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Market Efficiency and Volatility Dynamics in the Nigerian Stock Exchange: Evidence from the Pre- and Post-COVID-19 Lockdown Period

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Abstract: The Efficient Market Hypothesis (EMH) posits that asset prices adjust rapidly to new information, leaving no scope for systematic excess returns. The COVID-19 pandemic represented an unprecedented global shock, generating substantial volatility across financial markets, including those in emerging African economies. This study examines the volatility dynamics and informational efficiency of the Nigerian Stock Exchange (NGX) All-Share Index before and after the COVID-19 lockdown. Using daily data from January 2018 to December 2022, the analysis applies GARCH (1,1) models under Gaussian, Student's t, and Generalized Error Distribution assumptions to evaluate return dependence and volatility persistence across sub-periods. The empirical results confirm that returns are stationary in both pre- and post-lockdown phases. However, significant lagged return effects are observed across periods, indicating short-run return dependence inconsistent with strict weak-form efficiency. Volatility clustering is pronounced in the pre-lockdown period but weakens after the lockdown, with relatively rapid mean reversion of shocks in both phases. These findings suggest that the COVID-19 shock intensified volatility temporarily without fundamentally restructuring the informational dynamics of the Nigerian market. The study contributes to the emerging-market literature by distinguishing between volatility stabilisation and informational efficiency, demonstrating that reduced volatility persistence does not necessarily imply the elimination of return predictability. Strengthening market transparency and improving information dissemination remain essential for enhancing long-term market efficiency and resilience.

Keywords: Efficient Market Hypothesis (EMH), Nigerian Stock Exchange, COVID-19 pandemic, Market efficiency, Volatility clustering, GARCH model, Emerging markets

JEL classification: C58, G01, G14.

1. Introduction

The outbreak of COVID-19 in Wuhan, China, toward the end of 2019 rapidly evolved into a global health emergency, prompting the World Health Organization to declare it a pandemic on March 11, 2020 (WHO, 2020; WHO, 2020). Beyond its severe human consequences, the pandemic triggered one of the most significant disruptions to global economic activity in modern history. Lockdowns, mobility restrictions, and widespread business shutdowns depressed production and consumption across countries, thereby pushing unemployment to record levels and destabilising both developed and emerging economies (Zhang et al., 2020; Kumar & Kumara, 2021). International institutions, including the IMF and the World Bank, projected deep economic contractions across regions and noted that the COVID-19 shock exceeded previous disease outbreaks, such as SARS, H1N1, and Ebola, in both the speed and the magnitude of its economic impact (Abu et al., 2021).

Although countries implemented heterogeneous containment strategies, ranging from relatively mild restrictions to strict nationwide lockdowns, global financial markets responded sharply to the heightened uncertainty. To systematically measure these policy interventions, the Oxford COVID-19 Government Response Tracker (OxCGRT) constructed composite indices capturing school closures, travel bans, curfews, and restrictions on public gatherings. Empirical studies employing these indices consistently report that stricter government responses were associated with declining stock returns and heightened volatility in global equity markets (Alzyadat & Asfoura, 2021).

In Nigeria, the stock market had already been facing structural challenges before the pandemic. These challenges included shallow liquidity, regulatory bottlenecks, high transaction costs, inconsistent macroeconomic policy environments, and persistent information asymmetry between institutional and retail investors (Onuorah et al., 2022). In addition, sectoral performance showed considerable heterogeneity, with banking, consumer goods, and industrial firms responding differently to inflationary pressures, currency depreciation, and political uncertainty (Onuorah et al., 2022). Consequently, these pre-existing vulnerabilities rendered the Nigerian Exchange (NGX) particularly susceptible to external shocks when the pandemic emerged.

Empirical evidence suggests that pandemic-related shocks generated abnormal volatility and pricing distortions across African stock markets, with Nigeria experiencing some of the most pronounced fluctuations in returns and trading activity. For instance, the All-Share Index recorded sharp price distortions between March and May 2020, driven by panic-induced sell-

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offs, speculative trading behaviour, and temporary disruptions in the price-discovery process (Mohammed, 2023; Kumari et al., 2023). Similarly, cross-country evidence indicates that African markets experienced deeper liquidity shortages and more persistent volatility clustering than Asian and Western markets, largely due to weaker market microstructures and limited institutional buffers (Busari, 2025).

These developments raise important concerns regarding the informational efficiency of the Nigerian stock market during and after the COVID-19 lockdown. While a growing body of international literature documents crisis-induced shifts in market efficiency, much of this research focuses on global or regional aggregates, macroeconomic effects, or broad volatility responses. However, relatively little attention has been paid to how pandemic-induced uncertainty interacts with the specific institutional and microstructural characteristics of the Nigerian Exchange. In particular, few studies explicitly connect COVID-19-related shocks to structural issues such as fragmented information flows, limited analyst coverage, regulatory delays, and the dominance of retail investors who may trade based on sentiment rather than fundamentals. This gap is theoretically significant because weak market microstructures and pronounced information asymmetry may slow the incorporation of new information into prices, thereby challenging the core assumptions of the Efficient Market Hypothesis (EMH) (Fama, 1970).

Furthermore, existing Nigerian evidence remains fragmented and inconclusive. While some studies suggest temporary efficiency losses during the lockdown period, others argue that price adjustments remained relatively intact. The absence of a systematic empirical comparison between clearly defined pre-lockdown and post-lockdown periods limits our understanding of whether COVID-19 merely increased volatility or fundamentally altered the informational structure of the Nigerian market. Therefore, a structured pre- and post-lockdown assessment is necessary to clarify whether market efficiency deteriorated, improved, or remained stable during this unprecedented economic disruption.

Against this background, this study addresses this gap by evaluating whether stock prices on the Nigerian Exchange accurately and promptly reflected available information before and after the COVID-19 lockdown. Specifically, the study investigates whether the Nigerian stock market exhibited characteristics consistent with market efficiency across the pre- and post-lockdown periods. By distinguishing between these two phases, the analysis seeks to provide clearer evidence on the extent to which crisis-induced uncertainty affected return dynamics and volatility persistence within the Nigerian context.

2. Literature Review

Market efficiency refers to the extent to which asset prices fully and promptly reflect all available and relevant information in an unbiased manner. In efficient markets, prices adjust rapidly to new information, thereby limiting the possibility of consistently earning abnormal returns through stock selection or market timing strategies (Osinusi & Badmus, 2020). Informational efficiency, therefore, assesses how effectively information is disseminated, processed, and incorporated into market prices (Muhammed, 2023). When information is transparent and widely accessible, transaction costs decline, liquidity improves, and market participants operate under more favourable and predictable conditions. Consequently, the degree of informational efficiency serves as a critical indicator of market maturity and institutional robustness.

The Nigerian stock market constitutes a central component of the country's financial architecture, facilitating capital mobilisation, liquidity provision, and long-term investment for both public and private institutions. Scholars describe the stock market as an organised platform where securities such as equities and bonds are traded to support economic expansion and structural transformation (Okorie & Lin, 2021). Similarly, Kumari et al. (2023) characterise the capital market as a structured channel through which governments and private entities secure long-term financing for productive ventures. In addition, the market performs an allocative function by linking savers and borrowers, directing financial resources toward productive investments, and supporting broader financial sector reforms (Badmus & Ojelade, 2022). However, the efficiency of this intermediation role depends fundamentally on how rapidly and accurately prices adjust to new information.

