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Evaluating the Effect of Exchange Rate Unification on Exchange Rate Volatility in Emerging Markets: A Case Study of Nigeria

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ABSTRACT

This study addresses a critical gap in the literature by examining the impact of Nigeria's 2023 exchange rate unification on its exchange rate volatility. The recent unification has introduced unprecedented challenges and complexities that have not been thoroughly investigated in existing research. These uncharted dynamics pose significant risks for economic stability, as they contribute to heightened market uncertainty and volatility. The lack of detailed analysis on these effects underscores the need for deeper exploration, particularly in terms of how such policy shifts can disrupt financial markets and investor confidence. Understanding these implications is vital not only for Nigeria but also for other emerging economies, as it can inform the development of effective strategies to mitigate risks, facilitate smoother transitions, and promote long-term stability across similar contexts. The study adopts a dual-method approach, blending volatility modeling with an event study framework. It utilizes daily exchange rate data for the Nigerian Naira (NGN) against the US Dollar (USD) from January 1, 2020, to August 2, 2024. The analysis reveals significant and prolonged spikes in abnormal volatility surrounding the announcement, reflecting heightened market uncertainty in the face of these transformative changes. Specifically, the EGARCH model shows that volatility increases substantially during the post-event window, with a notable asymmetry where negative shocks have a larger impact on volatility than positive ones. Cumulative abnormal volatility consistently rises over time, suggesting that the market's adjustment to the unification is not immediate but accumulates over an extended period. The findings underscore the urgent need for well-crafted policies tailored to emerging market contexts, including clear communication, supportive fiscal and monetary strategies, and

continuous monitoring of market conditions. Such measures are essential for managing the transition effectively and ensuring long-term economic stability.
Keywords: Exchange rates, Volatility modeling, EGARCH model, Event study, Uncertainty

1 Introduction

Nigeria's economic trajectory has experienced profound shifts in recent years, influenced by a series of global and domestic events. The COVID-19 pandemic, coupled with the disruptions in the global energy market resulting from the Russian-Ukraine conflict, posed significant challenges for oil-dependent economies like Nigeria (Nseobot et al., 2020; Duke et al., 2024). Amidst these challenges, Nigeria's Central Bank implemented a landmark policy reform in mid-2023: the unification of exchange rates. This policy aimed to consolidate Nigeria's previously fragmented exchange rate system into a single, market-driven rate, with the goal of enhancing economic efficiency and stability Ozili (2024).

Prior to this reform, Nigeria enjoyed a period of relative exchange rate stability, characterized by more predictable currency movements and a degree of macroeconomic equilibrium, as depicted in Figure 1, which spans from January 1, 2020, to August 2, 2024. Notably, the exchange rate seemed relatively stable even after the fuel subsidy removal announcement on May 29, 2022. However, the introduction of a unified exchange rate brought about increased volatility, marking a significant departure from this previous stability, which has continued into 2024. The immediate aftermath of this policy change saw heightened exchange rate fluctuations, leading to broader macroeconomic impacts.

The increased exchange rate volatility resulting from this policy change has far-reaching implications for Nigeria's economy. One of the primary effects is on inflation. The unification of exchange rates could lead to higher import costs, which in turn can drive domestic prices upward. This inflationary pressure affects the purchasing power of consumers and increases operational costs for businesses, potentially stifling economic growth (Ajayi, 2023).

In addition, heightened volatility impacts capital flows and investment patterns. Investors typically seek stability, and the increased exchange rate fluctuations have created uncertainty, leading to reduced foreign direct investment and volatile portfolio flows. This uncertainty has undermined investor confidence and disrupted economic planning (Kofarbai et al., 2024).

Trade flows are also sensitive to exchange rate risks (Chipili, 2013). Greater exchange rate volatility could complicate trade transactions, impacting both export competitiveness and import costs. This can lead to a widening trade deficit and affect overall economic growth (Obstfeld and Rogoff, 1995). Fur-

