

## VOLATILITY SPILLOVER EFFECT OF EXCHANGE RATE ON SECTORAL STOCK RETURNS IN NIGERIA

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### Abstract

*This study investigates the volatility spillover effects of exchange rate fluctuations on sectoral stock returns in Nigeria using the Exponential GARCH (EGARCH) model, complemented by the Augmented Granger Causality framework. Employing an ex-post facto design, the research utilizes monthly time-series data from 2005 to 2023, sourced from the Central Bank of Nigeria (CBN) and the Nigerian Exchange Group (NGX). Empirical findings reveal heterogeneous transmission of exchange rate volatility across sectors, with no significant spillover observed in the banking and consumer goods sectors, indicating their relative insulation from currency fluctuations. In contrast, the insurance and oil & gas sectors exhibit significant volatility spillover effects, demonstrating strong sensitivity to movements in the exchange rate. These results support the Volatility Spillover Theory, which posits that shocks in one financial market can propagate to other sectors, with the magnitude of transmission depending on sectoral exposure to the initial shock. The study also finds strong return persistence across all sectors, while innovation, leverage, and asymmetry effects vary according to sectoral structure and macroeconomic sensitivity. Based on these findings, investors are advised to diversify portfolios by combining assets from relatively stable sectors, such as banking and consumer goods, with those more vulnerable to exchange rate shocks. Policymakers are encouraged to strengthen foreign exchange management, enhance insurance sector stability, and implement targeted sector-specific risk-mitigation frameworks to foster resilience in Nigeria's stock market.*

**Keywords:** Exchange Rate Volatility, EGARCH, Financial Markets, Sectoral Stock Returns, Volatility Spillover

### INTRODUCTION

The growing integration of global financial markets, cross-border capital flows, and the liberalization of foreign exchange regimes have intensified interest in the relationship between exchange rate dynamics and stock market performance (Oladapo, Fapetu & Ojo, 2022; Adekunle, 2023). This relationship is particularly relevant for investors (domestic and foreign) who rely on an understanding of exchange rate behaviour to build effective hedging strategies and diversify their portfolios. The stock market serves as a vital institution for capital mobilization, efficient resource allocation, and long-term economic development. Oladapo, Fapetu & Ojo (2022) found out that the stock market in Nigeria facilitates the flow of funds from surplus units

to deficit units, thereby supporting productive investments and sustaining economic growth. A well-functioning equity market promotes confidence among investors by providing transparent pricing mechanisms and opportunities for wealth creation. Conversely, instability in key macroeconomic indicators, particularly the exchange rate, can undermine market performance, disrupt investment decisions, and affect overall economic stability (Fakunmoju & Kasali, 2020; Adekunle, 2023).

Foreign exchange markets determine the value of the domestic currency relative to other currencies and reflect the strength or weakness of an economy in the global marketplace. Abina (2023) noted that the exchange rate in Nigeria has historically been vulnerable to fluctuations arising from imbalances in foreign reserves,

dependence on crude oil exports, and shifts in global economic conditions. Over the years, the Nigerian foreign exchange market has transitioned from a strictly regulated regime to a more flexible system, resulting in persistent volatility and repeated episodes of currency depreciation (Adekunle, 2023; Abina, 2023). These fluctuations have implications for production costs, investor confidence, import-dependent sectors, and ultimately, stock market performance.

Empirical evidence suggests that exchange rate volatility (ERV) has a detrimental effect on the Nigerian stock market. For example, a recent study shows that exchange rate volatility has a significant negative impact on stock market capitalization and trading volume (Adekunle, 2023; Gbadebo, 2023). Also, a joint examination of oil price shocks and exchange rate volatility finds that both contribute to increased share price volatility in Nigeria (Abina, 2023; Surajdeen, Olanipekun, Abdulkadri, Hakeem, & Olusegun, 2024).

Historically, the Nigerian stock market has exhibited considerable volatility in response to prolonged exchange rate instability. Periods of severe naira depreciation, especially following global oil price shocks, have coincided with declines in market capitalization, reduced foreign portfolio inflows, and heightened investor uncertainty (Adekunle, 2023; Fakunmoju & Kasali, 2020). Moreover, the response to exchange rate shocks varies across sectors due to differences in operational structures, import exposure, and sensitivity to macroeconomic risks. For instance, while some sectors (e.g., import-dependent firms) may suffer significantly during periods of exchange rate pressure, other sectors may display relative resilience depending on the nature of their operations.

Oladapo, Fapetu & Ojo (2022) and Adekunle (2023) noted that most existing studies in Nigeria have focused on aggregate market indices, thereby masking sector-specific behaviours and sensitivities. However, stock market sectors operate under different cost structures, regulatory environments, and levels of exposure to foreign exchange risk, making them likely to respond differently to currency fluctuations. As a result, conclusions based on aggregate level data may not accurately capture the heterogeneous reactions across sectors.

Therefore, against this backdrop, this study examines the effect of exchange rate volatility, particularly the volatility spillover from the foreign exchange market, on sectoral stock returns in Nigeria.

H<sub>01</sub>: There is no volatility spillover effect of exchange rate on stock returns of banking sector in Nigeria.

H<sub>02</sub>: There is no volatility spillover effect of exchange rate on stock returns of consumer goods sector in Nigeria.

H<sub>03</sub>: There is no volatility spillover effect of exchange rate on stock returns of insurance sector in Nigeria.

H<sub>04</sub>: There is no volatility spillover effect of exchange rate on stock returns of oil and gas sector in Nigeria.

