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NAVIGATING EXCHANGE RATE UNCERTAINTY: NIGERIA'S EXCHANGE RATE UNIFICATION AND STRATEGIC POLICY INSIGHTS

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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 exchange rate volatility, a crucial factor for economic stability, particularly in emerging markets. The recent unification has introduced unprecedented challenges and complexities that have not been thoroughly investigated in existing research. Using EGARCH and event study methods, the analysis reveals significant and prolonged spikes in abnormal volatility surrounding the announcement, reflecting heightened market uncertainty in the face of these transformative changes. 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. Ultimately, this study contributes valuable insights into the dynamics of exchange rate policies in emerging markets, providing a framework for policymakers to navigate the challenges associated with currency unification and its effects on volatility.

Keywords: Exchange rate unification, Volatility modeling, EGARCH model, Event study, Emerging markets

JEL Codes: C100, C580, E300

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.

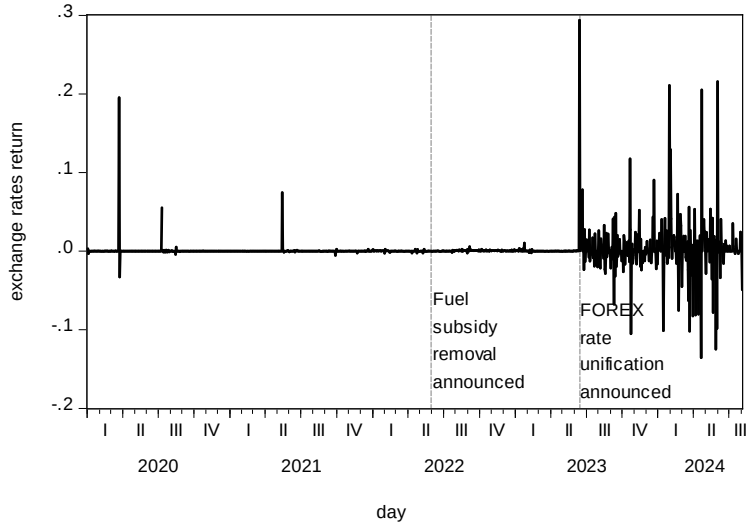

Figure 1: Exchange rates return in Nigeria showing the announcements of fuel subsidy removal and FOREX unification (January 1, 2020 -August 2, 2024)

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 led to higher import costs, which in turn has driven domestic prices upwards. This inflationary pressure affects consumers' purchasing power and increases operational costs for businesses, potentially stifling economic growth (Ajayi, 2023).

Additionally, the 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 also complicate trade transactions, impacting both export competitiveness and import costs. This can lead to a widening trade deficit and affect overall economic growth (Obstfeld & Rogoff, 1995). Furthermore, 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 like Canada, Chile, Cuba and Japan had 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; Ozil, 2024). This study seeks to widen the scope by examining how the 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 (Ozil, 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 conclusions and 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 models 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, 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) Ozil (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 summary, these studies uncovers a need for more focused studies on specific country contexts in addressing the impact of exchange rate unification announcements on exchange rate uncertainty in emerging markets like Nigeria. This study aims to fill the 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

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, covering the period from January 1, 2020, to August 2, 2024.

To estimate exchange rate volatility, the Exponential Generalized Autoregressive Conditional Heteroscedasticity (EGARCH) model was employed. EGARCH developed by Nelson (1991) 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.

Generalized Autoregressive Conditional Heteroscedasticity (GARCH) models, introduced by Engle (1982) and Bollerslev (1986), provide a framework for modeling time-varying volatility. While EGARCH extends these models by incorporating asymmetry, GARCH models offer a baseline for analyzing volatility changes before and after policy interventions. Exponential GARCH models, in particular, offer insights into the asymmetric effects of news on volatility, which is relevant for analyzing how positive and negative shocks impact exchange rates differently.

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

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

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

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

Where e_t denoted the logarithmic change in exchange rates computed as $e_t = \log(ex_t)\text{-}\log(ex_{t-1})$, ex is the nominal exchange rates. h_t represents the conditional variance of the exchange rate returns at time t, 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 varianceh$_t$, and β captures the persistence of volatility.

EGARCH, in contrast to GARCH, is less restrictive as it only requires that $\Sigma_{j=1}^{q} \beta_j < 1$ for Equation (3) to be covariance stationary. In other words, the parameters ω, α, β, γ are not required to be nonnegative: Since the left-hand side of Equation (3) represents the logarithm of the conditional variance, the forecasts for the conditional variance h_t will always be nonnegative.

