.64	15.64	31.28
Inc.Own	100.00	100.00	cTCI/TCI
NET	0.00	0.00	31.28/15.64
NPT	1.00	0.00	

Source: Author's computation using the Connectedness Approach developed by Gabauer.

The average connectedness estimates reveal the size of the spillover effect between exchange rate volatility (EXCV) and macroeconomic performance (MPI). The diagonal elements reveal the fraction of forecast error variance that is accounted for by shocks to the respective variables. The analysis reveals that the macroeconomic performance is mainly influenced by the shocks to itself, as it accounts for 84.36% of the forecast error variance, whereas the shocks from exchange rate volatility account for the rest 15.64%. Likewise, 84.36% of the variance of EXCV can be attributed to its own shocks while 15.64% comes from shocks

generated from the MPI. The off-diagonal elements show the existence of bidirectional volatility transmission between the two variables. Specifically, exchange rate volatility contributes 15.64% to changes in macroeconomic performance, indicating that fluctuations in the exchange rate transmit considerable volatility to the macroeconomic environment. Similarly, macroeconomic performance accounts for 15.64% of exchange rate volatility, indicating a feedback relationship.

The total connectedness index (TCI) of 15.64% means that roughly 15.64% of the forecast error variance of the overall MPI–EXCV is caused by spillovers effects, whereas the remaining is accounted for by own shocks. Hence, there exists moderate interconnectedness between exchange rate volatility and macroeconomic performance. The net connectedness values (NET = 0.00) indicate that neither MPI nor EXCV is a dominant transmitter or receiver of shocks over the full sample period. Hence, the relationship between them is balanced, since they both send and receive volatility shocks.

Dynamic Total Connectedness

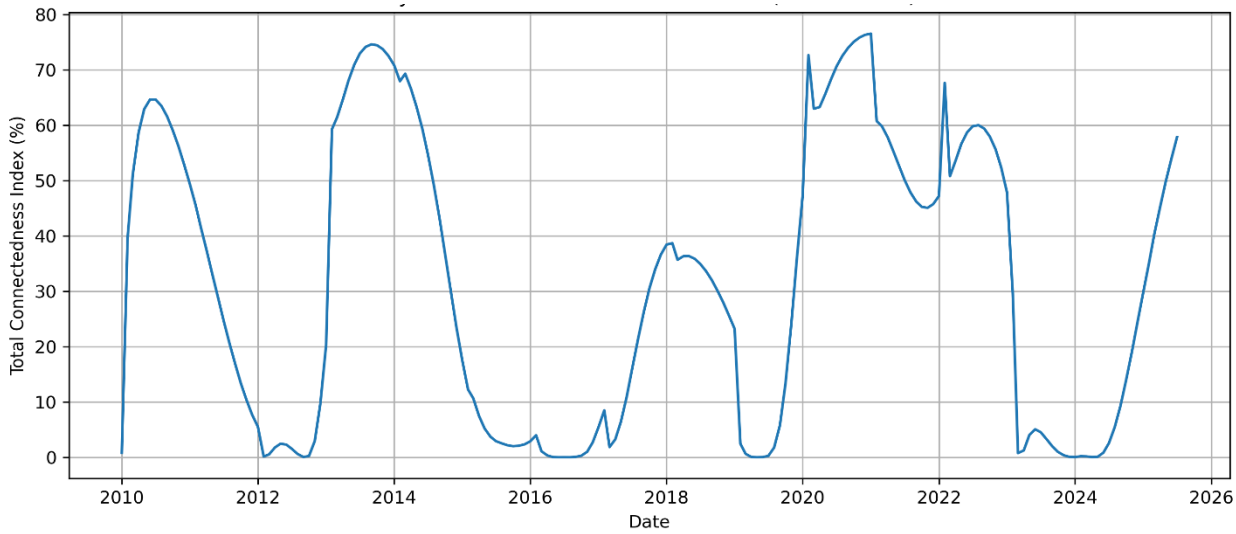


Figure 4.1: Dynamic Total Connectedness
Source: Authors' computation using the Connectedness Approach Shiny application developed by Gabauer.

From the dynamic total connectedness graph, it is clear that the degree of spillover effect from exchange rate volatility and macroeconomic performance varies through time. The figure depicts the situation where there are periods when the index remains very close to zero, indicating that the MPI and EXCV are influenced by their shock components only. This suggests that any change in the exchange rate have minimal spillover effects on macroeconomic performance significantly.