## 2.0. Conceptual Review

### 2.1 Foreign Exchange Rate

Foreign exchange rate is the price at which one country's currency can be exchanged for another, reflecting the relative value of currencies in the international market (CBN, 2020). It plays a pivotal role in international trade, investment, and economic growth, influencing import and export competitiveness, capital flows, and foreign portfolio investments (Umeaduma & Dugbartey, 2023). In Nigeria, exchange rate movements have been particularly important due to the economy's dependence on oil exports and imported goods, making the stability of the naira a key concern for investors and policymakers alike.

### 2.2. Volatility of Exchange Rate

Exchange rate volatility is defined as frequent and unpredictable changes in currency values over time, which generate uncertainty for investors, traders, and firms engaged in international trade (Mubaiwa & Fasanya, 2024). In Nigeria, volatility in the naira has been driven by factors such as fluctuations in crude oil prices, foreign capital inflows and outflows, and shifts in monetary policy (Ohajieze & Ozoekwe, 2025; Sani, Sale & Gambo, 2024). High volatility in exchange rates increases risks for investors in the stock market, as it can alter firm profitability, cost structures, and investor sentiment, thereby potentially transmitting shocks to sectoral stock returns (Ghumro, Soomro & Abbas, 2024).

### ***Misalignment of Exchange Rate***

Exchange rate misalignment occurs when the observed market exchange rate deviates from its long-run equilibrium level, leading to overvaluation or undervaluation of the currency (Owuru & Olabisi, 2023). Misalignment affects external competitiveness, trade balances, and the profitability of firms that rely on imported inputs or export revenues. Persistent misalignments can create financial instability and distort stock prices, particularly in sectors sensitive to exchange rate fluctuations, such as banking, manufacturing, consumer goods, and oil and gas sectors.

### ***Exchange Rate Volatility Spillover to Stock Markets***

Volatility spillover refers to the transmission of uncertainty or fluctuations from the foreign exchange market to the equity market, influencing stock returns and market risk (Amin & Janor, 2016). In Nigeria, sectoral stock returns respond differently to exchange rate shocks due to heterogeneity in capital structure, import dependence, and exposure to foreign-denominated revenues. For instance, the consumer goods sector is highly sensitive to import costs, while the banking sector may react to currency volatility through foreign assets and liability exposures. Empirical studies show that these spillover effects are often asymmetric and sector-specific, highlighting the need for sectoral-level analysis rather than aggregate market studies (Mubaiwa & Fasanya, 2024).

## **2.2. Theoretical Framework**

### **Volatility Spillover Theory**

The Volatility Spillover Theory, initially formalized by Engle et al. (1990) and later extended by Diebold and Yilmaz (2009), posits that shocks or fluctuations in one financial market can be transmitted to other markets, sectors, or assets over time. The theory emphasizes that volatility is not isolated but can “spill over” from one market to another, creating interdependence among financial assets. In this framework, exchange rate shocks can influence sectoral stock market returns differently, depending on their exposure to foreign currency fluctuations and macroeconomic conditions.

The model highlights that volatility transmission is heterogeneous across sectors,

and the direction and magnitude of spillovers may vary depending on the structural characteristics of each sector, such as import-dependence, foreign-denominated revenues, and operational exposure. In Nigeria, sectors like oil & gas are highly sensitive to exchange rate volatility due to foreign revenue streams, whereas sectors such as banking and consumer goods may be relatively insulated.

Adopting the Volatility Spillover Theory provides a relevant framework for examining how exchange rate volatility is transmitted to sectoral stock returns, which aligns directly with the empirical focus of this study. This theory also justifies the use of EGARCH models, which are designed to capture time-varying volatility, asymmetric shocks, and sector-specific heterogeneity in volatility dynamics. Using this framework, the study can identify which sectors are most vulnerable to currency shocks and how volatility propagates across the Nigerian stock market.

## **2.3. Empirical Studies**

Gokmenoglu, Eren & Hesami (2021) investigated the relationship between exchange rates and stock market returns in selected emerging economies using a quantile-on-quantile regression approach. The study utilized time-series financial market data from multiple emerging stock markets and employed distribution-sensitive econometric techniques to capture heterogeneous dependencies across market conditions. Their findings revealed that the exchange rate–stock return relationship is nonlinear and quantile-dependent, with stronger effects observed during extreme market states. However, the study was conducted at the aggregate market level and did not consider sectoral stock indices, thereby limiting its relevance for sector-specific investment decisions.

Owuru and Olabisi (2023) examined the dynamic response of Nigerian stock returns to exchange rate and oil price shocks using time-series data obtained from the Nigerian Stock Exchange and macroeconomic databases. The study employed vector autoregressive (VAR) and cointegration techniques to analyze short-run and long-run relationships. Their results showed that oil price increases positively influence stock returns, while naira depreciation negatively affects stock returns in the short run. Nevertheless, the study focused

on aggregate stock market indices and did not analyze volatility spillover effects at the sectoral level, which this study seeks to address.

Takpa, Oriin & Akunna (2023) studied the relationship between real exchange rate volatility and manufacturing sector performance in Nigeria using annual data from 1999 to 2021. The study applied autoregressive distributed lag (ARDL) and vector autoregressive models to examine the dynamic effects of exchange rate instability on manufacturing output. The findings indicated a negative impact of exchange rate volatility on manufacturing performance. However, the study concentrated on real sector output rather than stock market returns and did not investigate volatility transmission mechanisms across financial sectors.

