



EFFECT OF STOCK MARKET LIBERALISATION ON VOLATILITY IN NIGERIAN EXCHANGE GROUP (NGX).

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Abstract

The Nigerian stock market is seen as one of the key drivers of growth in the economy and hence has undergone significant changes in terms of policies that are aimed at improving its performance. Among these reforms is the stock market liberalization which was targeted at enhancing the efficiency of the market. This study examined the impact of financial liberalization on stock market volatility in Nigeria from February 2011 to September 2023 using monthly time series data extracted from the central bank of Nigeria (CBN) Data base and the Nigerian exchange group (NGX). The Augmented Dickey Fuller (ADF) and Philip Perron (PP) unit root tests were conducted on the time series data. The ARCH LM tests was also carried out and the EGARCH model was estimated under the assumption of normally distributed model. The ARCH tests results revealed that there exists ARCH effects in the NGX stock returns implying the presence of volatility clustering in the return series. The results further revealed that stock market liberalisation has a significant negative impact on volatility. The findings also indicates volatility persistence in the Nigerian stock market and that bad news generates higher volatility than good news of the same magnitude. Policy makers should institute policies and mechanism that will stabilize significant macroeconomic indicators like exchange rate and inflation as this would guarantee investor's confidence in the stock market.

Keywords: stock market liberalization (SML), volatility, foreign portfolio Investment, Exponential Generalised Autoregressive Heteroskedastic Model (EGARCH)

1.0 Introduction

The financial sector is instrumental in driving economic growth by efficiently allocating resources, managing risks, and facilitating trade. A robust financial system mobilizes savings and channels them into productive investments, thereby fostering economic development (Alashi, 2020). Within this sector, the stock market plays a pivotal role in long-term capital mobilization. It serves as a conduit for transferring funds from surplus to deficit sectors, enabling businesses to access the capital necessary for expansion and innovation. Empirical studies have demonstrated a positive correlation between stock market development and economic growth in Nigeria (Oyesiji, Sikiru, & Oladeji, 2020)

Volatility, an essential finance concept, indicates risk by measuring fluctuations in asset prices. Higher volatility reflects greater deviation from average prices and, consequently, higher risk, presenting challenges for investors who seek returns but must contend with accompanying risks

(Markowitz, 1952). Fama's Efficient Market Hypothesis suggests that stock prices respond to multiple factors, and the market's performance impacts economic growth (Fama, 1970). Higher stock returns are indicative of greater profitability, fostering growth across the economy. Bertram (2018) and Ifionu and Omojefe (2013) highlighted that the growth in Nigeria's economy is closely tied to stock market performance, while Aliyu (2014) recognized the Nigerian Stock Exchange (NSE) as a leading emerging market and the "heartbeat" of the Nigerian economy.

Despite its contributions, the Nigerian stock market is characterized by high volatility, generating uncertainty that disrupts the sector's stability. In response, Nigeria liberalized its stock market in 1995 to reduce financial repression. The market was previously characterized by high inflation, high interest rates, and exchange rate volatility. Liberalization aimed to align the Nigerian market with global standards, boost capital inflows, and address structural economic challenges.

Following the liberalization of Nigeria's stock market in 2005, steady growth was observed, with the All-Share Index (ASI) climbing to 5,092.20 by December of that year. This growth trajectory continued until the 2007–2008 global financial crisis, which caused significant market shocks. The ASI plummeted from 57,990.20 in 2007 to 31,450.78 in 2008, and further to 20,827.17 in 2009. A gradual recovery began in 2010, with the ASI reaching 24,770.52. However, by 2016, a domestic recession once again negatively impacted the ASI, which fell to 26,874.62. Despite ongoing economic challenges, including rising inflation and high interest rates, the ASI rose steadily, reaching 40,270.72 in 2020 and further climbing to 42,716.44 in 2021 and 51,251.06 in 2022.

This pattern reflects sustained volatility in Nigeria's stock market over the years, as economic fluctuations and market shocks create ongoing instability. Soludu (2004) highlights that this volatility presents a risk factor that erodes investor value, underscoring the challenges faced by market participants. Volatility, closely tied to risk, remains a major concern in safeguarding investor confidence and maintaining market stability. It is in view of this that the study seeks to answer the question:

To what extent does stock market liberalisation affect stock market volatility in Nigeria?