From a theoretical perspective, several frameworks inform the analysis of stock price behaviour during episodes of heightened uncertainty, such as the COVID-19 pandemic. These include the Capital Asset Pricing Model (CAPM), the Efficient Market Hypothesis (EMH), and behavioural perspectives embedded in classical market theories such as Dow Theory. Among these, the EMH provides the primary analytical foundation for the present study, given its direct relevance to informational efficiency. The Capital Asset Pricing Model, developed by Sharpe (1964) and extended by Lintner (1965), posits that investors are compensated only for bearing systematic risk, which reflects economy-wide factors that cannot be diversified away. In contrast, unsystematic firm-specific risk can be eliminated through portfolio diversification and does not command additional expected returns. The model highlights market beta as a key measure of an asset's sensitivity to aggregate market movements. In the context of COVID-19, the pandemic represented a systemic shock affecting broad economic and financial conditions. Therefore, CAPM offers a useful lens for understanding shifts in risk-return dynamics during the pre- and post-lockdown periods.

More centrally, the Efficient Market Hypothesis (EMH) argues that asset prices fully and instantaneously incorporate all available information (Fama, 1970). Under this framework, consistent outperformance of the market is unlikely unless additional risk is assumed. EMH is closely linked to the random walk hypothesis, which maintains that future price movements are independent of past prices and are driven solely by new information. Fama (1970) distinguishes three forms of efficiency. First, weak-form efficiency implies that prices reflect all historical market information, including past prices and trading volumes. Second, semi-strong-form efficiency suggests that prices incorporate all publicly available information, such as earnings announcements and macroeconomic indicators. Third, strong-form efficiency posits that prices reflect all information, including private and insider information. These distinctions provide the conceptual basis for evaluating how efficiently the Nigerian stock market processed information before and after the COVID-19 lockdown.

Dow Theory, one of the earliest frameworks in technical analysis, emphasises identifiable market trends: accumulation, upward movement, and distribution. Although historically grounded in U.S. market indices, it highlights the role of investor psychology and trend-following behaviour in price formation. However, the implication that historical price trends can predict future movements is at odds with the weak form of the EMH. While empirical support for systematic profitability of trend-based strategies remains inconclusive, the theory remains relevant in crisis contexts because it reflects behavioural responses under uncertainty.

Empirically, a substantial body of literature documents that COVID-19 generated significant disruptions in global financial markets. Nelson et al. (2023), using a pooled OLS framework, report that negative effects were strongest in early March 2020 but moderated by mid-April, with emerging Asian markets experiencing more severe shocks than European markets. Similarly, Chang et al. (2023) identify increased interconnectedness and systemic instability during the pandemic using graph-theoretic methods. Other studies document sharp declines in returns and surges in volatility at the onset of the pandemic. For example, Liu et al. (2020) report severe negative abnormal returns across 21 major stock indices, particularly in Asia. Likewise, Woo et al. (2020), Baig et al. (2022), and Broto and Lamas (2020) observe significant declines in U.S. indices, accompanied by liquidity deterioration and heightened volatility.

A consistent finding across these studies is that stock prices decline in response to rising COVID-19 infections and mortality rates. Boruah and Sharma (2022) demonstrate that projected infection changes altered U.S. market valuation by 4–11 percent, while Hordofa et al. (2022) confirm a negative association between confirmed cases and stock returns across 64 countries. Similarly, Al-Awadhi et al. (2020) report strong adverse effects of confirmed cases and deaths on Chinese stock returns. These findings suggest that pandemic-related information was rapidly priced into global markets, although the magnitude and persistence of the effects varied across institutional settings.

Evidence from emerging markets, however, reveals greater heterogeneity. In Vietnam, Newstyle and Major (2022) find that rising infections reduced stock returns, whereas lockdown implementation had a positive and significant effect, indicating that credible policy measures may stabilise investor sentiment. Comparable results emerge for Malaysia (Chia et al., 2020) and India (Ji et al., 2022; Kumar & Kumara, 2021), where lockdown announcements were associated with improved market responses despite rising infections. Similarly, Mensi et al. (2023) document asymmetric volatility persistence across upward and downward market trends in MENA countries. These results suggest that institutional quality, transparency, and policy credibility shape market reactions to crisis events.

In commodity-linked economies, pandemic-induced uncertainty also generated cross-market spillovers. Oyelami et al. (2022) identify negative interactions between oil and equity markets in heavily affected countries, while Abu et al. (2021) show sector-specific responses to pandemic-related news in India, implying semi-strong form inefficiency. Furthermore, Baig et al. (2022) and Sheth et al. (2022) emphasise the deterioration of liquidity and the persistence of volatility effects across advanced economies. Collectively, this literature demonstrates that COVID-19 shocks influenced markets through multiple channels, including volatility clustering, liquidity constraints, investor sentiment, and sectoral exposure.

Compared with the extensive global evidence, research on African markets, particularly Nigeria, remains relatively limited. Kelikume et al. (2020) challenge the weak-form EMH in major African markets, attributing inefficiencies to institutional constraints that may amplify the effects of crises. Similarly, Alade et al. (2020) document long-memory behaviour and serial correlation in Nigerian returns, indicating persistent inefficiency. Direct examinations of COVID-19's impact on Nigeria are relatively scarce. Nageri (2021), employing ARCH/GARCH models across ten Nigerian indices, reports that pandemic-related news did not significantly increase volatility, a finding that contrasts with much of the global literature. This divergence raises important questions regarding the informational efficiency of the Nigerian market and the speed of price adjustment during crisis periods.

Across the broader literature, several stylised facts emerge. First, COVID-19 generally increased volatility across global markets. Second, confirmed cases and mortality rates typically exerted negative pressure on returns. Third, markets with stronger institutional frameworks adjusted more rapidly to policy announcements. However, heterogeneity persists across regions and time periods. Asian markets were heavily affected in the early phases, whereas African markets showed persistent inefficiency and structural fragility. Moreover, Nigerian-specific evidence remains fragmented, with few studies explicitly distinguishing between pre-pandemic, lockdown, and post-lockdown phases using high-frequency volatility models (Abdulrahman et al., 2023; Ullah et al., 2023).

Uncertainty and policy shocks may distort asset prices and generate temporary deviations from fundamental values, thereby challenging EMH assumptions (Simão, 2023; Nkrumah-Boadu, 2022; Tierney, 2022). However, it remains unclear whether such deviations in Nigeria reflected transient volatility increases or deeper structural changes in informational efficiency. Given this context, the gap in Nigerian evidence is particularly significant. Weak-form efficiency concerns the ability of markets to absorb historical information, whereas semi-strong efficiency pertains to the incorporation of publicly available information during turbulent periods. A market may exhibit heightened volatility yet remain informationally efficient; conversely, reduced volatility does not necessarily imply efficient price discovery. Therefore, a structured pre- and post-lockdown comparison is necessary to determine whether COVID-19 merely amplified volatility or altered the underlying informational dynamics of the Nigerian Exchange. Accordingly, this study contributes to the literature by providing a systematic evaluation of Nigerian market efficiency across clearly defined pre- and post-lockdown phases. By situating the analysis within the broader emerging-market discourse, the study advances understanding of crisis-induced efficiency shifts in African financial markets and offers policy-relevant insights into how institutional structures mediate market responses to systemic shocks.