Mubaiwa and Fasanya (2024) analyzed quantile dependencies between exchange rate volatility and sectoral stock returns in South Africa using sectoral stock indices and exchange rate data. Quantile regression and volatility decomposition techniques were employed to capture sector-specific and tail-risk effects. The study found that exchange rate volatility affects sectors differently, with stronger impacts in extreme quantiles. Despite its sectoral focus, the study was conducted in South Africa, and its findings may not be directly applicable to the Nigerian stock market due to structural and institutional differences.

Sahoo and Kumar (2024) investigated volatility spillovers among stock market sectors in India and China using multivariate GARCH and connectedness frameworks. Using daily sectoral stock index data, the study documented significant cross-sector volatility transmission and time-varying connectedness. However, the study did not incorporate exchange rate volatility as a source of spillover, focusing instead on intra-market sectoral linkages.

Ibrahim, Tasi'u & Dikko (2024) examined volatility spillovers between Nigeria and BRICS foreign exchange markets using multivariate GARCH models. The study utilized exchange rate time-series data and found significant cross-country volatility transmission. Nonetheless, the research was limited to foreign exchange markets and did not investigate how exchange rate volatility transmits to domestic sectoral stock returns.

Mouna and Anis (2016) analyzed the impact of market, interest rate, and exchange rate risks on financial sector stock returns during the global financial crisis using a VAR-GARCH-in-Mean model. The study used financial sector stock data and macroeconomic variables from developed markets and found significant volatility spillovers during crisis periods. However, the study was conducted in a different economic environment and did not consider sectoral differences within emerging markets like Nigeria.

Despite extensive empirical evidence on exchange rate–stock market relationships, most Nigerian studies have concentrated on aggregate stock market indices, ignoring sectoral heterogeneity. Moreover, existing sectoral studies are largely conducted in developed or other emerging economies, with limited evidence from Nigeria. Furthermore, many studies rely on linear or symmetric models, which may fail to capture asymmetric and nonlinear volatility spillover dynamics. Therefore, this study contributes to the literature by examining the volatility spillover effects of exchange rate fluctuations on sectoral stock returns in Nigeria using the EGARCH framework, which explicitly captures asymmetry and leverage effects.

### **3.0. Methodology**

The research design adopted for the study was ex-post facto type. The information that used in this research was sourced from secondary data, mainly the Central Bank of Nigeria (CBN) and the Nigerian Exchange Group (NGX). Depending on the availability of variables, the data covered a multiple-year period from 2005 to 2023. The entities of this research are four sectoral stock market indices in Nigeria, namely the banking, consumer goods, insurance, and oil and gas sectors. The study also includes five macroeconomic variables: exchange rate, interest rate, inflation rate, foreign reserves, and money supply.

#### **3.1 Model Specification**

The Exponential GARCH model was used to model the volatility spillover effect of exchange rate on sector stock returns. Nelson (1991) introduced the EGARCH model, the natural log of conditional variance in the EGARCH was used to correct the weakness of GARCH model. Nelson and Cao (1992) argued that the GARCH models are too restrictive, as the GARCH

model imposes positive constraints on the parameters which cannot test for volatilities in financial time series data. EGARCH give room for a clear testing of volatility spillover without

imposing further constraints. The volatility model for the market returns and exchange rate are expressed in the mean and variance equation which is given as:

The mean and variance equations are expressed in equations 1 & 2.

$$RASI_t = \alpha_0 + \alpha_1 RASI_{t-1} + \varepsilon_t \tag{1}$$

$$\log(h_t) = \gamma + \sum_{j=1}^q \delta_j \frac{\varepsilon_{t-j}}{\sqrt{h_{t-j}}} + \sum_{j=1}^q \vartheta_j \frac{\varepsilon_{t-j}}{\sqrt{h_{t-j}}} + \sum_{i=1}^p \theta_i \log(h_t) + \tau EXRVOL_t \tag{2}$$

Where:

- RASI is return series of aggregate All Share Index;
- EXRVOL is exchange rate volatility generated from the EGARCH;
- $\log(h_t)$  = the natural log of the variance series;
- $\varepsilon_t$  = the disturbance term;
- $\gamma, \delta_j, \vartheta_j, \text{ and } \theta_j$  = the parameters to be estimated.

Taking the log of the variance series makes the leverage effect to be exponential instead of quadratic, and therefore the estimates of the conditional variance are guaranteed to be non-negative. To test for asymmetries the parameters of importance are the  $\vartheta$ s while the parameters of importance in testing the leverage effects are the  $\theta$ s. If  $\vartheta_1 = \vartheta_2 = \dots = 0$ , then the model is symmetry. When  $\vartheta_j < 0$ , then positive shocks (good news) generate less volatility than negative shocks (bad news).

The model is specified and tested on each of the selected sectors. The mean and variance equations of each sector are as follows:

**Modeling for NSE Banking**

$$RASI_{Bt} = \alpha_0 + \alpha_1 RASI_{Bt-1} + \varepsilon_{Bt}$$

$$\log(h_{Bt}) = \gamma + \sum_{j=1}^q \delta_j \frac{\varepsilon_{Bt-j}}{\sqrt{h_{Bt-j}}} + \sum_{j=1}^q \vartheta_j \frac{\varepsilon_{Bt-j}}{\sqrt{h_{Bt-j}}} + \sum_{i=1}^p \theta_i \log(h_{Bt}) + \tau EXRVOL_t \tag{3}$$

**Modeling for NSE Consumer Goods**

$$RASI_{CGt} = \alpha_0 + \alpha_1 RASI_{CGt-1} + \varepsilon_{CGt}$$

$$\log(h_{CGt}) = \gamma + \sum_{j=1}^q \delta_j \frac{\varepsilon_{CGt-j}}{\sqrt{h_{CGt-j}}} + \sum_{j=1}^q \vartheta_j \frac{\varepsilon_{CGt-j}}{\sqrt{h_{CGt-j}}} + \sum_{i=1}^p \theta_i \log(h_{CGt}) + \tau EXRVOL_t \tag{4}$$