The main objective of the study is to assess the impact of stock market liberalisation on volatility in the Nigerian Exchange Group (NGX).

The study of stock market liberalization's impact on volatility in Nigeria holds significant relevance for various stakeholders, including government policymakers, firms, and investors. Understanding this relationship can inform strategies to enhance market efficiency, attract foreign investment, and manage investment risks effectively. Insights from this study will guide government and policy makers in developing policies aimed at reforming the capital market to make it more attractive to foreign investors. By highlighting the economic potential of a liberalized stock market, policymakers can implement regulations that foster a more competitive and efficient market environment. Companies operating within Nigeria can leverage findings from this study to better understand the implications of market liberalization on their operations. A liberalized market may offer increased access to capital and a broader investor base, but it also comes with heightened competition and potential volatility. By comprehending these factors, firms can strategize effectively to capitalize on new opportunities while mitigating associated risks. Furthermore, Investment bankers, fund managers, and individual investors can benefit from understanding how liberalization affects stock market volatility. Since volatility influences asset pricing and risk assessment, insights into the effects of liberalization can inform

investment decisions and risk management strategies. The scope of the study covers the period from February 2011 to September 2023. The choice of the period is mainly due to data availability.

The reminder of the paper is structured as follows: section two presents a literature review and theoretical framework, section three discusses the methodology and model development, section four analyses the empirical results and section five concludes, recommends and draws policy implications.

2. Stock market volatility

Volatility is a fundamental measure of risk in finance, representing the tendency of asset prices to fluctuate over time. It involves both upward and downward swings and has a substantial impact on investor confidence, company stability, and market liquidity Lakshmanasamy (2021). High volatility can erode trust in the market, increase bankruptcy risk for firms, widen bid-ask spreads, and raise hedging costs. Ahuru and Ola (2016) argued that in volatile markets, risk-averse investors may reduce their activity, potentially dampening investment and economic growth.

According to Ibrahim (2017) Volatility clustering occurs when large or small price changes follow one another, highlights patterns often seen in financial markets and is described statistically as heteroskedasticity. Investors often view volatility as a double-edged sword, it brings both risk and opportunities to buy assets cheaply and sell at peaks.

Various models have been developed to measure and predict volatility, including the Stochastic Volatility (SV) model and Autoregressive Conditional Heteroskedasticity (ARCH) model. Engle (1982) introduced ARCH to capture changing variance in asset prices, later expanded to the Generalized ARCH (GARCH) model by Bollerslev (1986) to address its limitations. Further refinements, like the Exponential GARCH (EGARCH) developed by Nelson (1991), consider asymmetric effects of shocks on volatility, which is crucial for accurate financial forecasting. The GJR-GARCH developed by Glosten, Jagannathan, and Runkle (1993), the Threshold GARCH (TGARCH) developed by Zakoian (1994), and the Power GARCH (PGRACH) generalized by Ding, Granger and Engle (1993) have emerged.

Concept of stock market liberalization

Stock market liberalization, rooted in the broader concept of financial liberalization, is central to economic transformation, especially in developing economies. McKinnon (1973) and Shaw (1973) laid its foundational theory, positing that liberalization stimulates higher savings and investment, fueling economic growth. By reducing borrowing costs and allowing greater equity accumulation, it supports efficient capital mobilization, benefiting both domestic and foreign investors.

Financial liberalization removes constraints on financial markets, fostering integration with global markets (Bekaert and Harvey, 2003) and encouraging transparency and market discipline. It has internal and external dimensions: internal liberalization allows easier access for firms and individual investors within a country, while external liberalization opens domestic stock markets to foreign investors. Makina (2005) describes it as a gradual process, influenced by policy reforms to deregulate financial systems. Johnston and Sundararajan (1999) view it as a shift toward market-oriented systems with regulatory frameworks, while Chandrasekhar (2004) emphasizes the dismantling of regulatory controls to improve efficiency.