3. Methodology

This section describes the data, variable construction, model specifications, estimation procedures, and diagnostic checks employed to examine volatility dynamics and informational efficiency of the Nigerian stock market before and after the COVID-19 lockdown. Specifically, the study applies Ordinary Least Squares (OLS) to estimate the conditional mean equation and employs Generalized Autoregressive Conditional Heteroskedasticity (GARCH) models estimated via Maximum Likelihood Estimation (MLE) to capture time-varying volatility. This combined framework enables a structured assessment of return predictability and volatility persistence across sub-periods.

3.1. Model Specification

To evaluate return dynamics, the conditional mean equation is first specified as an autoregressive process of order one:

$$ASI_{rt} = C + \alpha_1 ASI_{r(t-1)} + \mu_t \qquad (1)$$

where:

- ASI_{rt} denotes the daily return of the All-Share Index at time t,
- C represents the constant mean return,
- $ASI_{r(t-1)}$ is the one-period lagged return,
- μ_t is the error term.

The inclusion of the lagged return term allows for testing short-run return dependence. Under weak-form market efficiency, past returns should not systematically predict current returns; therefore, statistical insignificance of α_1 would be consistent with weak-form efficiency.

Before estimating volatility models, it is necessary to test for the presence of ARCH effects in the residuals of the mean equation. The presence of conditional heteroskedasticity justifies the use of ARCH-type models.

3.2. ARCH Model

The Autoregressive Conditional Heteroskedasticity (ARCH) model introduced by Engle (1982) specifies the conditional variance as a function of past squared residuals:

$$\sigma_t^2 = C + \alpha_1 \varepsilon_{t-1}^2 + \cdots + \alpha_p \varepsilon_{t-p}^2 \qquad (2)$$

This formulation is referred to as the linear ARCH(p) model because the conditional variance depends on p lags of the squared residuals. A special case is the ARCH(1) model:

$$\sigma_t^2 = C + \alpha_1 \varepsilon_{t-1}^2 \qquad (3)$$

The ARCH(1) specification captures the immediate impact of past shocks on current volatility. During crisis periods, significant squared residuals may increase conditional variance; however, if volatility is not persistent, the effect dissipates relatively quickly.

3.3. GARCH Model

While ARCH models capture short-term volatility clustering, they may require many lag terms to adequately describe persistence. Therefore, the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model proposed by Bollerslev (1986) extends the ARCH framework by incorporating lagged conditional variances:

$$\sigma_t^2 = \omega + \alpha \varepsilon_{t-1}^2 + \beta \sigma_{t-1}^2 \qquad (4)$$

where:

- σ_t^2 denotes the conditional variance of returns,
- ω is the constant term,
- α measures the impact of recent shocks (ARCH effect),
- β captures volatility persistence (GARCH effect).

For model stability, the following conditions are imposed:

$$\alpha > 0, \beta > 0, \alpha + \beta < 1$$

The parameter $\alpha + \beta$ measures the degree of volatility persistence. When this sum approaches unity, volatility shocks decay slowly, indicating strong persistence. Conversely, smaller values imply faster mean reversion.

The half-life of a volatility shock, which measures the number of periods required for a shock to dissipate by 50%, is computed as:

$$k = \frac{\ln(0.5)}{\ln(\alpha + \beta)} \qquad (5)$$

This measure provides an intuitive interpretation of volatility reversion speed following sudden market disturbances.

3.4. Distributional Assumptions

Financial return series frequently exhibit excess kurtosis and heavy tails. Therefore, to ensure robustness, the conditional variance models are estimated under three alternative error distributions:

- Gaussian (Normal) distribution,
- Student's t-distribution,
- Generalized Error Distribution (GED).

The Student's t and GED specifications are particularly suitable for capturing leptokurtic behaviour often observed in financial markets. Comparing model fit across distributions allows for more accurate inference regarding volatility dynamics. The combined mean–variance specification is therefore expressed as:

Mean Equation:

$$ASI_{rt} = C + \alpha_1 ASI_{r(t-1)} + \mu_t$$

Variance Equation (GARCH(1,1)):

$$\sigma_t^2 = \omega + \alpha\varepsilon_{t-1}^2 + \beta\sigma_{t-1}^2 \qquad (6)$$

This framework enables simultaneous assessment of return predictability and volatility clustering. Volatility clustering refers to the tendency for high-volatility periods to be followed by high-volatility periods, and for low-volatility periods to be followed by low-volatility periods. In addition, volatility mean reversion implies that conditional variance gradually converges to its long-run average over time (Osinusi & Badmus, 2020).

3.5. Data and Variable Construction

The study focuses on the Nigerian Exchange Group (NGX) All-Share Index (ASI) as the primary market performance indicator. Daily closing prices were obtained from the official NGX website covering the period January 1, 2018, to December 31, 2022.

Daily returns are computed as:

$$ASI_{rt} = \frac{ASI_t - ASI_{t-1}}{ASI_{t-1}} \qquad (7)$$

where:

- ASI_t is the closing index value at time t,
- ASI_{t-1} is the index value at time $t-1$.

This transformation ensures stationarity and facilitates volatility modelling.

3.6. Sample Partitioning

To capture structural changes associated with the COVID-19 pandemic while avoiding extreme distortions during the strict lockdown phase, the full sample is divided into three sub-periods, Pre-lockdown period: January 1, 2018 – March 31, 2020, Transition/lockdown window: April 1, 2020 – May 31, 2020, and Post-lockdown period: June 1, 2020 – December 31, 2022

The April–May 2020 window is treated as a transition period and excluded from primary pre- and post-lockdown comparisons. These two months represent the most acute phase of nationwide restrictions and extraordinary policy interventions in Nigeria. During this period, trading conditions may have reflected temporary market closures, reporting irregularities, and concentrated policy responses that could generate extreme structural breaks. Therefore, excluding this window enhances comparability between the longer pre- and post-lockdown phases and reduces contamination from short-lived distortions. By combining autoregressive mean equations with alternative-distribution GARCH models across distinct sub-periods, this methodology enables a structured evaluation of return dependence, volatility persistence, and shock absorption dynamics. Consequently, the approach facilitates an empirical assessment of whether the COVID-19 pandemic altered the informational behaviour of the Nigerian stock market or merely temporarily intensified volatility.

4. Data Presentation And Analysis

This section presents the empirical findings, including descriptive statistics and unit root tests, which provide the preliminary statistical foundation for subsequent volatility modelling and efficiency assessment.

4.1. Descriptive Statistics

Table 1 reports descriptive statistics for the All-Share Index (ASI) level and its corresponding return series across the full sample and the pre- and post-COVID-19 lockdown periods. The mean return during the pre-lockdown period is slightly negative (–0.002327), whereas the post-lockdown period records a marginally positive mean return (0.001427). Although these magnitudes are economically small, such behaviour is typical of daily financial return series. The shift from negative to positive mean returns following the lockdown suggests a gradual recovery in market sentiment and investor confidence. However, mean returns alone are insufficient to infer efficiency; therefore, higher-order moments provide more informative insights.