**Modeling for NSE Insurance**

$$RASI_{INSt} = \alpha_0 + \alpha_1 RASI_{INSt-1} + \varepsilon_{INSt}$$

$$\log(h_{INSt}) = \gamma + \sum_{j=1}^q \delta_j \frac{\varepsilon_{INSt-j}}{\sqrt{h_{INSt-j}}} + \sum_{j=1}^q \vartheta_j \frac{\varepsilon_{INSt-j}}{\sqrt{h_{INSt-j}}} + \sum_{i=1}^p \theta_i \log(h_{INSt}) + \tau EXRVOL_t \tag{5}$$

**Modeling for NSE Oil and Gas**

$$RASI_{OGt} = \alpha_0 + \alpha_1 RASI_{OGt-1} + \varepsilon_{OGt}$$

$$\log(h_{OGt}) = \gamma + \sum_{j=1}^q \delta_j \frac{\varepsilon_{OGt-j}}{\sqrt{h_{OGt-j}}} + \sum_{j=1}^q \vartheta_j \frac{\varepsilon_{OGt-j}}{\sqrt{h_{OGt-j}}} + \sum_{i=1}^p \theta_i \log(h_{OGt}) + \tau EXRVOL_t \tag{6}$$

**3.2 Model Estimation Techniques**

The study employed the Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGARCH) model to examine the volatility spillover effects of exchange rate fluctuations on stock returns at both the aggregate market level and across the

selected sectors. The EGARCH specification models the natural logarithm of the conditional variance, enabling explicit testing of volatility spillover without imposing non-negativity constraints. Pre-estimation diagnostic tests were conducted to validate stationarity and confirm the robustness of the models.

**4.0. Data Presentation, Analysis and Discussion of Findings**

**4.1 Descriptive Result**

**Table 1: Summary of Descriptive Statistics of Variables**

| Statistics | Mean   | Max     | Min    | S/D    | Skew  | kurt  | J/B    | prob  |
|------------|--------|---------|--------|--------|-------|-------|--------|-------|
| Banking    | 371.35 | 577.14  | 223.74 | 74.36  | 0.29  | 2.89  | 1.73   | 0.042 |
| C/Goods    | 780.31 | 1103.07 | 409.68 | 176.78 | -0.13 | 2.19  | 3.48   | 0.175 |
| Insurance  | 169.49 | 541.79  | 107.85 | 78.11  | 2.79  | 10.85 | 451.80 | 0.000 |
| Oil & gas  | 311.47 | 658.60  | 153.97 | 84.55  | 0.53  | 5.12  | 27.49  | 0.000 |

|           |          |          |         |         |       |      |       |       |
|-----------|----------|----------|---------|---------|-------|------|-------|-------|
| Aggregate | 31692.2  | 64689.3  | 20230.6 | 9653.9  | 1.36  | 4.88 | 58.64 | 0.000 |
| Exc. Rate | 218.74   | 494.70   | 118.69  | 99.42   | 1.15  | 2.94 | 28.56 | 0.000 |
| INF       | 11.91    | 18.72    | 7.71    | 3.05    | 0.39  | 2.16 | 7.03  | 0.030 |
| FR        | 38704.7  | 62081.9  | 23689.9 | 9125.7  | 0.68  | 2.94 | 10.05 | 0.007 |
| MS        | 15530436 | 25277071 | 6527673 | 5205988 | 0.25  | 1.90 | 7.81  | 0.020 |
| INT       | 11.01    | 14.0     | 6.0     | 2.68    | -0.74 | 2.29 | 14.58 | 0.000 |

(Source: Author's Computation, 2025).

The descriptive statistics of selected Nigerian stock market sectors presented in Table 1 indicates significant variation in stock performance and investor behavior. The banking sector exhibited a monthly average all-share index of 371.35 with relatively low spread, while the consumer goods sector had the highest average at 780.31, reflecting strong investor interest and high volatility in stock prices. In contrast, the insurance sector recorded the lowest average of 169.49, suggesting low investor patronage, whereas the oil and gas sector displayed wide disparities in stock prices with a mean of 311.47, indicating high trading activity. Normality tests revealed that only the consumer goods sector data approximates normal distribution, while the other sectors, including banking, insurance, and oil and gas, showed non-normal distributions likely due to outliers. The non-normal distribution implies the presence of volatility clustering and fat tails in sectoral stock returns, making traditional linear models unsuitable. This justifies the use of the EGARCH model, which is robust to non-normality and captures asymmetric volatility effects.

Macroeconomic indicators also demonstrated significant variability over the period under

study. The foreign exchange rate averaged ₦218.74 to the US dollar, with high fluctuations between ₦118.69 and ₦494.70, indicating exchange rate instability. Inflation averaged 11.91%, while external reserves, broad money supply, and interest rates also exhibited substantial disparities, reflecting macroeconomic volatility in Nigeria. Normality tests confirmed that most macroeconomic variables are non-normally distributed. To address potential biases from outliers, logarithmic transformations were applied to most variables, except for rates of inflation and interest, prior to empirical modeling. These findings highlight the heterogeneous nature of sectoral stock performance and the macroeconomic environment, which is essential for understanding volatility spillovers in Nigeria's financial market. The non-normal distribution implies the presence of macroeconomic shocks and extreme fluctuations, which can bias standard estimators. Logarithmic transformation stabilizes variance and reduces the influence of outliers, ensuring more reliable econometric estimates. The heterogeneous macroeconomic environment also suggests differential sectoral responses to macroeconomic shocks, justifying sectoral volatility spillover analysis.