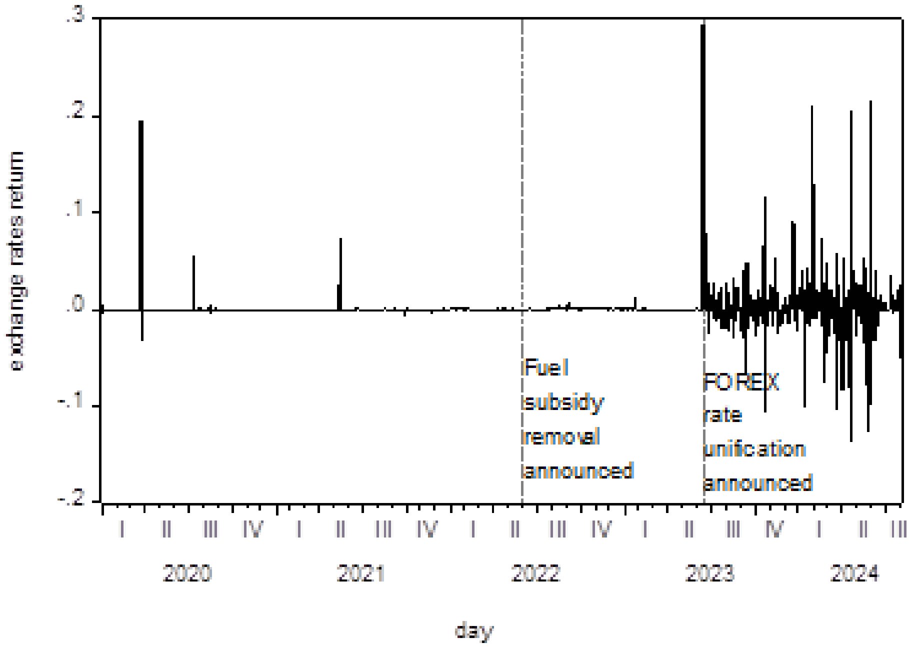

Fig. 1: Daily exchange rates return in Nigeria showing the announcements of fuel subsidy removal and FOREX unification (January 1, 2020 –August 2, 2024)

thermore, the policy introduces new challenges for monetary policy management, as the Central Bank must navigate the complexities of a unified exchange rate amidst fluctuating economic conditions (Mordi, 2006).

This study provides a focused analysis of the impact of exchange rate unification on Nigeria's exchange rate volatility, setting it apart from previous research by honing in on this significant policy change at this economic-turbulent period in the country. Some other countries such as Canada, Chile, Cuba and Japan have implemented exchange rate unification in the past, and studies have reported the effect of the policy on economic fundamentals (De la Torre and Ize, 2013; Ozili, 2024). This study seeks to expand the scope by examining how policy affects volatility. Moreover, the Nigerian case presents a peculiar scenario, noting that the unification policy was implemented at a time that the country grapples with heavy debt burden, high inflation, huge budget deficit, increased government borrowing, high cost of energy derivatives, reduced government revenue and low supply of foreign exchange (Ozili, 2024).

Our study fills a critical gap by providing an in-depth analysis, offering clearer and more actionable insights into the specific consequences of this pivotal policy shift in the midst of economic turbulence. It also provides key policy recommendations to mitigate the current uncertainty and ameliorate its adverse effects on the citizens. It therefore makes invaluable contribution to the literature and delivers valuable recommendations for policymakers.

The use of Exponential Generalized Autoregressive Conditional Heteroscedasticity (EGARCH) is particularly pertinent, as it offers a sophisticated approach to capturing asymmetric responses and varying degrees of volatility, which are essential for understanding the effects of the unification policy (Bollerslev, 1986). Additionally, the event study methodology will provide valuable insights into the market's reaction to the policy change, isolating abnormal volatility during the announcement and implementation phases (MacKinlay, 1997).

Our research's focused analysis, advanced methodological approach, and immediate relevance offer unique benefits and insights into the specific impact of the recent exchange rate unification. The findings will enhance the understanding of the specific effects of the Central Bank of Nigeria's policy change and offer valuable recommendations for managing exchange rate volatility and ensuring macroeconomic stability in Nigeria.

The structure of the paper was as follows: Section 2 provided a review of the literature; Section 3 detailed the methodology; Section 4 presented the results and discussions; and Section 5 concluded with recommendations.

2 Literature Review

Understanding the effects of exchange rate unification on exchange rate uncertainty requires a concise overview of relevant theoretical frameworks and empirical evidence. Exchange rate volatility, the degree of variation in exchange rates over time, is a crucial aspect of international finance. Theoretical frameworks like the Mundell-Fleming model and the Dornbusch overshooting model provide a foundational understanding of how monetary policy, fiscal policy, and external shocks influence exchange rate dynamics. These models suggest that exchange rate fluctuations are influenced by macroeconomic factors, market expectations, and policy changes, which can lead to increased volatility and uncertainty (Mundell, 1963; Dornbusch, 1976).

Policy changes, such as fiscal adjustments and monetary policy reforms, significantly impact exchange rate volatility (Quirk et al., 1991; Beine et al., 2007). The empirical evidence consistently indicates that while exchange rate unification may be beneficial for long-term market efficiency and economic stability, it often leads to significant difficulties and hardships (Parvin and Banouei, 2020). De la Torre and Ize (2013) and Ozili (2024) highlight the immediate impacts of exchange rate unification, including increased poverty level, energy prices and adjustment challenges. They also demonstrate that the effect of unification on various economies is country-specific, largely depending on economic fundamentals, policies and implementation. Di Bella and Wolfe (2008) provides broader context, confirming that the transition to a unified exchange rate typically exacerbates pressure on macroeconomic stability, stressing the need for supportive measures to manage short-term volatility.

In terms of modeling exchange rate volatility, several approaches have been employed in the literature. Classical models, such as the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model, are commonly used to assess volatility in financial markets. The GARCH model, developed by Bollerslev (1986), models time-varying volatility by assuming that past information, such as past volatility, influences current volatility. However, this model assumes symmetric volatility, meaning that both positive and negative shocks affect volatility in the same way. To capture the asymmetric nature of volatility - where negative shocks typically have a larger impact on volatility than positive shocks - the Exponential GARCH (EGARCH) model (Nelson, 1991) is often preferred. The EGARCH model allows for the modeling of leverage effects, where adverse economic news tends to increase volatility more than favorable news, which is particularly relevant in the context of exchange rate unification, where policy announcements often lead to sharp market reactions.