However, the graph also reveals periods of high connectedness, where the total connectedness index rises above 70%. These periods suggest increased volatility spillovers from exchange rate volatility to macroeconomic performance, which implies that the exchange rate volatility significantly influences the macroeconomic performance during these phases. Thus, the variations in connectedness mean that the connection between the volatility of exchange rate and macroeconomic performance changes over time, getting more stronger during the times of economic uncertainty and external disturbances. The DCC-GARCH results therefore provide evidence of a bidirectional volatility spillover relationship between exchange rate volatility and macroeconomic performance in Nigeria.

4.2.2 Fully Modified OLS Analysis

To help proffer solution to objectives two and three, a FMOLS technique has been adopted and the result reported in Table 4.5.

Table 4.5: FMOLS Result

Dependent Variable: MPI				
Method: Fully Modified Least Squares (FMOLS)				
Sample (adjusted): 2010M02 2025M07				
Included observations: 186 after adjustments				
Cointegrating equation deterministics: C				
Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth = 5.0000)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXCV	-0.051492	0.020993	-2.452770	0.0151
EPU	-0.153210	0.075302	-2.034611	0.0408
IMP	0.706776	0.158945	4.446661	0.0000
EXCV_EPU	-0.004188	0.001107	-3.782340	0.0002
EXCV_IMP	0.040057	0.009489	4.221628	0.0000
OILP	0.000184	0.004790	0.038360	0.9694
EXRES	-0.202658	0.649535	-4.307221	0.0035
C	2.134571	0.542173	3.937465	0.0002
R-squared	0.643847	Mean dependent var		1.038646
Adjusted R-squared	0.629841	S.D. dependent var		0.015311
S.E. of regression	0.617723	Sum squared resid		0.792147
Long-run variance	0.118213			

Source: Researchers' Compilation using Eviews 13.0

The FMOLS estimation was carried out to estimate the parameters of the model. From the result, the coefficient values for EXCV, EPU the interaction between EXCV and EPU, and EXRES are -0.051, -0.153, -0.0042 and -0.203 respectively. These show negative effects and the implication is that on average, 1% increase in EXCV, EPU, EXCV_EPU,

and EXRES decrease MPI by 0.051%, 0.15%, 0.00042% and 0.20% respectively. On the other hand, IMP, the interaction between EXCV and IMP, and OILP have positive effect and it suggests that 1% increase in IMP, EXCV_IMP, OILP increase MPI by 0.71%, 0.04% and 0.00018% respectively. The results further explained that EXCV, EPU, IMP, EXCV_EPU, EXCV_IMP, and EXRES are statistically significant while OILP is insignificant. The residual variance over the long term was estimated at 0.1182, revealing a relatively low level of fluctuations in the long-run residual process. In other words, the long-run equilibrium relationship of EXCV, EPU, IMP, EXCV_EPU, EXCV_IMP, OILP and EXRES remain constant throughout the study period. The R^2 shows the proportion of the variations in the dependent variable that are explained by independent variables. The finding indicates that about 64.38% of the variations in the MPI are accounted for by EXCV, EPU, IMP, EXCV_EPU, EXCV_IMP, OILP and EXRES, while the remaining 35.62% is due to factors not explicitly captured in the model and random disturbances. This makes the explanatory power quite high.

4.2.3 Test of Significance

The test is conducted to test the joint significance of the variables of interest and the result is reported in Table 4.6.

Table 4.6: Wald Test

Test Statistic	Value	Df	Probability
F-statistic	6.898326	(1, 178)	0.0094
Chi-square	6.898326	1	0.0086

Source: Researchers' Compilation using Eviews 13.0

The Wald test examines whether all slope coefficients (EXCV, EPU, IMP, EXCV_EPU, EXCV_IMP, OILP and EXRES) are jointly equal to zero. The F-statistic (6.898326, p = 0.0094) and Chi-square statistic (6.8983, p = 0.0086) are highly significant, leading to a clear rejection of the null hypothesis. This indicates that the explanatory variables are jointly significant in explaining macroeconomic performance in Nigeria.

4.3 Diagnostic Tests

Under this section, evaluation of our estimates is done to check the validity and reliability of our model. Both heteroscedasticity, normality and model specification tests are used to evaluate the results obtained from this model.