#### 4.2 Preliminary Estimation Techniques

Table 2: Pairwise Correlation Matrix

|                      | Banking | CG    | Insurance | Oil & Gas | Ex. Rates | Inflation | Ext. Res. | M2   | Int. Rate |
|----------------------|---------|-------|-----------|-----------|-----------|-----------|-----------|------|-----------|
| <b>Banking</b>       | 1.0     |       |           |           |           |           |           |      |           |
| <b>CG</b>            | 0.59    | 1.0   |           |           |           |           |           |      |           |
| <b>Insurance</b>     | 0.17    | -0.47 | 1.0       |           |           |           |           |      |           |
| <b>Oil &amp; Gas</b> | 0.19    | -0.02 | 0.49      | 1.0       |           |           |           |      |           |
| <b>Ex. Rates</b>     | -0.10   | 0.01  | -0.30     | 0.07      | 1.0       |           |           |      |           |
| <b>Inflation</b>     | -0.18   | -0.41 | 0.06      | 0.02      | 0.64      | 1.0       |           |      |           |
| <b>Ex. Res.</b>      | 0.62    | 0.18  | 0.44      | -0.11     | -0.39     | -0.29     | 1.0       |      |           |
| <b>M2</b>            | 0.04    | 0.34  | -0.53     | 0.02      | 0.67      | 0.28      | -0.31     | 1.0  |           |
| <b>Int. Rate</b>     | -0.04   | 0.34  | -0.51     | -0.17     | 0.63      | 0.04      | -0.19     | 0.62 | 1.0       |

(Source: Author's Computation, 2025).

The pairwise correlation matrix presented in Table 2 shows mixed positive and negative

relationships among sectoral stock returns and macroeconomic variables. Banking sector

returns are positively correlated with consumer goods (0.59) and external reserves (0.62), suggesting that improvements in foreign reserves and consumer market performance are associated with higher banking sector returns. Insurance and oil and gas sectors also show moderate positive correlation (0.49), indicating possible interconnected sectoral dynamics.

Exchange rate exhibits negative correlations with banking (-0.10), insurance (-0.30), and external reserves (-0.39), implying that naira depreciation is associated with lower stock performance and declining foreign reserves. Inflation is negatively correlated with banking (-0.18) and consumer goods (-0.41), indicating that rising inflation adversely affects stock

returns in these sectors. Money supply (M2) and interest rate show positive correlations with exchange rate (0.67 and 0.63 respectively), suggesting monetary conditions influence exchange rate dynamics.

All correlation coefficients are below the threshold of 0.80, indicating the absence of severe multicollinearity among the explanatory variables. The mixed positive and negative correlations indicate heterogeneous macroeconomic and sectoral interactions, suggesting that exchange rate shocks may affect sectors differently. The absence of high correlations confirms that multicollinearity is not problematic, ensuring robustness of the EGARCH estimates.

**Table 3: Augmented Dickey-Fuller Breakpoint Unit Root Test**

| Variables     | At level |          |       | At First Difference |          |       | Order of Integration |
|---------------|----------|----------|-------|---------------------|----------|-------|----------------------|
|               | T-Stat   | Crit.Val | P-Val | T-Stat              | Crit.Val | P-Val |                      |
| ASI           | -4.28    | -5.17    | 0.35  | -7.78               | -5.17    | 0.00  | I(1)                 |
| Banking       | -4.12    | -5.17    | 0.45  | -10.04              | -5.17    | 0.00  | I(1)                 |
| Cons. Goods   | -3.43    | -5.17    | 0.84  | -8.84               | -5.17    | 0.00  | I(1)                 |
| Insurance     | -6.63    | -5.17    | 0.00  |                     |          |       | I(0)                 |
| Oil and Gas   | -4.91    | -5.17    | 0.09  | -10.42              | -5.17    | 0.00  | I(1)                 |
| Exch. Rate    | -4.65    | -5.17    | 0.17  | -10.60              | -5.17    | 0.00  | I(1)                 |
| Inflation     | -5.64    | -5.17    | 0.01  |                     |          |       | I(0)                 |
| Ext. Reserve  | -3.46    | -5.17    | 0.83  | -8.22               | -5.17    | 0.00  | I(1)                 |
| M2            | -5.55    | -5.17    | 0.02  |                     |          |       | I(0)                 |
| Interest Rate | -3.99    | -5.17    | 0.53  | -13.26              | -5.17    | 0.00  | I(1)                 |

(Source: Author's Computation, 2025).

At the 5% level of significance, results of the ADF break point unit-root test in Table 3 confirm that insurance share index, inflation rate and broad money supply (M2) are stationary at levels. This is indicated by p-values less than 0.05 and test statistics greater than the critical values at 5%, signifying that these variables are I(0). However, the all-share index, banking index, consumer-goods index, oil & gas index, exchange rate, external reserves and interest rate series are found to be non-stationary at levels (p-values > 0.05; test statistics less than critical values). But these series are stationary after first difference, i.e. the first-differenced series are I(0) as the p-

values of the first differenced series are < 0.05 and the test statistics are greater than the critical value.