Thus, the choice of the EGARCH model in this study is justified by its ability to capture the asymmetry and non-linear dynamics of exchange rate volatility, which are expected to be pronounced in the Nigerian context following the recent exchange rate unification announcement. By incorporating both the conditional volatility and the asymmetric response to shocks, the EGARCH model provides a more robust framework for understanding the complexities of exchange rate uncertainty in emerging markets like Nigeria.

In summary, the existing literature highlights the need for more context-specific studies that examine the impact of exchange rate unification announcements on exchange rate uncertainty, particularly in emerging markets like Nigeria. This study aims to fill this gap by providing a detailed analysis of how Nigeria's recent exchange rate unification announcement has influenced exchange rate uncertainty, employing sophisticated modeling techniques and empirical methodologies to assess the policy's effects.

3 Methodology

3.1 Data

This study uses a quantitative research design to investigate the impact of the exchange rate unification announcement by the Central Bank of Nigeria (CBN) in mid-2023 on exchange rate volatility. The methodology combines advanced volatility modeling with an event study approach to analyze the immediate effects of the policy change.

Data for this analysis include daily exchange rate series for the Nigerian Naira (NGN) against the US Dollar (USD). They were obtained from Investing.com website (https://ng.investing.com), covering the period from January 1, 2020, to August 2, 2024.

3.2 EGARCH Model Description and Justification

To estimate exchange rate volatility, the Exponential Generalized Autoregressive Conditional Heteroscedasticity (EGARCH) model was employed.EGARCH captures asymmetric effects of volatility and is well-suited for analyzing policy-induced changes in exchange rate volatility. The model accounts for varying responses to economic shocks and is effective in understanding the nuanced impacts of unification policies on market stability.

The decision to employ a univariate EGARCH model was based on the focus of this study: understanding the dynamics of exchange rate volatility itself in the context of Nigeria's recent exchange rate unification. While exchange rate volatility is often influenced by a variety of macroeconomic factors, the univariate EGARCH model allows for a focused examination of the volatility inherent in the exchange rate time series, without the additional complexity of incorporating external variables that could obscure the direct impact of the policy change. This approach is particularly relevant when the objective is to isolate the volatility dynamics of the exchange rate itself, especially in response to policy shifts such as exchange rate unification (Beine et al., 2007).

Several studies have utilized univariate models like GARCH and EGARCH to analyze financial volatility, including exchange rate volatility, and have demonstrated the effectiveness of such models in capturing key features like volatility clustering and asymmetry. Engle's (Engle, 1982) introduction of the ARCH model and Bollerslev's (Bollerslev, 1986) extension with GARCH models provide foundational frameworks that have been widely applied to exchange rate data. These models focus on a single time series, modeling the conditional variance of returns without incorporating external variables, aligning with the objectives of this research. Similar approaches have been employed in the analysis of exchange rates in various contexts, including the Euro (Dritsaki, 2019), Turkey (Almisshala and Emirb, 2021), and African countries such as Kenya (Ayodeji, 2015) and Nigeria (Oludare et al., 2013; Adenekan et al., 2019).

While multivariate models could potentially offer more comprehensive insights by accounting for external factors such as inflation, interest rates, or foreign investment, the univariate EGARCH model is a robust tool for analyzing the direct impact of exchange rate unification on the volatility of exchange rates, which remains the central focus of this research. The simplicity of the univariate approach also ensures that the model remains well-specified, reducing the risk of overfitting and making the results more interpretable. Therefore, this methodology is both appropriate and effective for the research question at hand.

Moreover, volatility clustering, a key feature of financial time series, is well-captured by the EGARCH model, which allows for modeling the persistence of volatility shocks and their asymmetric effects. This characteristic is particularly important in the context of exchange rate unification, as significant policy shifts often lead to volatility spikes and prolonged periods of adjustment. The univariate EGARCH model provides a parsimonious yet effective tool for capturing these dynamics, particularly in a scenario like Nigeria's, where exchange rate policy changes are a central concern.

Basic EGARCH model is specified as Oludare et al. (2013):

$$e_t = c + \sum_{k=1}^{r} \phi_k e_{t-k} + \varepsilon_t, \tag{1}$$

$$\varepsilon_t = \sqrt{h_t} z_t, \quad \varepsilon_t \sim N(0, h_t) \tag{2}$$

$$\log(h_t) = \omega + \sum_{i=1}^{p} \alpha_i |z_{t-i}| + \sum_{m=1}^{s} \gamma_m z_{t-m} + \sum_{j=1}^{q} \beta_j \log(h_{t-j}) \tag{3}$$

where e_t denotes the logarithmic change in exchange rates, computed as:

$$e_t = \log(ex_t) - \log(ex_{t-1}), \tag{4}$$

where ex represents the nominal exchange rates. h_t represents the conditional variance of the exchange rate returns at time t. The parameter ω is a constant term, α measures the effect of past shocks on current volatility, γ measures the asymmetric effect of ε on the conditional variance h_t, and β captures the persistence of volatility.