The standard deviation of returns is considerably larger in the pre-lockdown period (0.529526) compared to the post-lockdown period (0.009325). This indicates that volatility was substantially higher prior to or during the early stages of the pandemic shock. The marked reduction in dispersion in the post-lockdown period suggests a relative stabilisation of market conditions after the initial disruption. This pattern aligns with global evidence indicating heightened volatility during the onset of COVID-19, followed by gradual moderation as markets adjusted to new information (Liu et al., 2020; Nelson et al., 2023). The skewness statistics further reveal asymmetry in the return distribution. The pre-lockdown return series exhibits near symmetry (–0.046226), whereas the post-lockdown period displays positive skewness (1.676595), indicating a longer right tail. Positive skewness suggests that extreme positive returns occurred more frequently than extreme negative returns in the post-lockdown phase. Such asymmetry may reflect episodic market rebounds or policy-driven optimism during recovery periods.

More notably, the kurtosis values are substantially higher than the benchmark value of three for normal distributions. The pre-lockdown kurtosis (289.7134) and post-lockdown kurtosis (12.01566) indicate leptokurtic distributions characterised by heavy tails and extreme observations. The Jarque–Bera statistics for all series are highly significant (p-values = 0.0000), leading to rejection of the null hypothesis of normality. These findings confirm the presence of non-Gaussian features in the return series.

From an econometric standpoint, heavy tails and excess kurtosis are consistent with volatility clustering and time-varying variance, which are common in financial markets (Engle, 1982; Bollerslev, 1986). However, non-normality alone does not imply market inefficiency under the Efficient Market Hypothesis (Fama, 1970). Rather, it suggests that return dynamics may exhibit heteroskedasticity and nonlinear adjustments. Therefore, these distributional properties justify the application of ARCH/GARCH models under alternative error distributions, including the Student's t and Generalized Error Distribution, to adequately capture volatility persistence. Overall, the descriptive statistics indicate that the Nigerian stock market experienced asymmetric behaviour, heavy tails, and varying volatility across the pre- and post-lockdown periods. These characteristics motivate a more rigorous econometric analysis to determine whether return dynamics exhibit predictable components inconsistent with weak-form efficiency.

Table 1: Descriptive Statistics of All Share Index Return

	ASI	ASIR pre	ASIR post
Mean	32295.02	-0.002327	0.001427
Median	30704.98	-0.000916	0.000220
Maximum	323152.9	9.037503	0.062345
Minimum	14035.02	-9.054546	-0.035637
Std. Dev.	13382.44	0.529526	0.009325
Skewness	17.46686	-0.046226	1.676595
Kurtosis	379.5847	289.7134	12.01566
Jarque-Bera	3516312.	2020863.	1441.863
Probability	0.000000	0.000000	0.000000
Sum	19054062	-1.373117	0.533584
Sum Sq. Dev.	1.05E+11	165.1543	0.032432
Observations	590	590	374

Source: Author's computation, 2023

4.2. Unit Root Tests

To ensure the appropriateness of volatility modelling, the stationarity of the return series is examined using the Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) tests. Stationarity is a fundamental requirement for ARCH-type modelling, as non-stationary series may yield spurious regression results. Table 2 reports the unit root test results for the All-Share Index return series over the full sample. The ADF test statistic (–14.50003) is far below the 1%, 5%, and 10% critical values, with a corresponding p-value of 0.0000. Similarly, the PP test statistic (–289.7956) is highly significant (p-value = 0.0001). Consequently, the null hypothesis of a unit root is rejected under both tests, indicating that the return series is stationary.

Stationarity implies that the mean and variance of the return series remain stable over time and that shocks do not generate permanent stochastic trends. This property is consistent with standard financial theory, which posits that price levels may follow a non-stationary process, whereas returns typically exhibit stationarity (Fama, 1970). Therefore, the confirmed stationarity of ASI returns validates the use of ARCH/GARCH models to capture conditional heteroskedasticity and volatility clustering. In addition, the absence of a unit root suggests that any predictability detected in subsequent models would not be driven by spurious persistence but rather by genuine return dynamics. This strengthens the reliability of the volatility analysis conducted in the subsequent sections.

Table 2: ADF and Philip Perron Unit Root Test Result of All Share Index Return

ASIR	t-statistics	p-value	ASIR	t-statistics	p-value
ADF test statistics	-14.50003	0.0000	PP test statistics	-289.7956	0.0001
Critical values:1%	-3.441357		Critical values:1%	-3.441223	
5%	-2.866287		5%	-2.866228	
10%	-2.569358		10%	-2.569326	

Source: Author's computation, 2023.

4.3. Unit Root Tests: Pre- and Post-Lockdown Subsamples

4.3.1. Pre-COVID-19 Lockdown Period

Table 3 presents the Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) unit root test results for the All-Share Index (ASI) return series during the pre-lockdown period. The ADF test statistic (–25.41153) is substantially lower than the 1%, 5%, and 10% critical values, with a corresponding p-value of 0.0000. Similarly, the PP test statistic (–43.23462) is highly significant (p-value = 0.0001). Consequently, the null hypothesis of a unit root is rejected under both tests, confirming that the return series is stationary in the pre-pandemic phase.

Stationarity implies that the return series fluctuates around a constant mean and does not exhibit explosive or persistent stochastic trends. This finding is essential for reliable econometric modelling because ARCH/GARCH frameworks require stationary return processes to produce valid and consistent estimates of conditional variance. In addition, the stationarity of returns is consistent with standard financial theory, which maintains that while price levels may follow a non-stationary process, returns are typically stationary (Fama, 1970). Therefore, the pre-lockdown return series satisfies the necessary statistical conditions for volatility modelling and subsequent efficiency assessment.

Table 3: ADF and Philip Perron Unit Root Test Result of All Share Index Return Pre COVID-19 Lockdown

ASIR pre COVID-19 lockdown	t-statistics	p-value	ASIR pre COVID-19 lockdown	t-statistics	p-value
ADF test statistics	-25.41153	0.0000	PP test statistics	-43.23462	0.0001
Critical values:1%	-3.440370		Critical values:1%	-3.440354	
5%	-2.865852		5%	-2.865845	
10%	-2.569124		10%	-2.569121	

Source: Authors' computation, 2023.

4.3.2. Post-COVID-19 Lockdown Period

Table 4 reports the unit root test results for the ASI return series during the post-lockdown period. The ADF test statistic (–2.931007) yields a p-value of 0.0428, which is below the 5% significance level. Similarly, the PP test statistic (–6.959115) is highly significant (p = 0.0000). Accordingly, the null hypothesis of a unit root is rejected under both testing approaches, confirming that the post-lockdown return series is also stationary.

The absence of a unit root during the post-lockdown phase indicates that return dynamics remained mean-reverting and did not display long-term stochastic persistence. This outcome is particularly important because crisis periods may, in some cases, induce structural breaks or unstable return processes. However, the results suggest that despite heightened uncertainty during COVID-19, the statistical properties of Nigerian stock returns remained stable. Therefore, the post-lockdown period also satisfies the prerequisites for ARCH/GARCH modelling. From a market-efficiency perspective, it is important to clarify that stationarity of returns does not, by itself, confirm weak-form efficiency. Rather, it establishes that the return process is suitable for testing predictability and volatility dynamics. If returns are stationary but exhibit significant autocorrelation, weak-form efficiency may still be violated. Consequently, the subsequent mean equation estimation provides a more direct assessment of short-run return dependence.