For developing countries, liberalization often includes central bank independence, reduced financial repression, and openness to capital flows, which reduces capital costs and increases access to high-yield investments (Gosh, 2005; Tswamuno et al., 2007). This openness enhances economic growth through greater investment, employment, and risk diversification. However, critics, including Njikam (2017), note that the benefits of liberalization are contingent on fulfilling necessary preconditions, highlighting the importance of complementary reforms. For this study, stock market liberalization is defined as removing restrictions on foreign capital inflow into domestic stock markets, creating free investment flows to stimulate economic development.

2.2 Empirical review

The relationship between stock market liberalization and stock price volatility has been widely studied across various countries, with findings that are often mixed. Some studies indicate that financial liberalization increases stock market volatility, while others report a reduction or no significant impact on volatility. These studies includes Long (2007) who used the GARCH model to determine the effect of financial liberalisation on volatility and found a negative influence of financial liberalisation on stock return in Vietnam stock market. However, the GARCH model only deals with magnitude and therefore it is not able to capture the positivity or negativity of shocks in the data. In another study, James and Karoglu (2010) examined the relationship between financial liberalistaion and stock market volatility in Indonesia using time series data from weekly returns on Jakarta composite index. The study utilized the GARCH model and the results revealed a significant decrease in volatility after the official opening of the stock market and a significant increase in volatility a year before the market opening. But the GARCH model is unable to capture the leverage effect simply put the GARCH model is unable to account for the asymmetrical skewness caused by the inverse correlation between volatility and the stock returns.

Nwokoye, Zubairu and Ayuba (2015) investigated the relationship between exchange rate and misalignment and stock market volatility during pre and post financial liberalisation in Nigeria using quarterly data between 1985Q1 and 2011Q4. The analysis was conducted using descriptive statistics, correlation matrix and error correction model. The results reveal that exchange rate misalignment has positive but insignificant relationship with stock market volatility and a negative insignificant relationship after deregulation. In general, the study found that the adoption of financial liberalisation policy in Nigeria had a positive but insignificant impact on stock market volatility. The results would have been more robust if the GARCH family model was utilized as it would have given a clear picture of nature of volatility in the Nigerian stock market.

Aziz and Iqbal (2016) examined whether the volatility and dynamic linkages of Pakistani stock market with the US stock market are improved if local and foreign macroeconomic variables are augmented in a Multivariate GARCH model. Using the BEKK specification of Engle and Kroner (1995) with local and foreign macroeconomic variables as exogenous variables they estimate a multivariate GARCH model and use the Wald test to investigate whether the stock market volatility is significantly changed due to the local and foreign economic conditions. In addition, monthly stock returns and some key macroeconomic variables were employed from July, 1997 to December 2015. Although both local and global variables significantly impact on the stock market volatility of Pakistan but the local macroeconomic variables contribute more than global to improve the forecast of Pakistan's stock market volatility.

Ahuru and Olaposi (2016) examined the role of liberalisation exercise on stock market volatility in Nigeria by utilizing quarterly time series data from 1985 to 2012. The results of the GARCH and co integration error correction model revealed that financial liberalisation increases stock price volatility in Nigeria. Similarly, Ogbebor, Oguntodu and Olayinka (2017) applied Ordinary Least squares technique on time series data to determine the relationship between financial liberalisation and stock market development in Nigeria from 1986 to 2016 and the results revealed a positive effect of financial liberalisation on stock market development. However the EGARCH would have been more suitable as it measures volatility persistence in the stock market.

Patrick, Olufemi, Oladapo and Stephen (2017) investigated the effect of financial liberalisation on the volatility of emerging stock markets in Africa with particular emphasis on the Nigerian stock market. The study made use of the ARCH and GARCH model to analyse the monthly data collected from the Nigerian Stock exchange from 1985 to 2016 and the findings from the study revealed a positive and significant impact of financial liberalisation on stock market volatility. But the ARCH and GARCH models do not capture the extent of the volatility persistence in the data.

However, a more robust approach was used by Yola, Khan and Hidthir (2018) who examined financial liberalisation and stock market integration in Nigeria, South Africa and Egypt for the period 1989 to 2016 using the vector Auto regressive methodology. The results from the analysis showed that there exists a long run relationship between selected stock markets further results revealed evidence of short run dynamics between stock exchange markets. A broader time frame should have been considered by the study to account for certain events that could likely affect the stock market.