EGARCH, in contrast to GARCH, is less restrictive as it only requires that

$$\sum_{j=1}^{q} \beta_j < 1 \tag{5}$$

for Equation (3) to be covariance stationary. Notably, the parameters $\omega, \alpha, \beta, \gamma$ are not required to be nonnegative because the model expresses the conditional variance in logarithmic form, ensuring nonnegativity by design (Nelson, 1991).

The EGARCH framework inherently incorporates the Generalized Error Distribution (GED) to account for the nonnormality of financial time series, which often display heavy tails and sharp peaks. This feature makes it particularly effective in capturing the volatility dynamics of exchange rate returns and other financial variables, as highlighted by Nelson (1991) and supported in later studies such as those of Oludare et al. (2013).

The use of GED aligns with the empirical characteristics of the dataset in this study, where significant deviations from normality are evident. Table 1, for instance, confirms this with a highly significant Jarque-Bera statistic

($p < 0.05$). By default, EGARCH accommodates these deviations, ensuring the model can effectively capture the heavy tails and extreme values characteristic of financial data. This makes it a robust choice for analyzing the dynamic behavior of exchange rate volatility.

The density function $g(z_t)$ of the GED for ϑ degrees of freedom is defined as:

$$g(z_t) = \frac{\vartheta \exp\left(-\frac{1}{2}\left|\frac{z_t}{\lambda}\right|^{\vartheta}\right)}{\lambda 2^{\left(1+\frac{1}{\vartheta}\right)}\Gamma(1/\vartheta)} \tag{6}$$

where Γ is the gamma function and

$$\lambda = \left(\frac{2^{(2/\vartheta)}\Gamma(1/\vartheta)}{\Gamma(3/\vartheta)}\right)^{1/2} \tag{7}$$

Here, ϑ represents the tail thickness parameter. When $\vartheta = 2$, the GED reduces to the standard normal distribution. For $\vartheta < 2$, the distribution exhibits thicker tails than the normal, while $\vartheta > 2$ results in thinner tails.

The EGARCH model will be estimated using the Maximum Likelihood Estimation (MLE). Model diagnostics will include tests for model adequacy, such as examining residuals for autocorrelation and heteroskedasticity.

Research by Bala and Asemota (2013) and Ayodeji (2015) have employed Exponential GARCH models to analyze the dynamics of exchange rate volatility in Nigeria and Kenya, respectively, providing valuable insights into the asymmetry and persistence of volatility in response to external shocks.

3.3 Event study

Event studies, as developed by MacKinlay (1997), are useful for isolating abnormal volatility around significant policy announcements. This method allows for the examination of how the exchange rate unification announcement has affected market behaviour and uncertainty in the immediate aftermath. An event study typically involves three key phases: the estimation window (or control period), the event window, and the post-event window Chowdhury and Abedin (2020). The timeline of this event study is illustrated in Figure 2.

Fig. 2: Timeline of the event study

3.3.1 Estimation Window

The estimation window, spanning 252 trading days immediately preceding the exchange rate unification announcement on June 14, 2023, establishes a baseline for "normal" market behavior in the absence of policy shocks. This duration aligns with Krivin et al. (2003), who suggest an estimation period of 60 days to one year for robust benchmarking, provided no structural changes occur within the chosen timeframe. Additionally, Dang et al. (2021) advocate for longer estimation periods to mitigate short-term fluctuations, yielding more accurate volatility measures.

To identify the estimation window, an EGARCH model was fitted to the daily exchange rate series for the Nigerian Naira (NGN) against the US Dollar (USD) from January 1, 2020, to August 2, 2024. The conditional volatility (standard deviation) derived from this model represents the time-varying volatility of the series. A plot of the conditional volatility over time was examined to identify a period of relative stability spanning 252 days (June 27, 2022, to June 13, 2023), which was subsequently designated as the estimation window.

3.3.2 Event Window

The event window is the specific day of the Central Bank of Nigeria's (CBN) exchange rate unification announcement, June 14, 2023.

3.3.3 Post-Event Window

The post-event window begins immediately after the event, spanning June 15, 2023, to August 2, 2024. The conditional volatility during this period represents the actual observed volatility (Chowdhury and Abedin, 2020). The expected volatility for this window was computed as the mean of the daily volatilities observed within the estimation window. This expected volatility serves as a benchmark against which the actual post-event volatilities are compared. Such an approach is particularly suited to emerging markets like Nigeria, where market-based proxies for expected volatility are often unavailable or unreliable (Ncube et al., 2023).

To evaluate deviations from normal volatility levels, the abnormal volatility (AV_t) is calculated as the difference between the actual observed volatility (h_t) derived from the EGARCH model and the expected volatility ($\bar{h}$):

$$AV_t = h_t - \bar{h} \tag{8}$$

The cumulative abnormal volatility (CAV_t) over a specified period (t_0 to t_1) is then calculated to quantify the total impact of the event:

$$CAV_t = \sum_{t=t_0}^{t_1} AV_t \tag{9}$$

As detailed in Benninga Benninga (2008), the significance of the abnormal volatilities (AV_t) is assessed using a t-statistic, computed by dividing AV_t by the standard deviation of daily volatilities during the estimation period. Statistical tests are subsequently performed to evaluate whether the abnormal volatilities around the event window are significant, thereby determining the extent of the exchange rate unification's impact on market behavior.

