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Stock market liquidity and volatility on the Nigerian Exchange Limited (NGX)

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Abstract

Globally, the importance of stock markets in facilitating the smooth exchange of financial assets cannot be overemphasized. The efficiency of stock markets across the globe including Nigeria is largely dependent on the adequacy of stock market liquidity. However, studies have shown that the Nigerian stock market is inadequately liquid which has led to inefficient stock trading with high cost of trading. Therefore, this study investigates the effect of stock market liquidity on stock volatility on the Nigerian Exchange Limited (NGX). The study used an ex post facto research design with a sample of top 30 most capitalized and liquid companies accounting for over 90% total market capitalization and trading volume was purposively selected for the study. Secondary monthly data spanning January 2014 to December 2021 were obtained from Security and Exchange Commission Statistical Bulletin while that of exchange rate and inflation were obtained from Central Bank of Nigeria Statistical Bulletin. The GARCH (1,1) model was employed as the estimating techniques. The result of the mean equation shows that stock market liquidity (β = 759.64, p-value = 0.0000) has a significant positive impact on volatility. Also, macroeconomic factors (β = 0.0217, p-value = 0.0000) has a significant positive impact on volatility. The variance equation reveals that current conditional volatility of stock market liquidity and volatility is influenced by their previous shocks and past volatility conditions ($\alpha_i + \beta_j$ = 0.9970). The study also found evidence of volatility clustering (GARCH = 1.0056) on the NGX. Therefore, the study recommended that investors should diversify their portfolios by combining highly liquid and less liquid stocks to balance the risk across different liquidity profiles, while regulators and policymakers should implement policies that incentivize market makers to provide liquidity by offering rewards and reducing regulatory barriers.

Keywords: Stock Market Liquidity; Volatility; Macroeconomic Factors; Nigerian Exchange Limited; GARCH (1;1)

JEL Classification: G1; G12; G14

1. Introduction

Quoted companies across the globe are generally listed on stock exchanges to optimize their ability to raise capital and harness liquidity. Their primary aim is to increase the value of their stocks and enhance overall firm performance. Stock exchanges are crucial for effective allocation of limited resources and facilitation of risk-sharing among competing needs. To instill confidence in individuals and encourage their participation in the stock market, it is essential that securities are accurately priced and easily exchanged to cash at a reasonable cost. The efficiency of the stock market depends on the presence of fair pricing and the speed with which security prices reflect relevant information. However, volatility provides insights on potential rewards and liquidity, equally posing problems to the stock market's efficiency. Managing and mitigating this volatility is essential to maintaining a well-functioning stock market (Uhunmwangho & Omorokunwa, 2022; Mortazian, 2021; Mortazian, et al., 2019).

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The role of stock markets in providing liquidity for easy conversion of securities into cash is of utmost importance. Naik et al. (2020) stressed that a liquid market allows continuous trading of securities in any quantity at prices closely aligned with their current market value, within a short timeframe. Stock market liquidity plays a vital role in ensuring the stability of the financial system, as it enables the absorption of systematic shocks and macroeconomic fluctuations. Thus, the underlying rationale is that improved stock market liquidity results in lower capital costs and higher stock prices, which ultimately increase the market value of the firm (Abdulkadir, et al., 2022; Naik & Reddy, 2021; Chia, et al., 2020).

The literature further highlighted various additional benefits linked to liquidity enhancement, such as improved corporate governance, more informative stock prices, increased alignment of managerial pay-for-performance with stock prices, and decreased risk of corporate bankruptcy. On the contrary, erratic liquidity in the stock market can lead to persistent volatility, which can in turn erode investor confidence and reduce market participation (Abdullahi, 2020). Stock market volatility tends to accompany decreases in liquidity and prices of individual stocks. While higher volatility is associated with larger decreases in individual stock prices, particularly for stocks experiencing concurrent liquidity shocks (Chung & Chuwonganant, 2020; Huang, et al., 2019). Active participation in a busy market leads to heightened volume and enhanced liquidity. Such that, investors face the potential for significant gains or losses within minutes due to sudden price movements. Various factors, including market perception and macroeconomic variables, influence share price movement, which are determined by the mechanism of price discovery derived from the concepts of supply and demand (Abdullahi & John, 2023; Olasehinde, et al., 2022; Agu, et al., 2019; Mahmah & Kandil, 2019; Assagaf, et al., 2019).