Since GARCH-family volatility models need weakly stationary series (constant mean and variance over time) and no unit root is allowed in the series on the volatility estimation is based, the conversion of non-stationary series into stationary series is necessary (Engle, 1982; Bollerslev, 1986; Franscq & Zakoian, 2019). After differencing the non-stationary series to make them stationary (I(0)) and keeping the originally stationary variables as level series, the data set is then suitable for

GARCH/MGARCH modeling. Hence, all the variables are now sufficiently processed, as either level I(0) series or transformed first-difference I(0) series, to allow for a coherent and valid MGARCH investigation of volatility and conditional correlations between financial and macroeconomic variables. The results

imply that most variables follow a stochastic trend and shocks are persistent in Nigeria's financial and macroeconomic environment. Differencing ensures stationarity, prevents spurious regression, and guarantees the validity of EGARCH volatility estimates.

**Table 4: Result of the ARCH Test**

| Sector         | Statistic     | Value   | p-value |
|----------------|---------------|---------|---------|
| Aggregate      | F-statistic   | 13.674  | 0.000   |
|                | Obs*R-squared | 13.366  | 0.000   |
| Banking        | F-statistic   | 106.961 | 0.000   |
|                | Obs*R-squared | 88.645  | 0.000   |
| Consumer Goods | F-statistic   | 14.776  | 0.000   |
|                | Obs*R-squared | 14.413  | 0.000   |
| Insurance      | F-statistic   | 49.682  | 0.000   |
|                | Obs*R-squared | 45.418  | 0.000   |
| Oil and Gas    | F-statistic   | 134.004 | 0.000   |
|                | Obs*R-squared | 106.365 | 0.000   |

(Source: Author's Computation, 2025).

The test results for the ARCH effect are shown in the Table 4 and it reveals that the null hypothesis of no ARCH effect is rejected for the aggregate stock market and those of each of the sectors. From the statistics and the corresponding p-values it can be seen. The F-stat and Obs\*R-sq for each of the sectors as well as the aggregate market were found to be significant. This can be seen from their p-

values, which offer enough evidence to conclude that there is no ARCH effect in the error term. Estimation of the models using ARCH/GARCH-family models best suit for the purpose. The presence of ARCH effects implies volatility clustering in Nigerian sectoral stock returns, rendering OLS inappropriate and justifying the use of EGARCH models for volatility spillover analysis.

**Table 5: Information Criteria for Model Selection**

| Sector         | Info Criterion | GARCH  | TGARCH | EGARCH |
|----------------|----------------|--------|--------|--------|
| Aggregate      | Akaike         | -4.416 | -4.413 | -4.404 |
|                | Schwarz        | -4.375 | -4.363 | -4.354 |
|                | Hannan-Quinn   | -4.400 | -4.393 | -4.384 |
| Banking        | Akaike         | -3.102 | -2.455 | -2.199 |
|                | Schwarz        | -3.060 | -2.405 | -2.149 |
|                | Hannan-Quinn   | -3.085 | -2.435 | -2.179 |
| Consumer Goods | Akaike         | -4.066 | -4.066 | -4.056 |
|                | Schwarz        | -4.025 | -4.016 | -4.006 |
|                | Hannan-Quinn   | -4.050 | -4.046 | -4.036 |
| Insurance      | Akaike         | -1.929 | -1.919 | -1.184 |
|                | Schwarz        | -1.887 | -1.869 | -1.134 |
|                | Hannan-Quinn   | -1.912 | -1.900 | -1.164 |
| Oil and Gas    | Akaike         | -3.386 | -3.337 | -3.323 |
|                | Schwarz        | -3.345 | -3.287 | -3.273 |
|                | Hannan-Quinn   | -3.370 | -3.317 | -3.303 |

(Source: Author's Computation, 2025).

The findings in Tables 4 and 5 imply that the volatility sequence of stock returns should be extracted and thereafter the volatility model be estimated by exponential GARCH to examine the volatility spillover effects of exchange rate on stock return in Nigerian.

4.4 Volatility Spillover Effect of Foreign Exchange Rate on Sector Stock Returns

Table 5: EGARCH (1,1) Model Results (Banking and Consumer Goods Sector)

| Banking Sector        |             |            |             |       |
|-----------------------|-------------|------------|-------------|-------|
| Mean Equation         |             |            |             |       |
| Variable              | Coefficient | Std. Error | z-Statistic | Prob. |
| Constant              | 0.000       | 0.001      | 0.305       | 0.760 |
| GRBANKING(-1)         | 0.197       | 0.043      | 4.588       | 0.000 |
| Variance Equation     |             |            |             |       |
| Constant              | -4.725      | 0.399      | -11.815     | 0.000 |
| Innovation            | 1.191       | 0.071      | 16.615      | 0.000 |
| Asymmetry             | -0.558      | 0.045      | -12.378     | 0.000 |
| Leverage              | 0.341       | 0.064      | 5.332       | 0.000 |
| Exch. Volatility      | -308.772    | 395.960    | -0.779      | 0.435 |
| Consumer Goods Sector |             |            |             |       |
| Mean Equation         |             |            |             |       |
| Variable              | Coefficient | Std. Error | z-Statistic | Prob. |
| Constant              | -0.000      | 0.001      | -0.355      | 0.722 |
| GRCG(-1)              | 0.157       | 0.047      | 3.342       | 0.000 |
| Variance Equation     |             |            |             |       |
| Constant              | -2.178      | 0.270      | -8.062      | 0.000 |
| Innovation            | 0.571       | 0.067      | 8.457       | 0.000 |
| Asymmetry             | 0.038       | 0.041      | 0.922       | 0.356 |
| Leverage              | 0.747       | 0.035      | 21.150      | 0.000 |
| Exch. Volatility      | 38.108      | 184.912    | 0.206       | 0.836 |

(Source: Author's Computation, 2025).