4 Results and Discussion

This section presents the results of the EGARCH model applied to analyze the volatility of Nigerian exchange rates following the unification policy. It begins with descriptive statistics for exchange rate returns and preliminary diagnostic tests to establish the foundational characteristics of the data. Following this, the section highlights the key estimates from the EGARCH model, focusing on how the selected parameters capture the dynamics of exchange rate volatility. The analysis is supported by visual representations. The section ultimately demonstrates the effectiveness of the model in reflecting market reactions to the exchange rate unification.

4.1 Preliminary Analysis

Table 1 provides an overview of the descriptive statistics for exchange rate returns and preliminary diagnostic tests. The dataset consists of $1,196$ daily observations of Naira returns. The mean return of 0.001373 reflects a slight positive trend, while the median of zero indicates a symmetric distribution of returns around this central value. The maximum return of 0.293655 and the minimum return of -0.135614 underscore significant fluctuations in exchange rate movements. With a standard deviation of 0.020873, the variability in daily returns is moderate. However, the returns display a marked skewness of 5.060962, indicating a long right tail, and a kurtosis of 72.94934, suggesting an exceptionally peaked distribution with heavy tails. The Jarque-Bera statistic of 248935.6 decisively rejects the hypothesis of normality, confirming the distribution's non-normal nature.

These characteristics validate the use of a generalized error distribution, as assumed in Equation (5), to account for the extreme values and non-standard distributional properties observed in the data.

Preliminary tests provide further insights into the dynamic properties of the returns. The Augmented Dickey-Fuller test statistic of -23.25 indicates stationarity, ruling out the presence of a unit root in the series. Evidence of autocorrelation and heteroscedasticity is apparent from the significant Ljung-Box Q statistics, with values of 42.696 for the returns and 27.498 for the squared returns, as well as the ARCH LM statistic of 22.867. These results point to complex temporal patterns in the data, setting the stage for a deeper examination of its volatility characteristics.

A key finding from the analysis is the presence of volatility clustering, a hallmark of financial time series. Volatility clustering refers to the tendency of large fluctuations in returns to cluster together, with periods of high volatility followed by more high volatility, and periods of low volatility followed by more low volatility. This pattern is visually evident in Figure 1, where the time series alternates between distinct phases of pronounced and subdued fluctuations. The statistical evidence from the Ljung-Box Q test for squared residuals corroborates this phenomenon, highlighting significant autocorrelation in the squared returns. Such clustering is indicative of persistent volatility shocks, necessitating the application of advanced models like GARCH to adequately capture the dynamics of exchange rate volatility in the Nigerian market.

Table 1: Descriptive Statistics and Preliminary Tests

Statistics	**Value**
Observations	1196
Mean	0.001373
Median	0.000000
Maximum	0.293655
Minimum	-0.135614
Std. Dev.	0.020873
Skewness	5.060962
Kurtosis	72.94934
Test of Normality	
Jarque-Bera	248935.6*
Unit Root Test	
Augmented Dickey-Fuller	-23.25*
Tests of Autocorrelation and Heteroscedasticity	
Ljung-Box Q (10)	42.696*
Ljung-Box Q^2 (10)	27.498*
ARCH LM (10)	22.867*

*Significant at 5%.

4.2 Presentation of results

Table 2 presents the maximum likelihood estimates for the EGARCH model, which was employed to model and analyze the volatility of Nigerian exchange rates.

The constant term c in the mean equation is small and statistically insignificant, with a value close to zero and a relatively large standard error. This suggests that the average return of the series is near zero, implying no significant trend in mean returns over the analyzed period.

The model's volatility equation provides more critical insights. The negative and statistically significant constant term ($\omega = -0.478$) suggests that the conditional variance has a negative baseline, indicating lower volatility when there are no shocks to the system. The positive and statistically significant α parameter indicates that larger shocks—whether positive or negative—increase volatility.

Notably, the negative and statistically significant γ shows that negative shocks (bad news) have a larger impact on volatility than positive shocks (good news) of the same magnitude. The high value of β, close to 1, signifies that volatility is highly persistent, meaning that once volatility increases, it tends to remain elevated for an extended period.

Diagnostic tests, including the Ljung-Box Q-statistic for autocorrelation in residuals and squared residuals, confirm the absence of significant autocorrelations, indicating that the model is well-specified. These results demonstrate that the EGARCH model has successfully captured the temporal dependencies in the volatility process, making it a reliable tool for analyzing exchange rate dynamics in this context. Additionally, the ARCH LM test was conducted to detect any remaining conditional heteroscedasticity in the residuals. The test results revealed no significant heteroscedasticity. These findings validate the model's adequacy and confirm its suitability for studying exchange rate volatility in Nigeria.