Table 4: ADF and Philip Perron Unit Root Test Result of All Share Index Return Post COVID-19 Lockdown

ASIR post COVID-19 lockdown	t-statistics	p-value	ASIR post-COVID-19 lockdown.	t-statistics	p-value
ADF test statistics	-2.931007	0.0428	PP test statistics	-6.959115	0.0000
Critical values:1%	-3.447770		Critical values:1%	-3.447627	
5%	-2.869113		5%	-2.869050	
10%	-2.570871		10%	-2.570838	

Source: Author's computation, 2023

4.3.3. Conditional Mean Equation: Pre-Lockdown Period

Table 5 reports the estimated conditional mean equation for the ASI return during the pre-COVID-19 lockdown period. The model includes a constant term (C) and the one-period lagged return, ASIR(–1), to capture short-run return dependence. In the context of the weak-form Efficient Market Hypothesis (Fama, 1970), the coefficient of the lagged return is particularly informative. Under weak-form efficiency, historical price information should not systematically predict current returns; therefore, the lagged return coefficient should be statistically insignificant. Conversely, statistical significance would indicate short-term return dependence and potential deviations from weak-form efficiency.

The estimated results indicate whether past returns explain current returns during the pre-pandemic period. If the lagged coefficient is statistically significant, it implies the presence of return autocorrelation and short-run predictability. Such dependence may arise from delayed information diffusion, market microstructure frictions, or behavioural trading patterns, particularly in emerging markets characterised by informational asymmetries (Kelikume et al., 2020; Alade et al., 2020). In addition to the mean equation, the corresponding variance equation evaluates the presence of volatility clustering and persistence during the pre-lockdown period. By estimating ARCH and GARCH parameters, the model captures whether shocks to market uncertainty dissipate rapidly or remain persistent over time. Together, the mean and variance equations provide a comprehensive view of return behaviour and volatility dynamics in Nigeria's stock market before the COVID-19 shock.

Table 5: Conditional Return / Mean Equation of All Share Index Return Estimate Pre COVID-19 Lockdown

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.000953	0.018970	-0.060252	0.9599
ASIR (-1)	-0.499751	0.035842	-13.94303	0.0000

Source: Author's computation, 2023

4.5. Conditional Mean Equation and ARCH Effects: Pre-Lockdown Period

4.5.1. Conditional Mean Equation

The estimated conditional mean equation for the pre-COVID-19 lockdown period indicates that the constant term (C) is −0.000953, with a t-statistic of −0.060252. Since the associated probability exceeds the conventional significance level ($p > 0.05$), the constant term is not statistically significant. This suggests that, on average, the daily return of the All-Share Index during the pre-lockdown period does not deviate significantly from zero. Therefore, the constant does not meaningfully contribute to explaining short-run variations in returns. In contrast, the lagged return variable, ASIR(−1), exhibits a coefficient of −0.499751 with a highly significant t-statistic of −13.94303 ($p < 0.05$). The magnitude and statistical significance of this coefficient indicate strong short-term return dependence. Specifically, a one-unit increase in the previous day's return is associated with an approximate 0.50-unit decline in the current return, holding other factors constant. The negative sign suggests mean-reverting behaviour, whereby positive shocks tend to be followed by negative adjustments and vice versa.

From the perspective of the weak-form Efficient Market Hypothesis (Fama, 1970), this result is economically meaningful. Under weak-form efficiency, past returns should not possess systematic predictive power over current returns. However, the statistical significance of ASIR(−1) implies the presence of return autocorrelation and short-run predictability. Therefore, during the pre-lockdown period, the Nigerian stock market exhibited return dynamics inconsistent with strict weak-form efficiency. Such mean-reverting behaviour may reflect delayed information diffusion, liquidity constraints, or behavioural trading tendencies often observed in emerging markets characterised by informational asymmetry (Kelikume et al., 2020; Alade et al., 2020). Consequently, the pre-pandemic Nigerian market appears to have exhibited measurable return dependence, suggesting that historical information was not fully and immediately incorporated into prices.

4.5.2. ARCH Effect and Volatility Clustering

To examine whether volatility clustering is present in the pre-lockdown return series, the ARCH–LM test was conducted on the residuals of the mean equation. Table 6 reports an F-statistic of 48.58432 and an Obs*R-squared value of 45.00084, both associated with p-values of 0.0000. Since these probabilities are well below the 5% significance level, the null hypothesis of no ARCH effect is rejected. This finding confirms the presence of conditional heteroskedasticity in the return series during the pre-COVID-19 period. In other words, past shocks significantly influenced current volatility, indicating volatility clustering, a common characteristic of financial time series (Engle, 1982; Bollerslev, 1986). Periods of high volatility tend to be followed by high volatility, while low-volatility periods cluster together.

Figure 1 visually supports this result. The return series exhibits alternating phases of heightened and subdued volatility rather than a constant variance process. Although certain stretches display relatively low fluctuations, these are interspersed with periods of elevated volatility, reflecting dynamic variance behaviour over time. It is important to distinguish between volatility clustering and market inefficiency. The presence of ARCH effects does not automatically imply weak-form inefficiency; rather, it indicates time-varying risk. However, when significant return autocorrelation (as observed in the mean equation) coexists with volatility clustering, this combination strengthens the evidence of short-run predictability. Therefore, taken together, the significant lagged return coefficient and the confirmed ARCH effects suggest that the Nigerian stock market during the pre-lockdown period exhibited return dependence alongside volatility persistence. These findings provide statistical justification for proceeding with GARCH modelling to quantify the magnitude and persistence of volatility shocks.

Table 6: ARCH Effect Result of All Share Index Return Series of Pre-COVID-19 Lockdown

F-statistic	48.58432	Prob. F (1,583)	0.0000
Obs*R-squared	45.00084	Prob. ChAuthor's (1)	0.0000

Source: Author’s computation, 2023

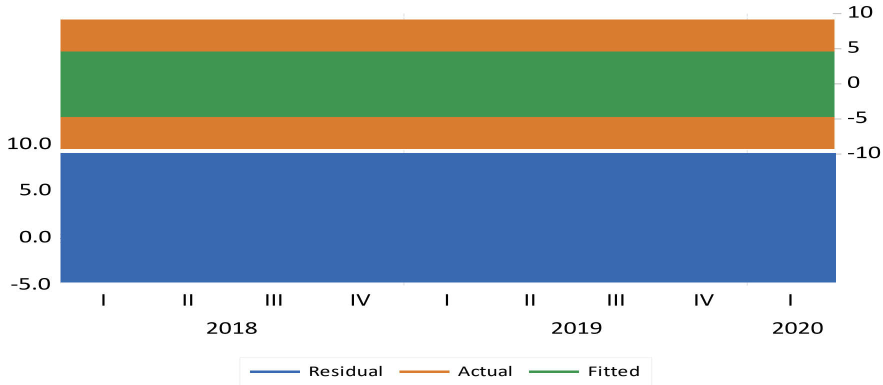

Figure 1: Volatility Clustering for Daily All Share Index Return Pre COVID-19 Lockdown. Source: Author's computation from E-views output, 2023

4.6. GARCH Estimation Results: Pre-Lockdown Period

Table 7 presents the GARCH(1,1) estimation results for the pre-COVID-19 lockdown period under three alternative conditional error distributions: Gaussian, Student’s t, and Generalized Error Distribution (GED). Estimating the model under different distributional assumptions is particularly important given the earlier evidence of non-normality and excess kurtosis in the return series (Engle, 1982; Bollerslev, 1986).

