

Re-examining the Effect of Volatility Persistence on Nigerian Stock Market Returns: Mean-Revert Garch Approach

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Abstract: The investment decision in the Nigerian stock is based on the level of volatility of the market. However, the volatility persistence of stock returns in the Nigerian market has negatively affects the participation of investors in the market. This study re-examined the effect of persistent volatility on the prices of the stocks in the Nigerian market between 2008 and 2018. With the use of ARCH and GARCH estimations, the study revealed three distributional assumptions with the co-efficients as (0.897, 0.939 and 0.956) revealing that the returns exhibit high volatility persistence at different selection criterion models. It concludes therefore, that the Nigerian stock market exhibits high volatility persistence. Hence, the study recommends that the regulators in the Nigerian stock market should model the regulatory framework guiding the operations in line with emerging markets with less volatile stock returns.

Keywords: Revert in Mean-GARCH Model; Stock Return; Volatility Persistence and Nigerian Capital Market

JEL Classification: G1; G4

1. Introduction

Stock exchange market being essential component of financial system contributes significantly to an economy capital formation and wealth creation. Stock market volatility has been one of the risk factors investors deliberated before taking stock investment decisions. Stock investors across the globe viewed volatility trend in the stock market as burden of uncertainty in stock returns. Ndigwa and Muriu (2016) emphasized that persistent volatility in stock prices trigger unpredictable stock market and returns.

Furthermore, the existence of volatility risk has created the challenges of less capital investment in stock market, market-making exposure, dispirits investors from holding stocks and unstable stock returns. The volatility in stock returns is exhibited by the varying conditional variance of the stock returns. In high volatile stock exchange markets, it is arduous for quoted firms to raise capital as rational investor prefers less volatile stock market as case may be, except for the risk lover investors.

Consequently, the challenge of volatility spread in risk-return is common in both developed and emerging stock markets leading to unpredictable market trends and returns. Stock market volatility trend determine economic activities, stock performance and investors' patronage. Evidence of persistent volatility in the market negatively affects investors' confidence and this push down investors' interest in stock market investment; resulting to unstable returns. Stock return volatility propelled variability in stock prices which could result to risk associated with investment.

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Atoi (2014) pointed out that Nigerian stock market, broad price index drops consistently from 66,371 point in March 2008 to 22,349 point in January in 2009, Likewise market capitalization drops from N12.640 trillion in March 2008 to N4.836 trillion in January, 2009. This indicates that the broad index lost about 67% point and market size of about 62% in its value. In September, 2018; All Share Index drop from 32,763 point to 32,383 point in October, 2018, likewise market capitalization drop from 11.961 trillion in September, 2018 to 11.822 trillion in October, 2018. This downward stock market indices are majorly caused by stock market news or rumor, unexpected information thus increases variability and unpredictable stock prices in the Nigerian Stock Market.

Onoh, Ukeje and Nkama (2017) argued that stock returns in Nigerian stock market exhibit volatility clustering, leptokurtosis and asymmetry which in turn reduced investors' confidence. Moreso, the subsistence of high level of volatility undermines the usefulness of stock returns prognostication of the Nigerian stock market and firm value. The major causes of the Nigerian stock market volatility are market news or rumor, unexpected information that affects expected returns and trading volume; which are driven by the modification in regulatory economic policies, shift in the level of investors' risk tolerance and increased in unpredictability in the market. This study is set out to re-examine the persistence of volatility on the Nigerian stock returns between 2008 and 2018. Accordingly, the objective was subjected to hypothetical analysis.

2. Literature Review

Various studies such as Tripathy and Gil-Alana (2010), Onwukwe, Bassey and Isaac (2011), Goudarzi and Ramanarayanan (2011), Bala and Asemota (2013), Dikko, Asiribo and Samson (2015), Uyaebio, Atoi and Usman (2015), Owidi and Mugo-Waweru (2016), Adewale, Olufemi and Oseko (2016), Ariwa, Ani, Onyele, Ekeleme and Okwuchukwu (2017), Kuhe and Chiawa (2017), Fasanya and Adekoya (2017), Oyinlola (2018), and Kuhe (2018), have investigated stock returns volatility within and outside Nigeria. There is sufficiently empirical literature on nexus between volatility and returns in the Nigerian stock market, but it seems that studies on persistence volatility in the Nigerian market after global financial meltdown are scarce.