Another study was also carried out by Awolaye and Dada (2018), they utilized the autoregressive distributed Lag (ARDL) to analyze the effect of financial liberalisation on stock market volatility in Nigeria from 1986 to 2016 and the results showed a positive effect of financial liberalisation on stock market volatility in Nigeria both in the short run and long run. However, the ADRL model does not account for volatility hence a more robust model like the EGARCH model would have been more appropriate measure of volatility in the NGX.

Alrafayia (2018) studied the relationship between the information and fluctuations in stocks return following the liberalisation process of financial market. The study further attempted to illustrate the effect of liberalisation of Amman Stock Exchange on price fluctuations, and the trend of this influence. Daily data on stocks returns for Amman stock market for the period (1994-2015) was utilised. The period from which the financial data were taken was divided into two periods: first, the pre-liberalisation of the financial market (1994-2000), and the second period, the post-liberalization which extended from 2001 to 2015. The results from the (GARCH) model showed that there is an effect of the stock market liberalization on the fluctuations pattern in the Jordanian Stock Exchange, the speed and accuracy of information flow to the market has increased after stock market liberalization. Al-Kandari and Abul (2020) examined the effect of financial liberalisation on stock market behavior in the Kuwaiti stock exchange (KSE). The study focused on two sub-periods, the first period is from 2009 to 2013, and the second is from 2014 to 2018. They study applied the Augmented Dickey-Fuller (ADF) to test stationarity, ARCH (1), GARCH (1,1) and TGARCH models were applied to examine the volatility of the market in these two sub-periods. The results revealed that Liberalisation has reduced the volatility of the

KSE hence the Kuwaiti Stock Exchange was more volatile during the pre-liberalisation period compared with liberalisation period.

Aremo, Olabisi and Adeboye (2020) empirically examined the effect of selected macroeconomic variables on stock market returns in Nigeria. The Autoregressive Distributed Lag (ARDL) approach was employed to examine both the short and long-run effects of selected macroeconomic variables on stock market returns using annual time series data spanning 1985 to 2014. The findings show that both foreign direct investment inflows and external debt do not have significant impact on stock market returns in Nigeria while money supply and trade openness have significant positive effect on stock market returns in the long-run. A more robust result would have been obtained if the time frame was extended to cover significant events that took place in Nigeria.

Oyesiji, Sikiru and Oladeji (2020) examined the effect of financial liberalization on stock market return in Nigeria using monthly time series data from January 2007 to July 2017. The ARCH and GARCH model was used for the analysis and the results revealed that foreign Portfolio investment and financial liberalisation have positive effects on stock returns. But the ARCH and GARCH models have been criticized for their inability to account for volatility persistence and leverage effects.

These studies suggest that stock market liberalization's impact on volatility is context-dependent, influenced by local macroeconomic conditions, the methodologies employed, and market-specific characteristics. However, the frequent use of GARCH and ARCH models is critiqued for their inability to capture certain aspects of volatility, such as persistence and leverage effects, which could provide a more nuanced understanding of liberalization's influence on stock markets.

Ho: Stock market liberalisation has no significant effect on volatility the Nigerian Exchange Group (NGX).

2.4 Theoretical Framework

The Efficient Market Hypothesis (EMH), proposed by Fama (1970, 1991), argues that in an efficient market, stock prices fully reflect all available information, making it impossible to consistently achieve abnormal returns through trading on new information. According to EMH, stock prices adjust rapidly and without bias to new information, suggesting that all current prices accurately reflect underlying value, leaving little room for investors to profit based on predictive strategies. Therefore, any price fluctuations arise primarily from new information, which may either positively or negatively impact stock prices.

This study utilizes EMH as its theoretical foundation, suggesting that the efficiency of stock markets, including the Nigerian market, allows them to absorb new information quickly. In this context, stock market liberalization which implies easing of restrictions to allow freer market access would not necessarily lead to increased volatility, as any impact of new market entrants or changing investment patterns would be absorbed into stock prices immediately. Consequently, this theory supports the idea that liberalization may not adversely affect stock price volatility due to the market's ability to incorporate such shifts efficiently.