4.6.1. Mean Equation (μ)

Across all specifications, the conditional mean parameter (μ) is statistically significant at conventional levels (p = 0.0000). However, the magnitude of the coefficient varies across distributions. Under the Gaussian and GED specifications, μ is negative, whereas it is positive under the Student’s t distribution. This variation reflects the sensitivity of the mean estimate to the assumed distribution of residuals. Nevertheless, statistical significance of the mean parameter does not, in itself, imply return predictability; rather, return dependence is primarily captured through the lagged return term discussed earlier.

Table 7: All Share Index Return Pre COVID-19 Lockdown (Jan 2018 -Mar 2020)

Parameters	Gaussian Distribution		Student's t- Distribution		Generalized Error Distribution	
	Estimates	P-Values	Estimates	P-Values	Estimates	P-Values
μ	-0.171731	0.0000	0.069790	0.0000	-0.187189	0.0000
ω	0.150523	0.0113	0.002479	0.8998	0.000332	0.0000
α	0.186434	0.1734	23.98432	0.9002	2.926153	0.0365
β	-0.062755	0.8806	-0.004275	0.5560	-0.000011	0.9862
AIC	0.899823		-6.314337		-5.664016	
SC	0.937138		-6.269559		-5.619238	
HQ	0.914364		-6.296888		-5.646566	

Source: Author's computation, 2023

4.6.2. Variance Equation (ω, α, β)

The variance equation parameters provide insight into volatility persistence and shock transmission. Under the Gaussian specification, the ARCH coefficient (α = 0.186434) is statistically insignificant (p = 0.1734), and the GARCH coefficient (β = −0.062755) is also statistically insignificant (p = 0.8806). Similarly, under the Student’s t distribution, both the ARCH and GARCH parameters are statistically insignificant at the 5% level. Under the GED specification, although the ARCH parameter appears statistically significant (p = 0.0365), the GARCH parameter remains statistically insignificant.

The general lack of statistical significance of the ARCH and GARCH terms suggests limited volatility persistence during the pre-lockdown period. In other words, past squared residuals and lagged conditional variances do not systematically explain current volatility at conventional significance levels across most specifications. This indicates that while volatility clustering was detected through the ARCH-LM test, its persistence within the GARCH framework appears weak or short-lived. However, it is important to interpret these findings cautiously. In stable periods preceding major crises, volatility may exhibit moderate clustering without strong long-run persistence. Therefore, the absence of highly persistent GARCH effects may reflect relatively contained risk transmission during the pre-pandemic phase.

4.6.3. Volatility Persistence and Half-Life

Volatility persistence is typically measured by the sum ($\alpha + \beta$). When this sum approaches unity, shocks dissipate slowly, indicating strong persistence; conversely, lower values imply faster mean reversion (Bollerslev, 1986). Across the specifications, the estimated α and β parameters do not jointly indicate strong persistence. Consequently, the implied half-life values are short, suggesting that volatility shocks revert to their long-run average relatively quickly. A short half-life implies that market disturbances prior to COVID-19 did not generate prolonged volatility regimes. It is essential to clarify that rapid mean reversion of volatility reflects risk dynamics rather than informational efficiency. Semi-strong efficiency concerns the speed at which publicly available information is incorporated into prices, whereas volatility persistence measures the duration of risk shocks. Therefore, volatility mean reversion should not be interpreted as direct evidence of semi-strong efficiency, but rather as an indicator of how quickly uncertainty dissipates.

4.6.4. Model Selection Criteria

The Akaike Information Criterion (AIC), Schwarz Criterion (SC), and Hannan–Quinn (HQ) statistics are reported to compare model fit across distributions. The Student's t distribution yields the lowest information criteria values among the specifications, indicating superior goodness-of-fit relative to the Gaussian and GED alternatives. This result is consistent with earlier descriptive evidence of heavy-tailed distributions, as the Student's t distribution is better suited to capturing excess kurtosis in financial return series. Therefore, the Student's t specification appears to provide the most appropriate representation of pre-lockdown volatility dynamics.

4.7. Conditional Mean Equation: Post-Lockdown Period

Table 8 reports the conditional mean equation estimates for the post-COVID-19 lockdown period. The constant term (C) is 0.002121, with a t-statistic of 2.022181 and a p-value of 0.0436. Since the probability is below the 5% significance threshold, the constant is statistically significant. This indicates a modest but positive average daily return during the post-lockdown period. The positive shift may reflect gradual market recovery and improved investor sentiment following the initial pandemic shock.

The lagged return coefficient, ASIR(−1), is −0.401647 with a highly significant t-statistic of −11.08284 ($p = 0.0000$). The negative and statistically significant coefficient indicates short-run mean-reverting behaviour similar to that observed in the pre-lockdown period. Specifically, positive returns tend to be followed by partial corrections in the subsequent period. From the standpoint of weak-form efficiency (Fama, 1970), the persistence of significant lagged return effects suggests continued short-run dependence on returns even after the lockdown period. Therefore, despite the observed stabilisation in volatility levels, return predictability did not disappear entirely in the post-pandemic phase. The comparison of pre- and post-lockdown mean equations indicates that, while the average return improved after the lockdown, the structure of short-term return dependence persisted. Consequently, although volatility levels moderated, the underlying dynamics of return autocorrelation persisted.

Table 8: Conditional Return /Mean Equation of All Share Index Return Estimate Post COVID-19 Lockdown

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.002121	0.001049	2.022181	0.0436
ASIR (-1)	-0.401647	0.036240	-11.08284	0.0000

Source: Author's computation, 2023

4.8. ARCH Effect and Volatility Dynamics: Post-Lockdown Period

4.8.1. ARCH–LM Test

Table 9 reports the ARCH–LM test results for the residuals of the conditional mean equation during the post-COVID-19 lockdown period. The F-statistic (2.091113) and the corresponding probability value (0.1486), together with the Obs*R-squared statistic (2.090816; $p = 0.1482$), exceed the conventional 5% significance level. Therefore, the null hypothesis of no ARCH effect cannot be rejected. This result indicates that, unlike the pre-lockdown period, where volatility clustering was statistically significant, the post-lockdown return series does not exhibit strong conditional heteroskedasticity at conventional levels. In other words, past squared residuals do not systematically explain current variance during the recovery phase. This suggests that volatility clustering diminished after the acute phase of the pandemic shock.

Figure 2 visually supports this statistical outcome. The return series displays relatively moderate oscillations around the mean, with fewer prolonged episodes of extreme volatility. Although certain intervals show temporary increases in fluctuations, particularly during late 2020, the overall pattern indicates reduced persistence compared to the pre-lockdown period. However, the absence of strong ARCH effects does not imply constant variance; rather, it suggests that volatility clustering is not statistically significant in this subsample. Consequently, further evaluation using GARCH specifications remains appropriate to assess whether longer-run persistence exists.