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

Research by Bala & 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.

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.

The event study method involves several key steps. First, the estimation window is identified, which is the period prior to the event used to estimate baseline or "normal" volatility. Within this window, volatility is calculated to establish a reference for typical market behaviour. Next, the event window is defined, encompassing the period around the event date to capture its impact on volatility. Volatility is then estimated within this event window, referred to as "abnormal" volatility, to identify deviations from the normal levels. Finally, statistical tests are performed to evaluate the significance of the abnormal volatility observed around the event dates, determining whether the event had a notable impact on market volatility.

A period of relative calmness, spanning one year, was identified using the conditional variance chart. This period was designated as the estimation window, consisting of 262 trading days prior to the exchange rate unification announcement. This duration was chosen based on recommendations from Krivin *et al.* (2003), who suggest that an estimation window of 60 days to one year is appropriate, assuming there have been no major structural changes in the relevant indices. Additionally, Dang *et al.* (2021) advocate for a longer estimation period to better smooth out short-term fluctuations and achieve a more accurate measure of volatility.

To estimate the expected volatility during the estimation window, the Mean-Adjusted Model (MAD) was employed. This involved calculating the mean of the daily exchange rate volatilities observed during the 262-day period. This approach was selected over the market model to circumvent the challenges of identifying an appropriate proxy for the market portfolio, which is required when using the market model.

In summary, the Central Bank of Nigeria (CBN) announced the exchange rate unification on June 14, 2023. Consequently, the estimation window was defined from June 13, 2022, to June 13, 2023. The event window extended from the announcement date, June 14, 2023, through August 2, 2024.

Abnormal volatilities were determined by subtracting the average return of the estimation window from the actual volatilities observed in the event window.

$$AR_t = h_t - \overline{h} \tag{4}$$

Where $\bar{h}$ represents the average return of the estimation window. Cumulative abnormal volatility was then calculated over a specified period from t_0 to t_1 to assess the total impact of the event within that time frame.

$$CAR_t = \Sigma_{t=t_0}^{t_1} AR_t \quad (5)$$

The t-statistic is computed by dividing the abnormal returns (ARs) by the overall standard deviation of the daily returns during the estimation period. This statistic is used to assess the significance of the AR results.

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 by outlining the key estimates from the model, highlighting how the selected parameters capture the dynamics of exchange rate volatility. The analysis is supported by visual representations. The section ultimately demonstrates the model's effectiveness in reflecting market reactions to the exchange rate unification.

4.1. Presentation of Results

Table 1 presents the maximum likelihood estimates for the EGARCH model, which was employed to model and analyze the volatility of Nigerian exchange rates. The model includes lags 1, 2, and 5, selected based on observations from the correlogram to effectively capture the serial correlation in the data.

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 autoregressive coefficients of the mean equation, φ_1, φ_2 and φ_5 though included to account for past returns, are relatively small and not statistically significant. This indicates that past returns do not have a strong predictive effect on current returns, underscoring the model's focus on volatility rather than on capturing mean dynamics.

The model's volatility equation provides more critical insights. The negative and statistically significant constant term ($\omega = -0.794$) suggests that the unconditional variance is influenced by a negative baseline factor. 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 that the model is well-specified, with no significant autocorrelation detected, making it a robust tool for analyzing exchange rate volatility in this context.

Table 1: Maximum likelihood estimates of EGARCH

	Parameter	*Values*
Mean	c	-1.13×10^{-4}
		(2.71×10^{-4})
	φ_1	-0.065
		(0.049)
	φ_2	-0.010
		(0.032)
	φ_5	-0.036
		(0.029)
Variance	ω	-0.794*
		(0.054)
	α	0.282*
		(0.027)
	γ	-0.180*
		(0.022)
	β	0.909*
		(0.006)
Diagnostics	$Q(10)$	10.688
		(0.382)+
	$Q^2(10)$	0.1465
		$(1.000)^+$

Standard error in parentheses *significant at the 5% level

$^+$p-values

Figure 2 presents the estimated conditional variance of exchange rate returns, showing two key periods: the estimation window and the event window. The estimation window, representing 262 days before the exchange rate unification announcement, clearly shows the baseline volatility dynamics. In contrast, the event window, covering the period around the unification announcement, reveals a significant shift in volatility. For ease of comparison, the chart also superimposes the conditional variance 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