The results for the banking sector reveal that past stock returns significantly influence current returns, indicating strong return persistence. The variance equation further shows that innovation, information asymmetry, and leverage effects are all statistically significant, confirming the presence of ARCH effects and demonstrating that past shocks and volatilities shape current volatility patterns. The positive innovation effect aligns with earlier ARCH test results, while the negative and significant information asymmetry coefficient indicates that bad news exerts a stronger impact on volatility than good news. The positive leverage effect suggests that increases in current volatility lead to higher future volatility. However, exchange rate volatility is not a significant determinant of banking sector stock return volatility, as evidenced by its high p-value (0.435), implying that movements in the naira, whether appreciation or depreciation, do

not meaningfully spill over into banking sector volatility.

The mean equation results in Table 5 indicate that lagged consumer goods sector stock returns significantly influence current returns, demonstrating strong return persistence in the sector. The variance equation further shows that both innovation and leverage effects are statistically significant, suggesting that positive developments within the sector, such as product rebranding or new product lines, enhance stock returns, while past volatility also feeds into future volatility. However, information asymmetry and exchange rate volatility are not significant determinants of consumer goods sector stock return volatility, as reflected in their high p-values (0.356 and 0.836). This implies that good and bad news exert similar effects on volatility, and fluctuations in the naira's value do not spill over into the sector's stock returns.

Table 6: EGARCH (1,1) Model Results (Insurance and Oil & Gas Sector)

| Insurance Sector  |             |            |             |       |
|-------------------|-------------|------------|-------------|-------|
| Variable          | Coefficient | Std. Error | z-Statistic | Prob. |
| Constant          | -0.006      | 0.002      | -3.674      | 0.000 |
| GRINSURANCE(-1)   | 0.118       | 0.052      | 2.283       | 0.022 |
| Variance Equation |             |            |             |       |

| Constant           | -6.678      | 1.132      | -5.899      | 0.000 |
|--------------------|-------------|------------|-------------|-------|
| Innovation         | 0.112       | 0.084      | 1.332       | 0.182 |
| Asymmetry          | 0.166       | 0.076      | 2.182       | 0.029 |
| Leverage           | 0.206       | 0.138      | 1.493       | 0.135 |
| Exch. Volatility   | 8357.126    | 1383.373   | 6.041       | 0.000 |
| Oil and Gas Sector |             |            |             |       |
| Variable           | Coefficient | Std. Error | z-Statistic | Prob. |
| Constant           | -0.000      | 0.001      | -0.220      | 0.825 |
| GROILNGAS(-1)      | 0.215       | 0.045      | 4.716       | 0.000 |
| Variance Equation  |             |            |             |       |
| Constant           | -4.662      | 0.570      | -8.175      | 0.000 |
| Innovation         | 1.037       | 0.067      | 15.434      | 0.000 |
| Asymmetry          | -0.464      | 0.045      | -10.168     | 0.000 |
| Leverage           | 0.403       | 0.087      | 4.626       | 0.000 |
| Exch. Volatility   | 973.658     | 351.933    | 2.766       | 0.005 |

(Source: Author's Computation, 2025).

The mean equation results presented in Table 6 indicates that lagged insurance sector stock returns significantly influence current returns, showing strong return persistence within the sector. In the variance equation, innovation and leverage effects are not statistically significant, suggesting that neither past shocks nor past volatility meaningfully drives current volatility in the insurance sector. However, information asymmetry is positive and significant, meaning that good news exerts a stronger impact on volatility than bad news. Exchange rate volatility also emerges as a significant contributor to insurance sector volatility, as shown by its highly significant p-value (0.000), indicating a clear spillover effect from exchange rate fluctuations to insurance stock returns.

significant effect on current returns, indicating strong return persistence in the sector. The variance equation further reveals that innovation, information asymmetry, and leverage effects are all statistically significant, confirming the presence of volatility clustering. The negative and significant information asymmetry coefficient suggests that bad news, such as adverse movements in international oil prices, induces greater volatility in oil and gas stock returns than good news. The positive leverage effect indicates that past volatility increases future volatility, reinforcing the persistence of shocks within the sector. Finally, exchange rate volatility is also found to be statistically significant, with a p-value of 0.0057, demonstrating that fluctuations in the value of the naira spill over into oil and gas sector stock return volatility.

The mean equation results show that lagged oil and gas sector stock returns have a statistically

#### 4.5 Post Estimation Test

Table 7: Correlogram Squared Residual for Autocorrelation – EGARCH

| Lag | Aggregate |       | Banking |       | Consumer Gds |       | Insurance |       | Oil & Gas |       |
|-----|-----------|-------|---------|-------|--------------|-------|-----------|-------|-----------|-------|
|     | Q-Stat    | Prob* | Q-Stat  | Prob* | Q-Stat       | Prob* | Q-Stat    | Prob* | Q-Stat    | Prob* |
| 1   | 0.121     | 0.728 | 0.025   | 0.873 | 0.044        | 0.834 | 0.022     | 0.882 | 0.043     | 0.835 |
| 2   | 1.017     | 0.601 | 0.037   | 0.982 | 0.593        | 0.743 | 0.026     | 0.987 | 0.054     | 0.973 |
| 3   | 1.093     | 0.779 | 0.043   | 0.998 | 0.652        | 0.884 | 0.031     | 0.999 | 0.287     | 0.962 |
| 4   | 1.155     | 0.885 | 0.365   | 0.985 | 0.652        | 0.957 | 0.038     | 1.000 | 0.506     | 0.973 |
| 5   | 1.245     | 0.940 | 0.366   | 0.996 | 4.983        | 0.418 | 0.042     | 1.000 | 0.558     | 0.990 |
| 6   | 3.158     | 0.789 | 0.562   | 0.997 | 7.345        | 0.290 | 0.046     | 1.000 | 0.609     | 0.996 |
| 7   | 6.613     | 0.470 | 0.563   | 0.999 | 10.454       | 0.164 | 0.052     | 1.000 | 0.689     | 0.998 |
| 8   | 6.614     | 0.579 | 0.587   | 1.000 | 10.939       | 0.205 | 0.058     | 1.000 | 1.316     | 0.995 |
| 9   | 7.565     | 0.578 | 0.956   | 1.000 | 11.497       | 0.243 | 0.065     | 1.000 | 5.670     | 0.772 |
| 10  | 7.569     | 0.671 | 1.099   | 1.000 | 11.628       | 0.311 | 0.072     | 1.000 | 5.681     | 0.841 |