Table 4.7: Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	3.640637	Prob. F(7,179)	0.0669
Obs*R-squared	23.30541	Prob. Chi-Square(7)	0.1038
Scaled explained SS	12.97109	Prob. Chi-Square(7)	0.9932

Source: Researchers' Compilation using Eviews 13.0

The BPG test for heteroskedasticity, i.e., constant variance of residuals or homoskedasticity, shows that the variance of residuals is constant. From the results, it is clear that all the probability values of F-statistic (0.0669), Obs*R-squared (0.1038), and Scaled explained SS (0.9932) are more than 0.05. Hence, the null hypothesis of homoskedasticity cannot be rejected. This shows that the variance of residuals is constant, and hence there is no problem of heteroskedasticity.

Test for Normality

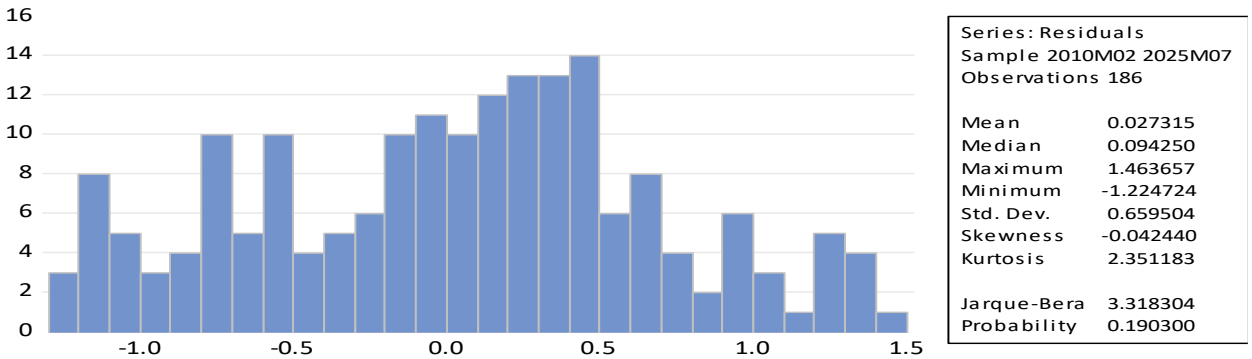


Figure 4.2: Histogram Normality Test

Source: Researcher's Compilation Using Eviews 13.0

The result of the normality test using a histogram, as presented in Figure 4.2, is used to check whether the residuals are normally distributed. The Jarque-Bera probability value of 0.4117, which is greater than 0.05, indicates that the null hypothesis cannot be rejected. This implies that the residuals are normally distributed, and as such, the model has satisfied the normality condition, ensuring that the results obtained are reliable and valid.

Model Specification Test

Table 4.8: Ramsey RESET Test			
Omitted Variables: Squares of fitted values			
Specification: MPI EXCV EPU IMP EXCV_EPU EXCV_IMP EXRES OILP C			
	Value	Df	Probability
t-statistic	0.864426	178	0.3885
F-statistic	0.747232	(1, 178)	0.3885

Likelihood ratio	0.783370	1	0.3761	
F-test summary:				
	Sum of Sq.	Df	Mean Squares	
Test SSR	0.271590	1	0.271590	
Restricted SSR	64.96781	179	0.362949	
Unrestricted SSR	64.69622	178	0.363462	
LR test summary:				
	Value			
Restricted LogL	-166.4917			
Unrestricted LogL	-166.1001			

Source: Researchers' Compilation using Eviews 13.0

The Ramsey RESET test was employed to examine whether the estimated model suffers from specification errors arising from omitted variables or incorrect functional form. The results reveal an F-statistic of 0.747232 with a probability value of 0.3885 and a likelihood ratio statistic of 0.783370 with a probability value of 0.3761. Since the probability values exceed the 5 percent significance level, the null hypothesis of correct model specification cannot be rejected. Consequently, the model is well specified without any signs of omitted variable bias or functional form specification error.