Table 9: ARCH Effect Result of All Share Index Return Series of Post-COVID-19 Lockdown

F-statistic	2.091113	Prob. F (1,638)	0.1486
Obs*R-squared	2.090816	Prob. Chi-Square (1)	0.1482

Source: Author's computation, 2023.

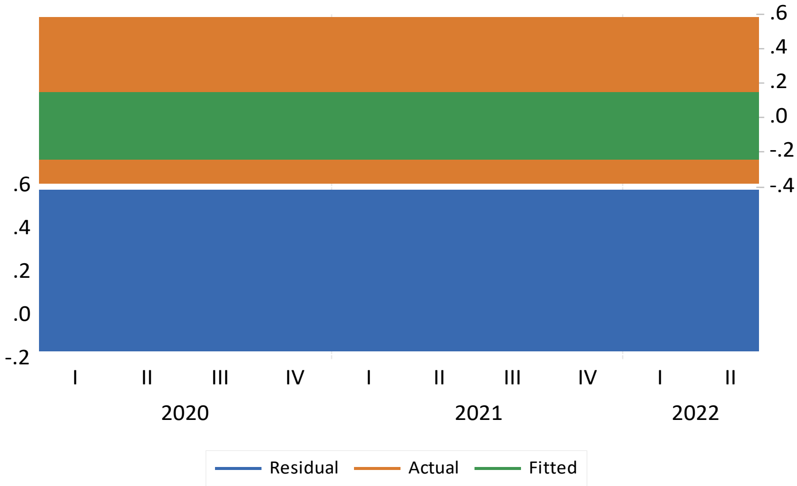

Figure 2: Volatility Clustering for Daily All Share Index Return Post COVID-19 Lockdown. Source: Author's computation from E-views output, 2023

4.9. GARCH Estimation Results: Post-Lockdown Period

Table 10 presents the GARCH(1,1) estimation results for the post-lockdown period under Gaussian, Student's t, and Generalized Error Distribution (GED) assumptions.

4.9.1. Mean Equation (μ)

Across all distributions, the mean parameter (μ) is positive and statistically significant. This confirms that the post-lockdown period is characterised by a modest but positive average daily return. The statistical significance suggests that, on average, market performance improved relative to the pre-pandemic phase. Nevertheless, return predictability is primarily assessed through the lagged return coefficient reported earlier in Table 8. The significant and negative lagged return coefficient (−0.401647; p = 0.0000) indicates persistent short-run mean reversion even after the lockdown period. Therefore, historical return information continued to exhibit predictive power, which is inconsistent with strict weak-form efficiency (Fama, 1970).

Table 10: All Share Index Return Post COVID-19 Lockdown (June 2020 -Dec 2022)

Parameters	Gaussian Distribution		Student's t- Distribution		Generalized Error Distribution	
	Estimates	P-Values	Estimates	P-Values	Estimates	P-Values
μ	0.121724	0.0000	0.118834	0.0052	0.033794	0.0001
ω	0.000956	0.0000	0.065184	0.9992	0.00007	0.0000
α	0.228309	0.0665	2352.614	0.9992	1.191620	0.0101
β	-0.550303	0.0000	0.122278	0.0087	-0.000880	0.9643
AIC	-4.529025		-7.100624		-7.134647	
SC	-4.494212		-7.058849		-7.092770	
HQ	-4.515513		-7.084410		-7.118391	

Source: Author's computation, 2023.

4.9.2. Variance Equation (ω, α, β)

The variance equation results reveal mixed patterns across distributions. Under the Gaussian specification, the ARCH parameter (α = 0.228309) is marginally insignificant at the 5% level (p = 0.0665), whereas the GARCH parameter (β = −0.550303) is statistically significant. However, the negative sign of β indicates instability in the volatility process under this specification, suggesting that the Gaussian assumption may not adequately capture the distributional properties of returns. Under the Student's t distribution, although the mean parameter remains significant, the ARCH and GARCH parameters are statistically insignificant at conventional levels. Similarly, under the GED specification, the ARCH parameter is statistically significant, while the GARCH term remains insignificant. Overall, the general absence of statistically robust and jointly significant ARCH and GARCH parameters indicates weak long-run volatility persistence during the post-lockdown period. This finding is consistent with the earlier ARCH–LM test results, which suggested reduced volatility clustering in the recovery phase.

4.9.3. Volatility Persistence and Mean Reversion

Volatility persistence is evaluated through the sum (α + β). In stable and well-specified GARCH models, this sum should lie between zero and one, with values closer to unity indicating slow decay of shocks (Bollerslev, 1986). Across the specifications, the estimated parameters do not consistently indicate strong and stable persistence. The implied half-life calculations suggest that volatility shocks dissipate relatively quickly, often within approximately one day. A short half-life implies rapid mean reversion of conditional variance, indicating that shocks during the post-lockdown period did not generate prolonged volatility regimes. However, it is crucial to distinguish between volatility, mean reversion, and semi-strong efficiency. Rapid volatility adjustment reflects the speed at which risk dissipates, whereas semi-strong efficiency concerns the speed of price adjustment to publicly available information (Fama, 1970). Therefore, while short volatility half-life suggests stabilisation of risk conditions, it does not independently confirm semi-strong efficiency.

4.9.4. Model Selection Criteria

The Akaike Information Criterion (AIC), Schwarz Criterion (SC), and Hannan–Quinn (HQ) statistics are reported to compare model fit across distributions. The Student's t and GED specifications yield lower information criteria values relative to the

Gaussian distribution, indicating improved goodness-of-fit. This result is consistent with the earlier evidence of non-normal return distributions and heavy tails. Consequently, heavy-tailed distributions appear more appropriate for modelling Nigerian stock return volatility during the post-lockdown period.

4.10. Integrated Interpretation of Post-Lockdown Results

The combined evidence from the mean equation, ARCH–LM test, and GARCH estimations suggests that although average returns improved following the lockdown, short-run return dependence persisted. Specifically, the lagged return coefficient remains statistically significant; volatility clustering has weakened relative to the pre-lockdown period; long-run volatility persistence appears limited; and Heavy-tailed distributions provide a superior model fit. Therefore, while volatility conditions stabilised during the post-lockdown phase, return autocorrelation remained present. This indicates that although the market exhibited improved risk dynamics, strict weak-form efficiency was not fully restored. These findings align with emerging-market evidence indicating that institutional characteristics and information frictions may prolong return dependence even after crisis shocks subside (Kelikume et al., 2020; Alade et al., 2020). Furthermore, the results partially contrast with Nageri (2021), who reported limited volatility response to pandemic news, suggesting that post-crisis market adjustments may differ from initial shock dynamics.

5. Discussion

This section interprets the empirical findings in relation to the Efficient Market Hypothesis (EMH) and the broader literature on crisis-induced market dynamics. By comparing the pre- and post-COVID-19 lockdown periods, the analysis clarifies whether the Nigerian stock market experienced structural shifts in informational efficiency or merely temporary changes in volatility conditions.