Stock market liquidity is important in the valuation of financial assets and has garnered significant attention in financial literature. In spite of the abundance of research publications on the topic, a thorough knowledge of the liquidity concept still appears to be lacking. Previous studies such as Hanh and Dut (2021), Cheriyan and Lazar (2020), Abdullahi and Fakunmoju (2019), Bhattacharya, et al. (2019), Eyob (2019) indicated that liquidity proxies, such as trading volume, can explain volatility in stock prices, establishing a link connecting liquidity to the generated returns from assets. However, the underlying reasons behind these interrelationships are not yet fully understood. Such understanding is of great importance to investors, policymakers, regulators, and academics. Moved by this gap, this study seeks to examine the effect stock market liquidity on stock volatility on the NGX.

The dynamic nature of financial markets poses challenges for investors, policymakers, and regulators in understanding how changes in stock market liquidity affects volatility. Liquidity is crucial for stock markets, and maintaining a stable level of liquidity is important for investors, companies, and regulators. However, advance and emerging markets are all impacted by the challenges brought on by lack of liquidity. Additionally, it would give authorities crucial information they could use to create regulations that would lessen the effects of volatility in the stock market. According to earlier studies, liquidity risk causes stock market prices to fluctuate from expected returns and become unpredictable (Uhunmwangho & Omorokunwa, 2022; Abdullahi & Fakunmoju, 2019).

Thus, insufficient liquidity could prevent investors from being able to buy or sell assets at their chosen prices and quantities, resulting in liquidity risk. Accordingly, factors such as low trading volumes, limited number of active traders, and a lack of diversification in the market contribute to liquidity risk. Additionally, macroeconomic factors which include foreign exchange fluctuations can also affect the liquidity of the NGX, leading to excessive market volatility (Naik, Poornima & Reddy, 2020). Also, stock volatility may be induced by macroeconomic variables like inflation, interest rates, currency rates, among others, making financial assets more appealing to investors who have the specialized knowledge needed to manage them technically (Ogbonna, et al., 2021). Consequently, both emerging and advanced markets face the issue of volatility spread in risk-return, which can result in erratic market patterns, and determining investor preferences and stock performance (Osamor, et al., 2019).

Additionally, inadequate liquidity poses a number of difficulties, including investors' disinterests in holding stocks, erratic market returns, and decreased capital investment. Except for investors who have high propensity for taking risks, risk-averse investors prefer moderate volatility, however, it becomes challenging for listed companies to raise capital in a highly volatile market (Karamti & Belhassine, 2022). Given the growing linkage of global stock markets, there is a limited body of literature that specifically examines liquidity-volatility nexus on the NGX in comparison to other global markets. Addressing these problems will provide valuable insights into the behavior of financial markets, aiding investors, policymakers, and regulators in gaining a deeper understanding of the dynamics of variations in liquidity and volatility with practical implications. Therefore, this study deviated from using different single measures by employing dimensional indicators of liquidity depth and liquidity breadth in order to fully capture the impact of liquidity on volatility on the NGX with the aim of providing relevant recommendations for regulators, policymakers, investors, as well as scholars and academics.

Past studies such as Hanh and Dut (2021), Cheriyan and Lazar (2020), Abdullahi and Fakunmoju (2019), Bhattacharya, et al. (2019), Eyob (2019) focused on the effect of stock liquidity on stock market performance and deployed volume-based metrics such as liquidity breadth, liquidity depth, or the Amihud illiquidity ratio. However, these studies paid little or no attention to how stock market liquidity (depth and breadth) can cause volatility in the stock market, particularly in Nigeria. This omission creates a significant knowledge gap in literature. Therefore, this study used two dimensions of liquidity including liquidity depth and liquidity breadth to fill the omitted-variable bias gap in existing literature by constructing a composite index from liquidity depth and liquidity breadth. The outcomes of this study are expected to have significant implications for all market players including investors, policymakers, market regulators and researchers.