Ghufran, Awan, Khakwani and Qureshi (2016) are of the opinion that persistent volatility in the market are directly associated with inflation and interest rates volatilities, while other factors such as money supply, current account deficit and industrial production are indirectly associated with volatility persistence in the stock markets. They further suggested that stock trades' volume causes asymmetrical volatility due to reaction to trade volume and stock price fluctuation. Furthermore, Ariwa *et al.* (2017) found that the volatility persistence in Nigerian stock market are majorly due to market news, unstable stock prices and loss of investor's confidence which reduces investors participation and liquidity in the Nigerian stock market. The available extant literature identified market maker and weak regulatory framework associated with persistent volatility in the Nigerian stock market.

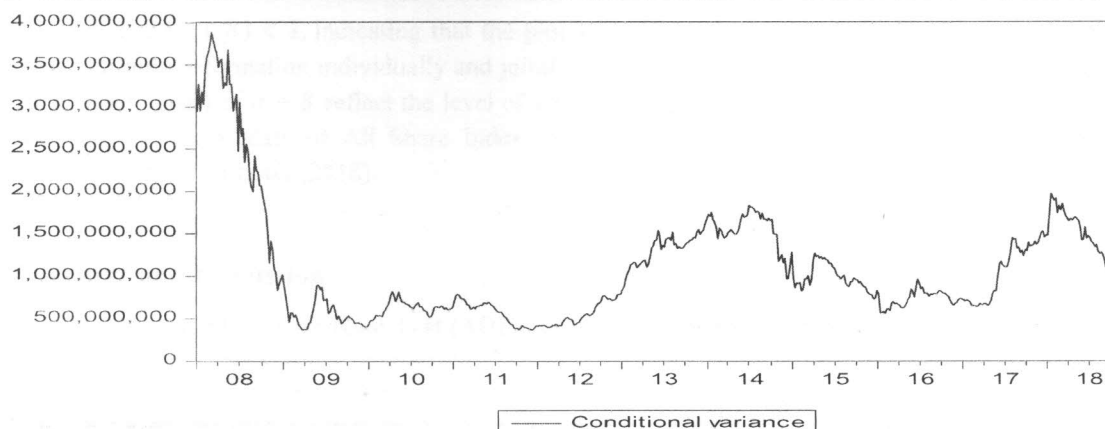


Figure 1. Persistence volatility in the Nigerian Stock Market between 2008-2018

Thus, this study is informed as a result of paucity of studies on persistent volatility in the Nigerian Stock Market. Engel (1982), Bollerslev (1986), Taylor (1986) and Hojatallah and Ramanarayanan (2011) pointed that to capture volatility persistent in the stock market, mean reverting form of GARCH model is more appropriate method in capturing volatility persistent in the capital market therefore, the need for mean-revert GARCH approach for this study.

3. Theoretical Framework

This study is built upon efficient market hypothesis. The main proponent of the hypothesis was Bachelier in 1900, but extended by Samuelson in 1965 to suit behavioural finance. The hypothesis was developed on the principle of “random walk” in explaining the state of stock efficiency under the condition of zero-profit equilibrium in classical assets pricing theory. Asset pricing theory demonstrates the pricing behavior in terms of level and types of information available in the market that might influence changes in the prices of assets. Based on the types and available information, efficiency of stock market can be classified into weak form of market efficiency; semi-strong of market efficiency; and strong form market efficiency. This study is specifically built on weak form of market efficiency where all historical prices are fully built in the current market price of assets, hence, does not give room for prediction of future prices through analysis of historical price sequence. Ho and Hung (2012) are of the opinion that successive prices were random in nature such that price of previous trading does not affect the current price of returns in the market.

4. Methodology

This study employed mean-reversion GARCH model given as;

$$\varepsilon_t^2 - \omega^2 = (\alpha + \beta)(\varepsilon_{t-1}^2 - \omega^2) + \mu - \beta\mu_{t-1} \text{ ----- Eqn 1}$$

Where: $\omega^2 = \theta / (1 - \alpha - \beta)$ is the unconditional long run magnitude of volatility persistence.

$\mu_t = (\varepsilon_t^2 - \sigma_t^2)$. The mean reverting rate $\alpha + \beta$ in a good fitted model is usually close to one which controls the magnitude of mean reversion (volatility persistence). The *A Priori Expectation* is that;

$\alpha, \beta > 0$ and $(\alpha + \beta) < 1$, indicating that the past squared residual of the mean return and the past return variance information individually and jointly cannot influence the current return variance while the addition (sum) of $\alpha + \beta$ reflect the level of volatility persistence in returns. This study employed secondary weekly data of All Share Index from 1/8/2010 to 10/26/2018 sourced from Nigeria Stock exchange fact book (2018).