4.3 Discussion of Findings

From the results obtained from this study, there is evidence of a two-way volatility transmission from exchange rate volatility (EXCV) to macroeconomic performance (MPI) with a total connectedness index of 15.64%. This shows that shocks in the exchange rate affect the macroeconomy, while the shocks of the macroeconomic performance also spill over into the exchange rate. The results are in line with those of Bello et al. (2022) and Nwangene and Akamobi (2025) that exchange rate volatility significantly impacted the level of inflation, growth, and unemployment in Nigeria. The negative coefficient of EXCV derived from the result of FMOLS conforms to a priori expectations because high exchange rate volatility leads to higher cost of imports, production cost, and uncertainty, thus hampering investment. The negative and significant effect of EPU also conforms to the a priori expectation because policy uncertainty discourages investment, weakens business confidence, and reduces economic activities. The result is in accordance with what has been found by Maula (2025) and Mumtaz and Ruch (2025), which revealed that uncertainty shocks decrease output and investment but increase inflation. In addition, the negative interaction of EXCV and EPU indicates that policy uncertainty amplifies the negative impact of exchange rate volatility on economic performance.

The positive and significant effect of imports (IMP) on macroeconomic performance does

not fully conform to the expectation that excessive import dependence may weaken domestic economic performance. However, the result can be explained by the fact that imports of capital goods, machinery, and intermediate inputs support production, industrial activities, and productivity. This is in tandem with the findings of Zadeh et al. (2014) that productive imports enhance economic growth. The positive interactive effect between EXCV and imports further suggests that imports help to lower the negative impact of exchange rate fluctuations provided that they contribute to productive capacity and not to consumption. The negative and significant effect of exchange rate volatility and imports interaction (EXCV_IMP) conforms to expectation because exchange rate depreciation increases the cost of imported inputs, thereby raising production costs and reducing economic stability. This adverse effect of EXRES is expected due to the fact that a decrease in EXRES leads to an increased risk for the economy to protect the currency, respond to external shocks, and ensure macroeconomic stability.

The positive but insignificant effect of oil price (OILP) does not fully conform to the expectation that higher oil prices should improve Nigeria's macroeconomic performance as an oil-exporting economy. This could be attributed to inherent structural weaknesses, ineffective management of oil revenues, and reliance on imported goods, which affect the positive impact of higher oil prices. Hence, the conclusions reveal that the volatility of exchange rates continues to be a significant factor influencing the performance of the Nigerian economy, as evidenced by the results that largely conformed to theoretical expectations.

5.0 Conclusion and Policy Recommendations

Exchange rate volatility remains a critical factor shaping Nigeria's macroeconomic performance, reflecting the strong influence of currency movements on the broader economic environment. Fluctuations in the value of the naira affect inflation dynamics, productive activities, employment conditions, and monetary policy responses. Given Nigeria's dependence on foreign exchange earnings and imported goods, exchange rate instability has significant implications for investment decisions, production costs, economic planning, market expectations, and consumer purchasing power. The influence of exchange rate volatility demonstrates the vulnerability of the Nigerian economy to both domestic and external currency pressures, as changes in exchange rate conditions alter the behaviour of key economic agents and affect macroeconomic outcomes. The persistent fluctuations in the foreign exchange market

show the connection between external sector conditions and domestic economic activities, with implications for business operations, price movements, and policy effectiveness. This highlights the importance of exchange rate conditions in understanding the stability and long-term performance of the Nigerian economy.

The following policy recommendations are made in relation to the findings of the study;

1. Exchange Rate Volatility Control Mechanism must be developed by CBN and should include real-time monitoring of foreign exchange market, clear intervention rules and efficient liquidity management to prevent the unnecessary volatility of the naira. It becomes necessary due to the fact that exchange rate volatility affects macroeconomic performance through channels of price level fluctuations, uncertainty of investments, and monetary policy instability.
2. The Federal Government through the Ministry of Finance, Budget and National Planning should introduce a Policy Certainty Framework requiring major economic policies to undergo impact assessment, stakeholder consultation, and clear implementation guidelines before adoption. This will reduce economic policy uncertainty, improve investor confidence, and minimize the adverse effect of uncertainty shocks on macroeconomic performance.
3. The Federal Ministry of Industry, Trade and Investment must adopt the Productive Import Transformation Policy which ensures that foreign exchange is used for the importation of capital goods, industrial equipment, and essential production inputs while reducing the dependence on non-productive imports. This will enhance productive capacity within the nation, boost the efficiency of imports in influencing economic performance, and minimize the risk of exposure of Nigeria's economy to exchange rates fluctuations.

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