2. Literature Review

2.1. Stock Market Liquidity

Stock market liquidity involves the smooth and rapid trading of quoted companies' shares without causing substantial disruptions to the price. It represents the ease of converting stocks into cash without affecting their overall worth. According to Naik, et al. (2020), stock liquidity refers to the capacity to execute trades involving large quantities of securities promptly, without causing significant price impact. Additionally, liquidity can be understood from the demand pressure and volume of orders near equilibrium prices (depth) and how many orders are being traded at various price levels (breadth) (Cui, et al, 2021). A market is considered deep when there is a substantial presence of buying and selling orders around equilibrium prices (Cui et al., 2021; Cheriyan & Lazar, 2020). Also, a market is considered broad when it accommodates numerous buying and selling orders representing substantial volumes (Abdulkadir, et al., 2022; Bhattacharya, et al., 2019). Market depth is often measured by the rate of turnover while market breadth is measured as the ratio of stock price to volume of traded stock.

Generally, trading volume is frequently used as a measure of stock market liquidity, as it reflects the interplay between supply and demand, providing insights into investors' perception of the market. Higher trading volume in the stock market is typically associated with liquid and deep markets, indicating more interested investors and can typically generate higher returns, while lower trading volume tend to yield lower returns (Cui et al., 2021; Cheriyan & Lazar, 2020). However, it is crucial to consider that large volume of trade can be influenced by other factors, such as the dissemination of new market information. Higher transaction costs are typically indicative of lower liquidity, since market players frequently scale back their trading activities to avoid incurring substantial costs (Bhattacharya, et al., 2020; Naik, et al., 2020). This study, limited by data availability, focuses on measuring stock market liquidity across two dimensions which are depth and breadth using monthly aggregate market-level data.

2.1.1. Stock Volatility

Stock volatility refers to the fluctuations observed in stock prices, encompassing both upward and downward movements around the average value. It represents the level of stability or instability in stock prices by measuring the dispersion of returns from the mean (Bhowmik & Wang, 2020). Volatility is an indicator of uncertainty and reflects the extent of deviations in share prices or market indexes. Typically, it is quantified using statistical measures such as standard deviation or variance, which compare stock prices or market indexes (Hsu, et al., 2019). The financial literature widely agrees that stock volatility has a significant impact on the overall well-being of the market (Ali, 2019). The nature of volatility finds multiple applications in portfolio management, risk management, and financial market regulation. However, excessive volatility in the stock market undermines the reliability of stock prices as an indicator of a firm's intrinsic value (Nageri & Abdulkadir, 2019).

Furthermore, stock volatility in the short term is influenced by the announcement of new positive or negative information which can lead investors to perceive the current price of a financial asset as overvalued or undervalued. If the majority of investors believe the price is too high, they may rush to sell their shares. In the absence of significant buying interest from other investors, this can result in a sharp price decline and heightened short-term volatility (Cheriyan & Lazar, 2020). However, if there is lack of buyers who are interested in purchasing undervalued shares, this can result in a significant drop in prices (Alp, Canbaloglu & Gurgun, 2022). As a result, it becomes crucial for market regulators to have an understanding of the prevailing level of stock volatility. High volatility can lead to investor panic, increased transaction costs, and a loss of market confidence. Recognizing this is essential for investors to make informed investment decisions, and for policymakers to effectively regulate financial markets. Policymakers rely on volatility estimates derived from market data as an indicator of the vulnerability of financial markets (John, Abdullahi & Mustapha, 2022; Yang & Chi, 2020).