Figure 3 presents the estimated conditional volatility of exchange rate returns, showing the three key periods: the estimation window, the event window and post-event window. The estimation window, representing 252 days before the exchange rate unification announcement, clearly shows the baseline volatility dynamics. In contrast, the post-event window, covering the period immediately after the unification announcement, reveals a significant shift in volatility.

For ease of comparison, the chart also superimposes the conditional standard deviation with the actual exchange rate returns, allowing for a clear visualization of how the EGARCH model captures the volatility pattern observed in the data. The alignment of shifts in volatility with the timing of the announcement underscores the impact of exchange rate unification on market perceptions and uncertainty.

Figure 4 presents the abnormal volatilities and cumulative abnormal volatilities. On most days within the post-event window, actual volatility exceeds expected volatility, resulting in positive abnormal volatility. The figure highlights periods of exceptionally high abnormal volatility, particularly towards the end of 2023 and into early 2024, indicative of major market reactions potentially linked to significant economic or policy events. Notably, the period from July 2024 to August 2024 shows consistently low volatility, suggesting a phase of relative market stability following the earlier spikes.

As outlined in Table 3, all days within the post-event window exhibit statistically significant abnormal volatility, indicating that deviations from ex-

Table 2: Maximum Likelihood Estimates of EGARCH

Parameter	Values
Mean	
c	-1.693×10^{-4}
	(6.12×10^{-7})*
Variance	
ω	-0.478*
	(0.052)
α	0.322*
	(0.041)
γ	-0.289*
	(0.041)
β	0.966*
	(0.004)
GED Parameter	
ϑ	0.370
	(0.010)*
Diagnostics	
$Q(10)$	8.061762
	$(0.623)^{+}$
$Q^2(10)$	0.0939
	$(1.000)^{+}$
ARCH LM (10)	0.032
	$(1.000)^{+}$

Standard errors in parentheses. *Significant at the 5% level.
$^{+}$ p-value.

pected values are not random but likely related to external factors or events. Following the event day, volatility rises significantly, peaking at various points before eventually stabilizing. This pattern reflects initial market reactions to the exchange rate unification, followed by a period of adjustment.

Table 3: Event Study Analysis

Window	Day	AOV	EV	AV	t-test	Sig*	CAV
Estimation	6/27/2022	0.001413					
	6/28/2022	0.001395					
	⋮	⋮					
	6/12/2023	0.001095					
	6/13/2023	0.001091					

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Window	Day	AOV	EV	AV	t-test	Sig*	CAV
Event	6/14/2023	0.001105	0.001447	-0.00034	-1.15566	no	-0.00034
Post-event	6/15/2023	0.090228	0.001447	0.088782	300.1397	yes	0.088782
	6/16/2023	0.077142	0.001447	0.075695	255.8996	yes	0.164477
	6/19/2023	0.067077	0.001447	0.065631	221.8748	yes	0.230108
	6/20/2023	0.058614	0.001447	0.057167	193.2626	yes	0.287275
	6/21/2023	0.050895	0.001447	0.049449	167.169	yes	0.336724
	6/22/2023	0.045514	0.001447	0.044067	148.9756	yes	0.380791
	6/23/2023	0.03983	0.001447	0.038384	129.7618	yes	0.419175
	6/26/2023	0.035308	0.001447	0.033861	114.4724	yes	0.453036
	6/27/2023	0.038182	0.001447	0.036735	124.1892	yes	0.489771
	⋮	⋮	⋮	⋮	⋮	⋮	⋮
	7/23/2024	0.00536	0.001447	0.003914	13.2309	yes	13.2309
	7/24/2024	0.005049	0.001447	0.003602	12.17745	yes	12.17745
	7/25/2024	0.005681	0.001447	0.004234	14.31367	yes	14.31367
	7/26/2024	0.00534	0.001447	0.003893	13.16094	yes	13.16094
	7/29/2024	0.00503	0.001447	0.003583	12.11384	yes	12.11384
	7/30/2024	0.004748	0.001447	0.003301	11.16071	yes	11.16071
	7/31/2024	0.00489	0.001447	0.003443	11.64093	yes	11.64093
	8/1/2024	0.00462	0.001447	0.003174	10.72959	yes	10.72959
	8/2/2024	0.004374	0.001447	0.002928	9.897592	yes	9.897592

AOV – Actual observed volatility, EV – Expected volatility, AV – Abnormal volatility, CAV – Cumulative abnormal volatility. *Significance at 5% level.

Cumulative abnormal volatility consistently increases over time, showing that the deviation from expected volatility accumulates. Significant jumps in cumulative abnormal volatility correspond to days with exceptionally high abnormal volatility, emphasizing the lasting impact of exchange rate unification on market dynamics.

4.3 Discussion

The EGARCH model results offer profound insights into the dynamics of exchange rate volatility in the context of Nigeria's recent exchange rate unification policy. These findings shed light on how this significant policy shift has influenced market behaviour, aligning with and expanding upon previous studies.