5. Results and Discussion

Table 1. Unit Root Test (ADF) Result of ASI between 2008 and 2018

		t-Statistic	Prob.*
		-19.35938	0.0000
Test critical values:	1% level	-3.978221	
	5% level	-3.419664	
	10% level	-3.132445	
*MacKinnon (1996) one-sided p-values.			

Source: Computation (2019)

Table 2. Unit Root Test (PP) Result of ASI between 2008 and 2018

		Adj. t-Stat	Prob.*
		-19.35169	0.0000
Test critical values:	1% level	-3.978221	
	5% level	-3.419664	
	10% level	-3.132445	
*MacKinnon (1996) one-sided p-values.			

Source: Computation (2019)

The unit root test result of the ASI return series after the global financial crisis covering the periods between 1/8/2010 to 10/26/2018 as presented in Table 4.1 indicating that P-Value of 0.000 under ADF and PP test statistics meaning the null hypothesis is rejected i.e return series after global financial crisis has no unit root at 5% level of significance (See Table 1 and 2).

Table 3. ARCH Effect Result of ASI Return during and after Global Financial Crisis

Test Statistics	Value	P-value
F-statistics	7.627623	0.0021
Observed R ²	7.618933	0.0011

Source: Computation (2019)

The ARCH effect test on the residual of the mean equation of whole ASI return series is shown in Table 3 with F-Statistics and the observed R² values having correspondence P-Value of 0.0021 and 0.0011 respectively, this indicate that the null hypothesis of no ARCH effect is rejected i.e there is ARCH effect in the residual of the mean equation of ASI return series on the Nigerian stock exchange market after global financial crisis.

Table 4. Mean Reversion Estimate for All Share Index (ASI) Return during and after Global Financial Crisis

Parameters	Gaussian Distribution Estimate	Student's t Distribution Estimates	Generalised Error Distribution Estimate
α	0.321832	0.352812	0.281234
β	0.575234	0.586435	0.675317
Total	0.897066	0.939247	0.956551
Half-Life Estimate	8.763241	7.854632	7.487453
AIC	-5.352641	-5.531243	-5.581074
SC	-5.183487	-5.534679	-5.643531
HQ	-5.120543	-5.327643	-5.478932

Source: Computation (2019)

Table 4 depicted the sum of the estimated ARCH and GARCH co-efficient (persistence co-efficient) for the three distributional assumptions as 0.897, 0.939 and 0.956 which is systematic response function to shock indicating that volatility is highly persistent. The ASI return series in the Nigerian stock market between 2008 and 2018 do not follow random walk, hence returns series is mean reverting. The volatility half-life estimate is approximately 9 weeks under the Gaussian Distribution Assumption, 8 weeks under Student's t Distribution Assumption and 7 weeks under Generalised Error Distribution Assumption. The ASI volatility have long memory but it is still mean reverting such that new shock will affect the price of returns in the Nigeria stock market for the period of 7, 8 to 9 weeks between 2008 and 2018 depending on the distributional assumption used. The generalized error distribution estimates appears to have the lowest values among the model selection criteria suggesting that the estimates under the generalized error distribution provide the best prediction on the magnitude of volatility in ASI returns in the Nigerian stock market after the global financial crisis. In summary, the ASI returns exhibit high persistent volatility between 2008 and 2018.

5. Conclusion

The study concludes that All Share Index returns exhibit high persistent volatility between 2008 and 2018. Based on the findings, this study recommends that:

- i. The Nigerian Stock Exchange regulators need to review the seemingly weak listing requirements towards achieving stock market that accommodates different risk-classes of investors in the markets.
- ii. The trading rules and regulations in the Nigerian stock market should be modelled and aligned with some of the emerging stock market that were less volatile.
- iii. The Nigerian stock market regulators should institute a vibrant audit committee to oversee and review the financial statements of companies to be listed in view to monitor their performances. Also, Nigerian stock market regulators should provide a platform for information dissemination and make available software application to the public in order to enhance ease accessibility of market information which in turn enhances investors informed investment decisions on stock market. This will lead to an increase in investors' confidence, patronage, high liquidity and reliable stock market.

Acknowledgement

I acknowledge the effort of Mr. Segun Fakunmoju Kamoru who is my research assistant and P.hD. supervisee for the sourcing of material and data used for this study

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