2.2. Theoretical Review

2.2.1. Asset Pricing Theory

The Capital Asset Pricing Model (CAPM), developed by Sharpe in 1964, Lintner in 1965, and Black in 1972, provides a traditional framework for understanding the relationship between stock liquidity and stock volatility. According to this model, stock prices are primarily determined by exposure to systematic risk. The CAPM is built upon the principles of modern portfolio theory proposed by Markowitz in 1959, which aims to maximize portfolio expected return for a given level of portfolio risk. It assumes that in efficient markets, investors face only one systematic risk factor, as the idiosyncratic risk can be diversified away. Idiosyncratic risk affects individual firms, while systematic risk impacts the entire market. By constructing diversified portfolios, investors can reduce overall risk. The key insight of the CAPM is that the market portfolio represents an efficient portfolio, and the variation in returns across stocks can be explained by a single factor, known as market beta or systematic risk. However, the explanatory power of market beta has been challenged by several studies, as discussed by Cheriyan & Lazar (2020) and Grillini, Ozkan, Sharma, & Al Janabi (2019).

The CAPM, proposed by Sharpe in 1964, Lintner in 1965, and Black in 1972, has some limitations. One of its shortcomings is the use of a market portfolio that cannot be practically replicated in real-world situations. Proxies attempting to mimic the market portfolio's performance may not fully capture its underlying characteristics. Moreover, empirical studies have suggested the existence of additional factors in financial markets that influence an asset's expected return beyond just market beta.

To address these limitations, Roll and Ross (1980) argued that investors face risks beyond market risk and should consider other risk measures to accurately assess the underlying risk of an asset or portfolio. In response, Ross (1976) introduced the Arbitrage Pricing Theory (APT) as an alternative model. The APT offers several advantages over the CAPM, such as being a multifactor model and requiring fewer restrictive assumptions. It aims to provide a more realistic framework with potentially greater explanatory power.

Unlike the CAPM, the APT does not assume that investors hold the market portfolio, eliminating the need for a proxy. Instead, it considers a combination of macroeconomic or security-specific factors and an asset's sensitivity to those factors as determinants of its expected return. By incorporating multiple factors, the APT offers a broader perspective on asset pricing and risk assessment.

The APT, in contrast to the CAPM, adopts a supply-side perspective in analyzing markets. It allows for the consideration of multiple factors that can impact asset returns, such as inflation, exchange rates, investor confidence, and production measures. Unlike the CAPM, the APT offers greater flexibility in customization. However, a drawback of this approach is the lack of specific guidance on which factors to include, necessitating empirical determination. Similar to the CAPM, the APT fails to fully explain certain pricing anomalies observed in financial markets, such as long-term reversal and short-term momentum. Nevertheless, recent empirical and theoretical studies have explored the systematic influence of stock liquidity on stock volatility and prices. These studies, including works by Olasehinde et al. (2022), Uhunmwangho and Omorokunwa (2022), Pole and Cavusoglu (2021), Cheriyan and Lazar (2020), Grillini et al. (2019), and Osamor, Anene and Saka (2019), provide empirical evidence supporting the significant role of stock liquidity in determining stock volatility and prices.

2.3. Empirical Reviews

Zhu, et al. (2022) conducted a thorough examination of asset price volatility in China. They used the MS-AR model to distinguish between states of high and low volatility, and they discovered that liquidity has a big impact on the volatility of asset prices. The study also demonstrated how monetary policy affects liquidity regulation, with quantitative monetary policy showing a rapid response time that is consistent with its influence on the macroeconomy. In a related study, Umar, et al. (2022) used GARCH analysis to examine the effect of the Covid-19 pandemic on stock market liquidity in China and the four worst affected countries. They discovered that liquidity in stock markets across all of the sampled countries was severely impacted by the news of the outbreak. Additionally, for all investigated nations, an increase in illiquidity brought on by transient shocks quickly returns to the long-term trend, indicating that the liquidity shocks brought on by the occurrence of Covid-19 were transient.

Abdulkadir, Olatinwo and Afolabi (2022) used the autoregressive distributed lag (ARDL) bounds testing approach to explore the drivers of stock market liquidity in Nigeria and discovered that higher market performance and governmental monetary interventions increase stock market liquidity. Additionally, they discovered that although market liquidity persistence exists, but market liquidity is hindered by high price levels. Uhunmwangho and Omorokunwa (2022) investigated the link connecting volatility, liquidity, to stock returns using the generalized method

of moments (GMM), and found that volatility significantly and inversely influences returns, while stock market liquidity significantly and positively influences market returns.