A key finding is the negative sign of the parameter ω, which indicates the presence of a leverage effect - where past negative shocks exert a larger impact on future volatility than positive shocks of the same magnitude. This observation aligns with studies by Olowe (2011) and Ayodeji (2015), who similarly identified significant leverage effects in Nigerian and Kenyan exchange rate

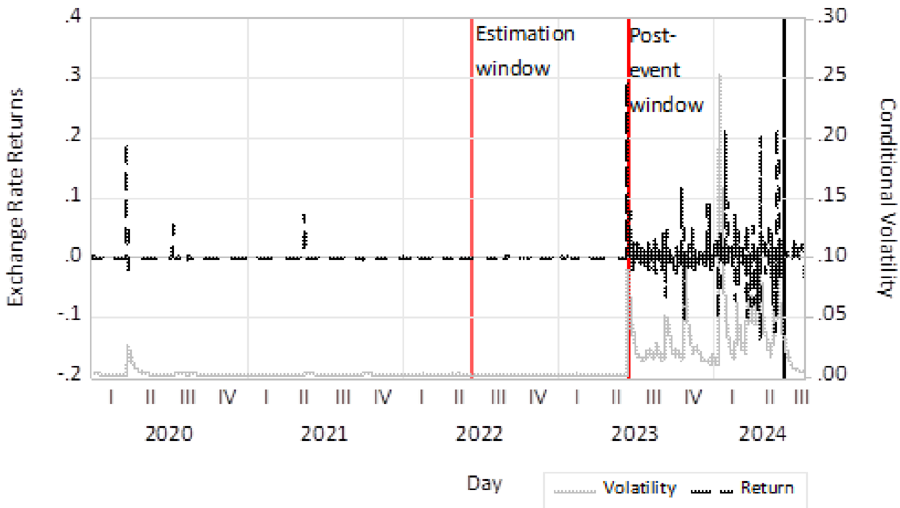

Fig. 3: Daily conditional volatility superimposed with exchange rate returns (January 1, 2020 –August 2, 2024)

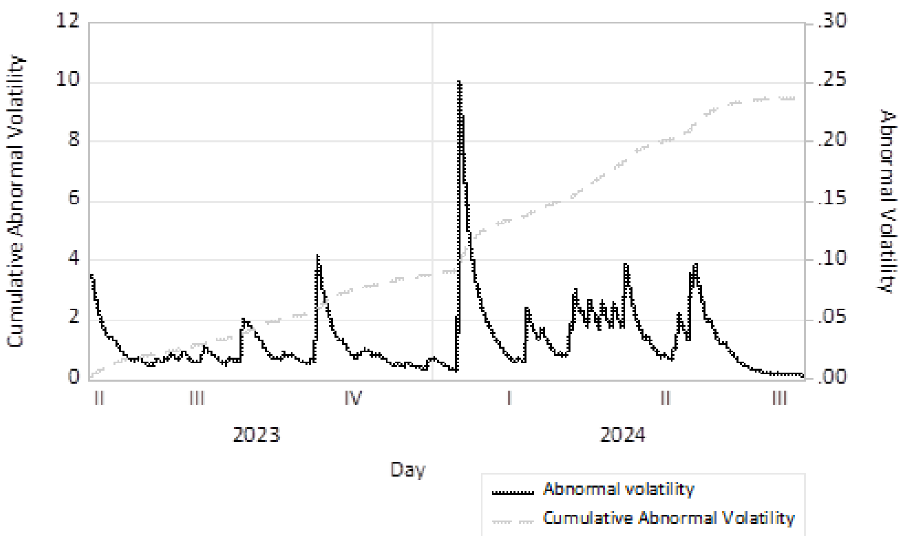

Fig. 4: Abnormal volatilities and Cumulative abnormal volatilities in the Event window

volatility in the time of economic and political crises, respectively. The implication of our finding is that in Nigeria, bad news tends to exacerbate market instability more than good news can stabilize it - a pattern particularly relevant in today's volatile economic climate, marked by inflationary pressures and political uncertainties.

The positive and significant value of α highlights that new information, whether positive or negative, contributes to increased volatility. This finding contrasts Olowe (2011) research, which observed insignificant ARCH effects in the Nigerian foreign exchange market, particularly during times of economic crisis. In the current context, as Nigeria grapples with both the effects of the recent unification and broader economic challenges like fuel subsidy removal and rising inflation, the market's sensitivity to new information is even more pronounced. Every policy announcement or economic indicator release is met with heightened market reactions, contributing to ongoing volatility.

The coefficient γ is negative and significant, confirming the presence of asymmetry in volatility responses to shocks. Specifically, negative shocks (or bad news) have a greater impact on volatility than positive shocks (or good news). This asymmetric response is a well-documented phenomenon in financial markets, as noted by Bouoiyour and Selmi (2002), Okyere et al. (2013) and Ayodeji (2015), and more recently by Adenekan et al. (2019) in their studies of African markets. In Nigeria, where economic policy changes often generate considerable market anxiety, this asymmetry is particularly acute. The recent unification of exchange rates, for instance, has sparked significant market volatility, reflecting deep-seated concerns about the policy's implications for inflation, trade, and overall economic stability.

Volatility persistence, as indicated by the near -1 value of β, underscores how deeply entrenched these shocks are in the market. This finding is consistent with Beine et al. (2007) work, which highlighted the long-lasting effects of policy changes on exchange rate volatility in Europe. The persistence observed suggests that the volatility seen today is likely to remain a feature of Nigeria's financial landscape for the foreseeable future.