3. Research methodology

This study employs an ex-post facto research design, which is suitable as it investigates events that have already occurred, using existing data. The population for the study includes 108 firms listed on the Nigerian Exchange Group (NGX) as of December 31, 2023. With a census

sampling approach, the entire population is used as the sample. The monthly time series data for the study period are sourced from the Central Bank of Nigeria's (CBN) statistical bulletin and database.

Given the time-series nature of the data, the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests are applied to assess the stationarity of variables, helping to prevent spurious results. The study utilizes the Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGARCH) model, chosen for its ability to handle logarithmic specifications, capture volatility asymmetries, and account for the persistence of volatility shocks. The model's flexibility and efficiency for forecasting volatility, as well as its ability to show asymmetric and leverage effects, align with previous research findings by Su (2010), Ibrahim (2017), and others. Various diagnostic tests, including heteroskedasticity, and ARCH-LM test is used to verify model stability, ensuring robust and reliable findings.

In this study, the dependent variable, stock market volatility (SMV), is measured by the return on the monthly All Share Index (ASI), a widely accepted indicator of stock market trends and performance across the Nigerian stock market. This approach aligns with previous studies, including those by Osagie (2012), Maku and Atanda (2010), Mohammed (2016), and Okonkwo and Jude (2019), which also utilize the ASI to capture volatility.

The primary independent variable, stock market liberalization (SML), is measured by the monthly growth rate of foreign portfolio investment (FPI) inflows, expressed as a percentage. FPI inflows serve as an indicator of financial openness and the degree of market liberalization, as the inflow of foreign capital signals the extent of foreign investor participation in the country's financial markets (Chizoba et al., 2019). This measure of SML provides insight into the effects of liberalization policies on stock market behavior, particularly in relation to volatility.

The theoretical model for this study is thus stated below. The conditional mean equation is given as follows:

$$R_t = \beta_0 + \beta_1 SML_t + \mu_t \dots \dots \dots (1)$$

$$R_t = \text{Log} \left(\frac{NSE_t - NSE_{t-1}}{NSE_{t-1}} \right) \dots \dots \dots (2)$$

Where:

R_t = Return on NGX All Share Index.

NSE_t = Current values of NSE All Share Index.

NSE_{t-1} = Previous values of NSE All Share Index.

SML_t = Stock market liberalization

μ_t = Random disturbance term

On the other hand, the conditional variance equation can be stated as follows:

$$\log(\delta_t^2) = \omega + \beta \log(\delta_{t-1}^2) + \gamma \frac{\mu_{t-1}}{\sqrt{\delta_{t-1}^2}} + \alpha \left[\frac{|\mu_{t-1}|}{\sqrt{\delta_{t-1}^2}} - \sqrt{\frac{2}{\pi}} \right] \dots \dots \dots (3)$$

Where:

$\log(\delta_t^2)$ = Log of Conditional Variance of Return on NGX All Share Index (Stock Market Returns)

ω = Constant term

$\log(\delta_{t-1}^2)$ = Log of last period forecast variance

γ = Asymmetry or leverage term

4. Results and Discussions

The first step taken to analyze the data for this study was to establish the stationarity of the monthly time series data used in the study. To ensure that the variables are stationary the ADF and PP unit root tests were conducted and the results are presented below:

Table 4.1 ADF and PP Test for Stationarity of Variables

Variable	<i>Augmented Dickey Fuller</i>		<i>Philip Perron</i>	
	Test statistic	Order of integration	Test statistic	Order of integration
RETURN	-10.290***	I(0)	-10.293***	I(0)
SML	-13.467***	I(0)	-13.426***	I(0)

Source: EViews10 stationarity test, 2024

The result of the Augmented Dickey-Fuller (ADF) and PP tests conducted revealed that the variables RETURN and SML are found to be stationary at levels and are integrated in the order I(0).

Heteroskedasticity Test

The Engle (1982) ARCH test was conducted to check for the presence of ARCH effects on the residuals. The T statistics test for the joint significance of the ARCH effect in the residuals. Table 4.2 presents the results of the Engle test for ARCH effect and is thus presented below.

Table 4.2 Engle ARCH Test

	Test statistic	Prob
f-statistic	3.473	0.064
chi squared	3.439	0.064

Source: Eviews 10 Engle ARCH test output 2024.