Basri, et al. (2022) used the panel regression approach to examine the impact of fundamental, stock market, and macroeconomic factors on the equity premium in Indonesia and discovered that stock liquidity had no bearing on the equity premium's explanation. Alp, et al. (2022) investigated how liquidity affected the likelihood of stock price crashes in Turkey. They found that, independent of ownership, greater stock liquidity increases the chance of stock price crashes. They also noted that high-frequency trading results in more liquidity, which in turn increases the likelihood of a stock price drop. Additionally, the likelihood of stock price collapse often increases with the relaxation of short-sale prohibitions.

Hanh and Dut (2021) used the random effect model to examine the effects of bank liquidity and bank stock liquidity on the volatility of stock prices and discovered no evidence to support the claim that stock liquidity affects the volatility of stock prices for commercial banks listed on the Vietnamese Stock Exchange. Also, the existence of low-risk anomalies (LRAs) in South Africa was examined by Seetharam (2021). It discovers that LRA is present on the JSE when using univariate sorts but is not present when using multivariate portfolio sorts. It is concluded that whereas the risk-return relationship is predictable and negative under conventional proxies, it is linear under a Kalman filter.

Harrisberg (2020) used Fama-Macbeth two-stage regression to examine if the low-volatility anomaly hypothesis was true or false for the Johannesburg Stock Exchange (JSE). It was found that the low-volatility anomaly is still present on the JSE. A fair investor would accept a genuine risk-return relationship when choosing between assets that are high risk but also have a great potential for profit, according to what was learned. The idea of risk, however, does not fully represent this relationship. Abdullahi (2020) examined the stock price behavior of the banking sector in response to volatile macroeconomic variables using autoregressive distributed lag model. The study found that interest rates and foreign reserves had negative, significant effects on the stock price behavior of the banking sector in the short- and long-term, respectively. At a 1% level of significance, the inflation rate has a positive significant influence, however the exchange rate has no statistically significant impact on stock price behavior in the Nigerian stock market.

3. Methodology

3.1. Model Specification

This study used the NGX-30 index which comprises top 30 companies in terms of liquidity and market capitalisation, and applied principal component analysis (PCA) to create two composite indexes. First, stock market liquidity index which consists of liquidity depth and liquidity breadth, and macroeconomic index consisting of inflation and exchange rate. The methodology adopted in this study was the GARCH (1,1) model. Studies such as Umar et al. (2022) used this model. The model can be expressed as follows:

$$Y_{it} = \alpha_0 + \beta_0 Y_{it-1} + \beta_1 LIQIDX_{it-1} + \beta_2 MACROIDX_{it-1} + u_t \quad (1)$$

$$NGX30IDX_{it}^2 = \omega_0 + \sum_{i=1}^{q} \alpha_i \varepsilon_{it-i}^2 + \sum_{j=1}^{p} \beta_j \sigma_{it-j}^2 + \beta_1 LIQIDX_{it-1} + \beta_2 MACROIDX_{it-1} \quad (2)$$

Equation (1) represents the mean equation and includes an error term. While, equation (2) expresses the conditional variance in terms of three components: a constant; ω; the ARCH term, ε_{it-i}^2 which measures the previous period's volatility as the squared residual lagged from the mean equation; and the GARCH term, σ_{it-j}^2, which reflects the forecasted variance of the previous period.

Where, Y_{it} represents the volatility index, Y_{it-1} shows the lagged values of index risk adjusted volatility, while $LIQIDX_{it-1}$, $MACROIDX_{it-1}$ and $NGX30IDX_{it-1}$ represent the lagged liquidity composite index, lagged macroeconomic composite index and lag of the standard deviation of NGX-30 index in the mean and conditional variance equation to capture the role of liquidity and macroeconomic factors in explaining the volatility of stock prices on the NGX. β_0 represents the coefficient of the model, α_i is the coefficients of the lagged square residuals and β_j is the lagged conditional variance. The coefficients to be estimated are: α, and β respectively, with ω>0, $\alpha \geq 0$, $\beta \geq 0$, $\alpha_i + \beta_j < 1$.