(Source: Author's Computation, 2025).

Table 7 presents the correlogram squared residual result to test for autocorrelation in the residuals of the EGARCH models. The Q-statistics and respective p-values for different lag periods up to 10 lags are reported for each of aggregate, banking sector, consumer goods sector, insurance sector, and oil and gas sector models respectively. Results show that none of the Q-statistics reported is statistically significant. This is shown by their low statistical values and high p-values. Therefore, there is absence of serial correlation in the models.

#### 4.6 Discussion of Findings

The study provides evidence of strong volatility spillover effects from exchange rate fluctuations to the insurance and oil and gas sectors, while no significant spillover was found for the banking and consumer goods sectors in Nigeria. For the insurance sector, the effect may be attributed to the exposure of assets and liabilities to foreign exchange risk, supporting the findings of Mouna and Anis (2016), who documented similar volatility spillovers between exchange rates and insurance sector stock returns. In the oil and gas sector, volatility spillover is likely driven by negative shocks in international crude oil prices, the major determinant of the Naira's value, consistent with Asaolu and Ilo (2012) although contrasting with Lorna (2018), who found insignificant effects in Uganda.

Conversely, despite expectations from Isa et al. (2021) that banking stocks would be sensitive to exchange rate movements, the study finds no significant spillover, possibly due to banks' off-balance sheet activities and effective risk management strategies. Similarly, the consumer goods sector shows no significant spillover, likely due to its dynamic nature and sensitivity to consumer preferences rather than exchange rate volatility, contradicting Amin and Janor (2016). These findings support the Volatility Spillover Theory, which posits that shocks or fluctuations in one market (here, the foreign exchange market) can be transmitted to other financial markets or sectors, but the magnitude and direction of the spillover depend on the sector's exposure to the initial shock. In this context, exchange rate volatility systematically transmits to the insurance and oil & gas sectors, while sectors less exposed to foreign currency risk, such as banking and consumer goods,

remain relatively insulated. This sector-specific heterogeneity underscores the importance of analyzing volatility spillovers rather than aggregate market indices when assessing financial risk in Nigeria.

#### 5.0. Conclusion and Recommendations

The study concludes that foreign exchange rate volatility exhibits heterogeneous spillover effects across Nigerian stock market sectors. Specifically, there is no evidence of volatility spillover from exchange rate movements to stock returns in the banking and consumer goods sectors, indicating these sectors are relatively insulated from currency fluctuations. In contrast, the insurance and oil & gas sectors are significantly affected by exchange rate volatility, suggesting heightened sensitivity to naira movements. These findings imply that investors can strategically diversify their portfolios by including banking and consumer goods sector stocks to mitigate the foreign exchange risk inherent in the more sensitive insurance and oil & gas sectors. This sector-specific insight emphasizes the importance of tailored investment strategies and risk management in the Nigerian stock market. Based on the findings, the following recommendations were provided:

- i. Since the banking sector is relatively insulated from foreign exchange volatility, investors can safely include banking stocks in their portfolios to mitigate currency risk. Regulators, such as the Securities and Exchange Commission (SEC), should focus on monitoring broader macroeconomic indicators, including interest rates, inflation, and liquidity, which may have a more pronounced impact on banking sector performance.
- ii. Given that the consumer goods sector also shows no significant spillover effect, investors can include consumer goods stocks in diversified portfolios for risk mitigation. Policymakers should prioritize factors affecting domestic consumption, such as credit availability and inflation control, to support sector growth rather than focusing solely on exchange rate fluctuations.

- iii. Due to the high sensitivity of the insurance sector to exchange rate volatility, investors are advised to implement hedging strategies to reduce portfolio risk. Policymakers should promote regulatory frameworks and initiatives that enhance sector stability, including incentives for insurance adoption and robust risk management standards, to limit systemic spillover effects from currency fluctuations.
- iv. As the oil & gas sector is significantly affected by exchange rate volatility, investors should diversify and hedge against currency risk using derivatives or balanced portfolio strategies. Government policies aimed at stabilizing the naira and maintaining adequate foreign exchange reserves can help buffer this sector from extreme volatility. Firms should adopt strong financial risk management practices, particularly for foreign-denominated revenues and import-dependent operations.
- v. Across all sectors, investors should adopt a diversified investment strategy that combines relatively stable sectors (banking and consumer goods) with sectors exposed to foreign exchange volatility (insurance and oil & gas). This approach minimizes currency risk while maximizing potential returns and ensures balanced portfolio performance in the Nigerian stock market. Regulators should also monitor cross-sectoral volatility linkages to strengthen market stability and inform investment decisions.

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