The results indicate that, during the pre-lockdown period, the Nigerian stock market exhibited statistically significant return dependence, as evidenced by the negative and significant lagged return coefficient. This finding implies short-run mean-reverting behaviour, whereby past returns exert predictive influence on current returns. Under the weak-form EMH (Fama, 1970), historical price information should not systematically forecast future returns. Therefore, the presence of significant autocorrelation suggests deviations from strict weak-form efficiency prior to the pandemic. This outcome is consistent with earlier evidence from African markets that documents return predictability linked to informational asymmetries, liquidity constraints, and institutional frictions (Kelikume et al., 2020; Alade et al., 2020). In addition, the ARCH–LM test for the pre-lockdown period confirmed the presence of volatility clustering. Financial time series commonly exhibit conditional heteroskedasticity, and such clustering does not necessarily contradict market efficiency. However, when volatility persistence coexists with significant return autocorrelation, it may indicate delayed information incorporation or structural inefficiencies within the trading environment. In emerging markets characterised by fragmented information flows and retail-dominated participation, such dynamics may be amplified, thereby slowing the speed of price adjustment.

Following the COVID-19 lockdown, the empirical findings reveal a partial shift in market dynamics. Although average daily returns turned positive, the lagged return coefficient remained statistically significant and negative, indicating continued short-run mean reversion. Therefore, return predictability did not disappear in the post-lockdown phase. From a weak-form efficiency perspective, this suggests that the market did not fully eliminate short-term autocorrelation even after volatility stabilised. However, volatility behaviour changed more noticeably across periods. The post-lockdown ARCH–LM test results indicate that volatility clustering weakened relative to the pre-lockdown phase. Moreover, GARCH estimations suggest limited and less persistent conditional variance effects during the recovery period. This implies that volatility shocks dissipated more rapidly after the initial crisis phase. Such behaviour may reflect improved information assimilation, enhanced policy coordination, or gradual adaptation by market participants to pandemic-related uncertainty. Similar crisis-adjustment patterns have been documented in global markets, where initial volatility spikes were followed by progressive stabilisation (Liu et al., 2020; Nelson et al., 2023).

Nevertheless, it is important to distinguish clearly between volatility dynamics and informational efficiency. Rapid mean reversion of volatility indicates stabilisation of risk, whereas weak-form efficiency concerns the absence of return predictability. The empirical evidence suggests that although volatility conditions improved in the post-lockdown period, short-run return dependence persisted. Consequently, while the market exhibited enhanced risk stability, strict weak-form efficiency was not fully achieved. With respect to semi-strong efficiency, the findings do not provide direct evidence of complete informational incorporation of public announcements. Semi-strong efficiency requires that publicly available information be instantaneously reflected in prices. Although volatility shocks dissipated quickly after the lockdown, the persistence of return autocorrelation suggests that price adjustments may not have been fully instantaneous. Therefore, the results imply that semi-strong efficiency may remain constrained by structural characteristics of the Nigerian market, including limited analyst coverage and information dissemination frictions.

The comparative pre- and post-lockdown analysis further indicates that COVID-19 did not fundamentally alter the informational structure of the Nigerian stock market. Instead, the pandemic appears to have intensified volatility temporarily, while underlying return dependence remained present. This observation aligns with literature suggesting that crisis events often amplify existing structural inefficiencies rather than creating entirely new ones (Simão, 2023; Nkrumah-Boadu, 2022). Moreover, the superior fit of heavy-tailed distributions, particularly the Student's t and GED specifications, underscores the presence of non-normal return behaviour throughout both periods. Such leptokurtic features are common in emerging markets and reflect exposure to episodic shocks and liquidity constraints. Consequently, appropriate distributional assumptions are essential for accurately modelling volatility and assessing persistence.

Taken together, the evidence suggests that the Nigerian stock market demonstrated partial stabilisation in volatility after the lockdown; however, return predictability persisted across both periods. Therefore, while the crisis did not generate prolonged volatility regimes in the recovery phase, it also did not eliminate short-run inefficiencies. These findings contribute to the emerging-market literature by showing that structural informational frictions may endure even after systemic shocks subside. From a policy perspective, the persistence of return dependence highlights the importance of strengthening information transparency, enhancing disclosure standards, and improving market microstructure efficiency. Furthermore, volatility modelling remains a valuable tool for regulators and institutional investors seeking to anticipate risk dynamics during periods of economic disruption. Strengthening institutional frameworks and improving investor education may accelerate the incorporation of information and reduce short-term predictability. Overall, the discussion indicates that COVID-19 acted primarily as a volatility shock rather than a structural transformation of informational efficiency in the Nigerian stock market. While volatility stabilised in the post-lockdown phase, the continued presence of return autocorrelation suggests that further structural reforms may be necessary to achieve higher levels of market efficiency consistent with EMH expectations (Fama, 1970).

6. Conclusions

This study examined the volatility dynamics and informational efficiency of the Nigerian Stock Exchange (NGX) All-Share Index between January 2018 and December 2022, distinguishing between the pre- and post-COVID-19 lockdown periods. Using ARCH/GARCH modelling under alternative distributional assumptions, the analysis evaluated return dependence and volatility persistence as indicators of market behaviour under crisis conditions.

The empirical evidence confirms that return series were stationary across both sub-periods, thereby satisfying the statistical requirements for volatility modelling. However, the conditional mean equations reveal statistically significant lagged return effects in both the pre- and post-lockdown phases. This indicates the presence of short-run return dependence, which is inconsistent with the strict interpretation of the weak-form Efficient Market Hypothesis (Fama, 1970). Although the coefficients were economically moderate in magnitude, their statistical significance suggests that historical price information retained predictive content.

Regarding volatility dynamics, significant ARCH effects were observed in the pre-lockdown period, confirming volatility clustering. In contrast, volatility persistence weakened in the post-lockdown phase, and estimated half-life measures indicate relatively rapid mean reversion of shocks. These results suggest that while the COVID-19 shock temporarily intensified market volatility, it did not generate prolonged instability. Nevertheless, rapid volatility adjustment should not be equated with semi-strong efficiency, as informational efficiency requires the instantaneous incorporation of publicly available information into prices. Overall, the findings indicate that COVID-19 primarily served as a temporary volatility disturbance rather than a structural transformation of the Nigerian market's informational framework. Although volatility stabilised during the recovery phase, return autocorrelation persisted, suggesting partial, rather than complete, conformity with the weak-form efficiency hypothesis.

7. Implications

The findings have several important implications. Theoretically, the persistence of return autocorrelation alongside rapid volatility mean reversion underscores the conceptual distinction between risk dynamics and informational efficiency. While volatility conditions may stabilise following systemic shocks, informational frictions may persist, particularly in emerging markets characterised by structural constraints (Kelikume et al., 2020; Alade et al., 2020). Methodologically, the superior performance of heavy-tailed distributions highlights the importance of appropriate error specifications in modelling financial time series. Accurate inference regarding volatility persistence and efficiency depends critically on distributional assumptions that accommodate excess kurtosis and asymmetry.

From a policy perspective, the continued presence of return dependence suggests the need to strengthen market transparency, disclosure standards, and information dissemination mechanisms. Enhancing market microstructure efficiency and promoting investor education may reduce short-term predictability and accelerate price adjustment processes. For investors, the evidence supports the relevance of volatility forecasting models in managing risk during periods of systemic uncertainty. Collectively, the study contributes to the emerging-market literature by demonstrating that crisis events may amplify existing inefficiencies without fundamentally restructuring market informational dynamics. Strengthening institutional quality and regulatory oversight remains central to improving long-term market efficiency and resilience.

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