This study constructed a composite index from liquidity depth and liquidity breadth with the aid of principal component analysis (PCA). The study used monthly data covering the period January 2014 to December 2021. The data used in this study were obtained from various sources, including the Security and Exchange Commission Statistical Bulletin, Central Bank of Nigeria Statistical Bulletin and www.ng.investing.com.

4. Data Presentations and Discussion of Findings

Table 1 Data Description

Variables	Average	Strd. Dev.	Max.	Min.
NGX301DX	-0.0007	0.1035	0.1595	-1.0000
LIQIDX	-0.0000	1.3888	4.4570	-1.1136
MACROIDX	0.0000	1.0000	1.8963	-1.0324

Source: Author's Computations (2023)

From table 4.1, descriptive statistics revealed that the mean for NGX30IDX is 7626.889 with the maximum at 4260.090 and minimum at -1.1136. The mean of 7626.889 indicates that the average performance of companies listed on the NGX is positive.

Table 2 Unit Root Test: H_0: Variables has a Unit Root/Non-stationery

Variables	Level			First Difference		
	t-stat	p-value	Status	t-stat	p-value	Status
NGX301DX	1.8136	0.7700	I(0)	30.0327	0.0000	I(1)
LIQIDX	1.3524	0.9119	I(0)	-4.6151	0.0000	I(1)
MACROIDX	0.2528	0.2600	I(0)	-8.1085	0.0000	I(1)

Source: Author's Computations (2023)

The results of the Augmented Dickey-Fuller unit root test are presented in Table 4.2, demonstrating that liquidity composite index, macroeconomic composite index and volatility index became stationary when the first difference was taken.

Table 3 Principal Components Analysis

Liquidity proxies				Macroeconomic proxies			
Component	**Eigenvalue**	**Difference**	**Cumulative Proportion**	**Component**	**Eigenvalue**	**Difference**	**Cumulative Proportion**
LDE	1.9215	1.8430	0.9608	INF	1.0876	1.1942	0.7985
LBR	0.0785	-	1.0000	EXC	0.9124	-	1.0000

Source: Author's Computations (2023)

The liquidity and macroeconomic composite index, produced by the principal component analysis, exhibits some favorable characteristics. First, the variables included in the final equation reflected the anticipated signs, with negative values indicating a decrease and positive values indicating an increase. Secondly, each of the variables entered the equation at the anticipated timing.

Table 4 Johansen Test for Cointegration

Series: NGX301DX, LIQIDX, MACROIDX				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5% Critical Value	1% Critical Value
None *	0.07959	11.7809	11.4947	12.3471
At most 1 *	0.0018	7.8003	3.84146	7.6349
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Stat	5% Critical Value	1% Critical Value

None *	0.07959	11.5283	11.2646	12.2222
At most 1 *	0.0018	7.7824	3.84146	7.6349

Source: Author's Computations (2023)

The rejection of the null hypothesis is demonstrated in Table 4.3 with the existence of at least one cointegrating vector indicates that the NGX's liquidity-induced volatility is stationary in at least one direction. Thus, the Johansen test suggested that there is evidence of a persistent equilibrium relationship between liquidity and volatility. Based on these results it can be said that liquidity influences volatility in the Nigerian stock market. Hence, alternative hypothesis is favoured over the null hypothesis of no cointegration, with a rejection at both 1% and 5% critical levels. This implies that, the variables exhibit a coordinated movement in the long-term.

Table 4 Estimated GARCH (1,1) Model

Dependent Variable: NGX301DX			
Mean Equation			
Parameters	**Coefficient**	**t-statistic**	**p-value**
Ω	-0.0145	-2.8655	0.0042
LIQIDX	759.64	16.90	0.0000
MACROIDX	0.0217	4.4522	0.0000
Variance Equation			
ARCH (α)	-0.0086	-4.899	0.0000
GARCH(β)	1.0056	14.755	0.0000
$\alpha_i + \beta_j$	0.9970	9.856	0.0000

Author's Computation (2023)