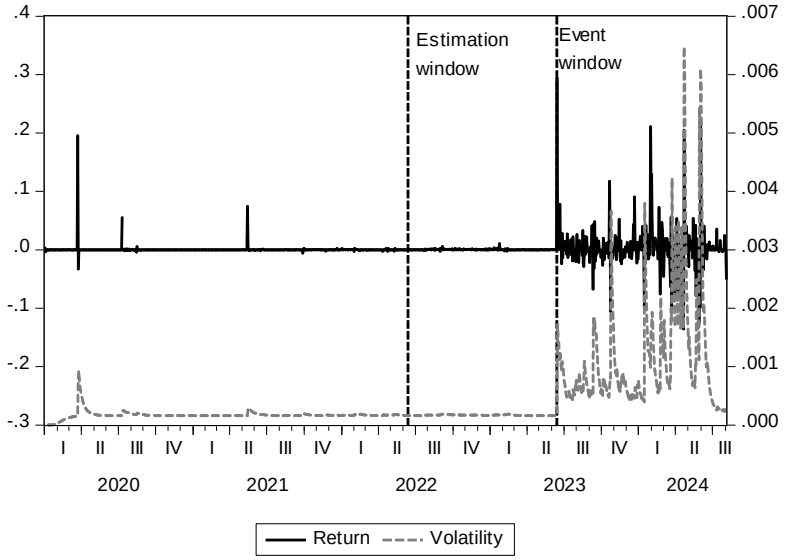

Figure 2: Conditional variance superimposed with exchange rate returns (January 1, 2020 -August 2, 2024)

volatility with the timing of the announcement underscores the impact of exchange rate unification on market perceptions and uncertainty.

Figure 3 presents the abnormal volatilities and cumulative abnormal volatilities. On most days within the 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.

All days within the event window, except for the day of the announcement, exhibit statistically significant abnormal volatility, indicating that deviations from expected values are not random but likely related to external factors or events. Following the initial period, 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.

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.

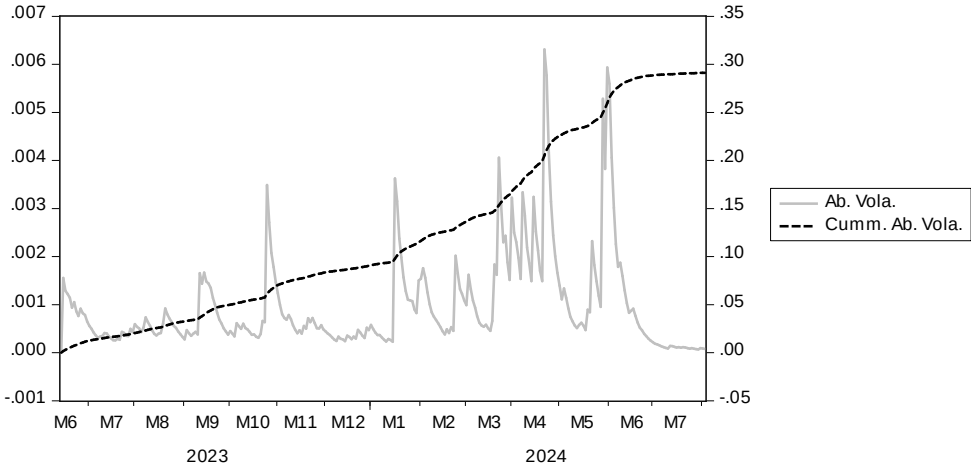

Figure 3: Abnormal volatilities and Cumulative abnormal volatilities in the Event window

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 ?, 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 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)'s 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.*'s (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.*'s (2022) 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. Ozil (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.

3. CONCLUSIONS AND RECOMMENDATIONS

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.

These findings are consistent with global trends observed during periods of major financial disruptions, such as the global financial crisis, where significant policy changes led to prolonged market instability. This alignment with broader patterns highlights that Nigeria's experience is part of a larger phenomenon seen in other emerging markets undergoing similar policy shifts.

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.

Further research could delve into how different sectors of the Nigerian economy respond to exchange rate volatility and policy changes, offering a more granular understanding of sector-specific impacts. Additionally, exploring how investor behaviour and market sentiment influence volatility, and examining the psychological factors contributing to market responses, could provide deeper insights into the dynamics at play.

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