The significant impact of past shocks and the persistence of volatility observed in Nigeria align with broader studies on financial markets (Bollerslev, 1986; Taylor, 1986). This illustrates that such patterns are not unique to Nigeria but are part of a well-established trend in financial markets.

The market's prolonged reaction to policy shifts underscores the need for sustained and careful economic management to navigate the ongoing volatility effectively. The spikes in volatility observed around the time of the exchange rate policy changes reflect the market's heightened uncertainty as it adjusts to the new regime. This pattern is consistent with findings from Beine et al. (2007), who observed that central bank interventions often leads to increased volatility as markets react to shifts in currency values and their broader economic implications. The current Nigerian scenario mirrors this experience, underscoring the challenges inherent in managing market expectations during such significant policy shifts.

Moreover, the significant abnormal volatility observed during the unification period supports Alam et al. (2021) argument that such substantial economic changes can lead to increased market instability, particularly in turbulent periods. As Nigeria navigates its post-COVID economic recovery, the unification of the exchange rate, though necessary, has introduced additional volatility into an already fragile economic environment.

The implications of our findings extend to investor behaviour. As Campbell and Hentschel (1992) noted, periods of high volatility often lead to more conservative investment strategies and increased risk premiums. In Nigeria, where the economic environment remains uncertain, this pattern is likely to manifest as investors seek to mitigate risks by adopting more cautious approaches.

The extended period of significant abnormal volatility aligns with studies that have found markets can experience prolonged periods of instability following major policy changes or economic shocks. Similar patterns were observed following the global financial crisis and during significant regulatory changes in other countries (Ben Ltaifa et al., 2009; Beine et al., 2007). This broader context reinforces the observation that Nigeria's experience with volatility is consistent with global trends.

The observed period of low volatility following the spikes, particularly from July 2024 to August 2024, suggests that the market may have begun to find equilibrium after the initial shock of policy changes. In other words, this pattern describes the adjustment phase where markets gradually return to a more stable state after reacting to major events. Customarily, volatility may spike initially, but markets typically adjust and stabilize over time as they incorporate new policies into their expectations and strategies.

The steady rise in cumulative abnormal volatility further reflects the ongoing market adjustment, with effects accumulating over time as the new exchange rate regime is absorbed. This sustained volatility indicates that market reactions to significant policy shifts can be both immediate and prolonged.

Finally, our results suggest that while exchange rate unification is often necessary for economic stability, it must be accompanied by strong fiscal and monetary policies to prevent prolonged market volatility. Ozili (2024) had predicted short-term adverse effect of the unification of the naira. However, the prolonged reaction of the market observed in this study suggests that the current monetary policies may have lacked sufficient supporting measures to stabilize the market. This underscores the importance of comprehensive preparatory actions, such as clear communication and gradual implementation, to manage market expectations and reduce uncertainty. Without these measures, the market remains vulnerable to persistent volatility, which can undermine the intended benefits of such policy changes.

5 Conclusion

This study offers a detailed examination of the effects of Nigeria's exchange rate unification policy on exchange rate volatility, using both EGARCH and event study methodologies. Before mid-2023, Nigeria's exchange rate environment exhibited relative stability. However, the introduction of a unified exchange rate system aimed at enhancing economic efficiency and stability resulted in a notable increase in volatility. The use of the EGARCH model revealed that negative shocks had a more substantial effect on volatility than positive shocks, highlighting the asymmetrical response of the exchange rate to policy changes. This result underscores the complexity of managing exchange rate policies in emerging markets.

The event study analysis further provided insights into market reactions around the announcement of the exchange rate unification. The analysis illustrated a significant spike in abnormal volatility surrounding the announcement, reflecting heightened market uncertainty and adjustment to the new exchange rate regime. The subsequent stabilization observed in the data supports the notion of an adjustment phase where the market begins to incorporate and adapt to the new policy.

The study underscores the importance of strategic policy implementation and clear communication to mitigate adverse effects and manage market reactions. Policymakers should focus on transparent communication to reduce market uncertainty and employ supportive fiscal and monetary measures to buffer against volatility.

While this study serves as a critical case for understanding the complexities of exchange rate policy and provides insights that can inform future research in various emerging market contexts, it is important to recognize that distinct economic conditions, regulatory environments, and market behaviors in different countries can influence how similar policies affect their respective economies. Given these variances, further research is warranted to explore these dynamics in a broader context.

Additionally, external variables, as suggested by previous research, may contribute to volatility clustering. Studies by Bollerslev et al. (1992) and Engle (2002) highlight that macroeconomic shocks or changes in interest rates can play a role in volatility clustering. However, this study deliberately avoids incorporating multivariate factors to maintain focus on the effects of exchange rate unification on volatility dynamics. Future research could explore a multivariate model to examine the broader factors like inflation, interest rates, or external factors such as oil prices, which could also influence volatility in Nigeria. This would offer a more detailed understanding of how various variables interact with exchange rate volatility and providing a comprehensive perspective on the underlying dynamics.

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