Table 4.2 presents the results for the ARCH LM test. The F statistics is 3.473 and the associated p-value is 0.0644. The p-value of 0.0644 appears to be greater than the 0.05 significance level. This suggests evidence that there are significant ARCH innovations in the NGX we therefore

reject the null hypotheses which states that there is no significant ARCH effects. Another way to test for the ARCH effects is using the chi square test. The p-value of the chi square is 0.064 and is not significant at 0.05 level of significance. This also reinforces the indication of the presence of ARCH effects in the NGX and hence justifies the use of the EGARCH model to model for volatility in the Nigerian exchange Group.

Test of Hypotheses

The results of the EGARCH normal distribution model are presented in the table below:

Table 4. 3 EGARCH Normal Distribution model

Variable	Coefficient	P- value
C	-0.025	0.012
SML	-0.003	0.000
AR(1)	0.055	0.088
ω	-1.208	0.000
α	0.907	0.000
γ	0.063	0.219
β	0.668	0.000

EvIEWS 10 output, 2024. *, ** and *** imply significance at 10%, 5% and 1% levels

Table 4.3 presents the results from the asymmetric EGARCH (1, 1) model estimated under the assumption of normally distributed conditional errors. The table presented the regression analysis results in respect of the dependent and independent variable which describes the summary of the model and their relationship. The constant, which represents the measure of the average value of the dependent variable has a coefficient of -0.025 and a p-value of 0.012 is negative and statistically insignificant. It can be seen from the table that SML affects volatility negatively. This is evident as the coefficient is -0.03 and a probability of 0.000 show that it is highly significant at the 5% level of significance. This implies that SML has a negative and statistically significant impact on volatility in the NGX. An increase in SML by 1% will result to 0.3% decrease in volatility. Thus, SML is a significant determinant of volatility in the NGX.

The autoregressive term (AR(1)) has a coefficient of 0.055 and a probability of 0.088. The high p-value is a clear indication that the AR(1) is not significant at the 5% level of significance indicating that the coefficient may not statistically contribute to explaining the variance in the dependent variable.

The intercept of the variance equation as represented by ω has a coefficient of -1.208 and a p value of 0.000. This simply means that the intercept of variance has a negative and is statistically significant at 5%. In the same vein, the ARCH term as denoted by α has a coefficient of 0.907 and a p-value of 0.000. This simply means that the ARCH term has a positive and statistically significant at 1% implying strong presence of ARCH effects in the NGX returns. In addition, the GARCH term denoted by β has a positive and is statistically significant at 5% with a coefficient of 0.668 and a p-value of 0.000. This suggests the presence of GARCH effects in the NGX returns. Implying high persistence in the volatility of shocks in the NGX. However, the fact that

the value of the ARCH term is greater than the GARCH term signifies that there is no dominance of volatility clustering in the NGX. Furthermore, the sum of the ARCH and GARCH term is greater than unity indicating that the monthly NGX return series follow an explosive pattern.

In addition, the coefficient of asymmetry is 0.063 and a p-value of 0.219 is not statistically significant at 5% that is the coefficient of asymmetry is positive and not statistically significant. Implying that negative shocks have larger effect on the conditional variance than positive shocks of the same magnitude. This simply implies that negative or bad news evokes more volatility than the positive news of the same magnitude. Put simply, volatility increases with unfavourable information about the market and favourable information (good news) decreases volatility. This result also indicates that the EGARCH is more suitable for measuring volatility in the NGX due to the presence of the asymmetric effects.

5. Conclusion, recommendations and policy implication

The study examined the stock market liberalization on volatility in Nigeria. The findings from the study revealed that SML has significant negative impact on volatility in the NGX implying that liberalisation has an inverse relationship with volatility an increase in SML decreases volatility in the NGX. This findings is in line with Consistent with the notion of volatile stock markets, the study also found evidence of ARCH innovations and volatility clustering in the NGX returns. Furthermore, the positive and significant coefficient of asymmetry is an indication that the Nigerian stock market reacts sharply and more pronounced to negative (bad) news than positive (good) news of the same magnitude.

From the foregoing, it is appropriate to recommend that considering the level of progress in the Nigerian stock market, and how the market reacts to external shock policy makers should institute policies and mechanism that will stabilize significant macroeconomic indicators in order to promote the stock market.

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