Table 4 displays the outcome of the GARCH (1,1) model. At a significance level of 1%, the results from the mean equation provide proof that stock volatility is positively affected by LIQIDX and MACROIDX. The significant positive effect of LIQIDX on stock volatility implies that when a stock is more liquid, meaning there is a higher trading volume, it tends to have lower price volatility. This is because there is a larger pool of buyers and sellers, making it easier to transact without significant price impact. This finding aligned with a priori expectation and the asset pricing theory. This result aligns with the conclusions drawn by Alp et al. (2021), who noted that high-frequency trading results in more liquidity, which in turn increases the likelihood of stock price instability. Also, Zhu et al. (2022) discovered that liquidity has a big impact on the volatility of asset prices moreover, the positive relationship indicates that there are sufficient buy and sell orders at various price levels, providing stability and reducing the likelihood of extreme price movements. In addition, the statistical significance of LIQIDX revealed that both liquidity depth and breadth captured the volatility persistence of the NGX. This finding is in opposition to the conclusions drawn by Saleem, Sulong and Isa (2019) who found a strong inverse relationship between volatility and stock liquidity. Also, Hanh and Dut (2022) and Gbadebo and Oyedeko (2022) found no evidence to support their claim that stock liquidity affects stock volatility. The reason for this discrepancy could potentially be attributed to various factors such as methodology used, estimation techniques, frequency of data, domiciled country, time period analyzed, and the adoption of best practices within the financial system.

Similarly at 1% level of significance, the results showed that MACROIDX has a significant positive impact on volatility, implying that changes in macroeconomic factors, specifically inflation and exchange rate, are associated with increased stock price volatility. This suggests that fluctuations in macroeconomic indicators can lead to higher volatility in the stock market. This aligns with the notion that macroeconomic conditions and events can influence market dynamics and introduce uncertainty, ultimately affecting stock price movements. This finding aligned with a priori expectation and the asset pricing theory. This result aligns with the conclusions drawn by Wang (2022) who demonstrated liquidity has significant positive impact on volatility. Also, Ochenge, et al. (2020) discovered that Kenya's stock market liquidity is strongly explained by changes in exchange rate variations.

One the other hand, findings obtained from the analysis of conditional variance indicate that the conditional volatility of stock liquidity is influenced by both their own prior shocks and the past conditional volatility. The statistical

significance of the coefficients for the ARCH (α) and GARCH (β) parameters has been established. Moreover, the sum of α + β is almost equivalent to one, indicating the stability of the GARCH (1,1) model. This is an indication of high persistence of volatility, that is, stock liquidity in the previous periods affects the current period's volatility. This shows the importance of unexpected shocks generated by liquidity in explaining the volatility of the NGX. Likewise, the positive and statistically significant coefficient of the GARCH parameter (β) suggests the existence of volatility clustering in the NGX, while the persistence parameter (α + β) is close to unity, showing an evidence of volatility persistence in the NGX. Furthermore, it is worth noting that all the parameters are statistically significant. This implies that the current volatility can be explained by past shocks, with previous period's volatility being the primary contributor. Any shock to current volatility will have an impact on the anticipation of volatility for numerous periods in the future.

5. Conclusion

In conclusion, this study concluded that stock market liquidity and macroeconomic indicators have significant positive effects on stock volatility. Also, conditional variance provided evidence that conditional volatility is influenced by individual past shocks, and respective past volatilities. Thus, high or low level of stock liquidity can stimulate volatility on the NGX.

Drawing from the results of this study, it was recommended that:

- Investors should incorporate liquidity considerations into their risk management strategies, recognizing that highly liquid stocks are generally associated with lower volatility, offering better execution opportunities; and vice versa.
- Investors should diversify their portfolios by combining highly liquid and less liquid stocks to balance the risk across different liquidity profiles.
- In addition, policymakers should invest in technologies and market infrastructure to facilitate faster and more efficient trading, as well as implement policies that incentivize market makers to provide liquidity by offering rewards and reducing regulatory barriers.

Compliance with ethical standards

Disclosure of conflict of interest

Authors declare that there are no conflicts of interest regarding the publication of this paper.

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