UNIVERSITY OF PORT HARCOURT JOURNAL OF ACCOUNTING AND BUSINESS
DEPARTMENT OF ACCOUNTING
UNIVERSITY OF PORT HARCOURT, CHOBA
PORT HARCOURT, RIVERS STATE
NIGERIA
VOL. 7 NO. 1 DECEMBER 2020

ANALYSIS OF STOCK PRICE VOLATILITY ON STOCK MARKETS: EVIDENCE FROM NIGERIA

JOHN AYODELE AJAYI
Department of Finance,
Faculty of Management Sciences,
University of Lagos-Akoka, Nigeria

Abstract

Volatility plays significant roles in many financial decisions because changes in stock prices affect investment and risk management decisions. Based on the above, this paper examined the effect of stock price volatility on the Nigerian stock market with particular emphasis on all share index volatility, market capitalization and inflation rate in Nigeria. Econometric techniques of Autoregressive Distributed Lag (ARDL) and Autoregressive Conditional Heteroskedacity (ARCH) methods were employed to analyse the data sourced from the Central Bank of Nigeria Statistical Bulletin and Nigerian Stock Exchange Fact Book for the period 1997 to 2018. Findings from the study showed that there is a positive relationship between stock price volatility and market capitalization implying that stock price volatility has significant effect on the Nigerian stock market and an inverse relationship between stock price volatility and inflation rate. The study recommends that regulatory authorities should keep abreast of the level of volatility in the stock market so as to bring profitable investment to investors in the market.

Keywords: Volatility, Stock Price, Nigerian Stock Market, ARDL, ARCH.

Introduction

The pivotal role of the stock market is to serve as a fund raising channel for the deficit side of the economy and a return boosting channel for the surplus side of an economy who deems it fit to reserve part of their income to make extra returns from the stock market by investing in the securities available for sale in the market (Junkun, 2012). A sound functioning stock market will contribute to the development of an economy through two important channels; namely, boosting savings and allowing for more efficient allocation of resources. Since firms create an enabling environment for business transactions, the stock market enhances the easy and efficient acquisition of capital to companies operating in the economy.

However, volatility plays a very significant role in many financial decisions, because changes in stock prices affect investment and risk management decisions. The frequent changes in prices of securities in the market are perceived as hazardous to the market in a way that makes the market difficult to bounce back to its previous position (Ojong et. al, 2015). The main quandary with price instability that affects the stock market competence is the surplus fluctuations that end up in crashes in financial markets.

The intention of a rational investor is to maximise his wealth which thereby gives room for making judicious financial decisions on the best way to invest the remnant of his income. Volatility is the unavoidable market phenomenon that reflects on fundamentals of finance,

information in the market and investor expectations (Wafula, 2016). The level of share price volatility may lead to an unpredictable outcome. For instance, high volatility of a share is related to greater risk. Investors, who are risk averse, are likely to avoid the market due to the unpredictable nature of the expected returns, which may negatively impact the performance of the market and may adversely affect the economy in general.

The efficient flow of information and the level of awareness of investors in a market positively impact the trading volume and consequently the trading value. Trading volumes would be affected drastically if investors shy away from an asset deemed to be highly volatile (Onakoya, 2013). Prices of securities which grow steadily tend to be less volatile and thereby become attractive to long-term investors. This results into low trading volumes and a more inefficient stock market. Due to the discovery of a link between volatility and risk, volatility can form a basis for efficient price discovery. This then triggers the intent of this study.

This study therefore seeks to investigate the extent at which stock price volatility affects the trading volume, market capitalisation and inflation rate in the Nigerian stock market. The remainder of this paper is organized as follows. Part 2 discusses the literature review as well as theoretical framework. Part 3 examines the methodology of the paper while part four presents the empirical results and findings. Part 5 which is the last and final part concludes the paper.

Literature Review and Theoretical Framework

Salamatu, et al (2019) examined the impact of calendar anomaly and stock price volatility on the performance of stock market in Nigeria using econometric technique. Findings from the study showed that calendar effect anomaly has negative and significant impact on stock market returns in Nigeria. In addition, stock price volatility has negative and insignificant effect on performance of stock market returns in Nigeria. Impliedly, the results from their study are mixed.

Onthatile (2017) posits that stock price volatility is a common phrase that speaks to the fluctuations in stock prices and by extension, stock returns. Milan and Peter (2018) investigated the relationship between volatility of the equity market and the oil market, both for implied and realized volatilities using wavelet methodology. Results from their study showed that implied volatility of the stock market leads the implied volatility of the oil market, whereas no such relationship is observed for realized volatilities.

Hussainey et al. (2011) examined the impact of dividend policy on stock price volatility using the price data from London Stock Exchange in United Kingdom. In their analysis, dividend yield and dividend pay-out ratio were the main independent variables, while price volatility was the dependent variable. In order to mitigate the impact from other unknown factors, firms' growth rates, leverage, size, earnings were also the other controlling variables of the study. Ten years' data was used in the analysis. They concluded that dividend pay-out has a negative relationship with price volatility and their findings were in line with Baskin's analysis, in that dividend yield has shown a positive but insignificant relationship with share price volatility.

Volatility in its most basic form represents daily changes in stock prices. Volatility is the degree of variation of a trading price series over time as measured by the standard deviation of logarithmic returns. It refers to the amount of uncertainty or risk related to the size of changes in a security's value. A higher volatility means that a security's value can

potentially be spread out over a larger range of values. This means that the price of the security can change dramatically over a short time period in either direction. A lower volatility means that the price or value of a security does not fluctuate dramatically and tends to be steadier. One measure of the relative volatility of a particular stock to the market is its Beta (Antonov et. al, 2015).

Grzelak and Oosterlee (2016) identified the types of volatility in the literature to include stochastic, implied, local volatilities amongst others. The types of volatility affecting stock prices performance include historical and implied volatility.

Theoretical Framework

Efficient Market Hypothesis

Fama (1970) in his research work titled "Efficient Capital Markets: A Review of Theory and Empirical Work" developed the Efficient Market Hypothesis which rests on the premise that prices of stocks include all information available such as company announcements by which no investment strategy utilized can result in abnormal profits. The efficient market hypothesis (EMH), presupposes that current information is immediately included in prices of shares such that no extra profits can be made using the information. Efficient Market Hypothesis postulates that a market that is efficient is both internally and externally efficient; thus, the price of assets at any point include all information on the asset, expected future cash flows and the uncertainty involved in investing in that security (Mgbame and Ikhatua, 2013).

The efficiency of the stock market is defined at three levels, namely- the weak, semi-strong and strong forms. According to Fama (1991), the weak form of market efficiency proposes that current stock prices reflect all past information. It also suggests that changes in stock prices are random and that no investment strategy that is based on past information can yield above returns to the investor. This implies that technical analysis will not be rewarded with above average returns.

The weak form of market efficiency has prevailing prices of securities include every past information available including a historical sequence of prices, market return, market capitalization and information from the market (Ilaboya and Aggreh, 2013). The semi-strong form of market efficiency otherwise known as informational efficiency proposes that current stock prices incorporate all material public information about the firms issuing the security. This implies that fundamental analysis will not be rewarded with above average returns (Ajayi and Ogbulu, 2018).

The strong form of market efficiency proposes that insider trading will not be rewarded as current stock prices incorporate all material public information as well as insider information. Efficient Market Hypothesis applies rationality to asset pricing in the markets. Prices of all securities include all available information in an efficient financial market, thereby, eliminating opportunities for abnormal profits (Praptiningsih, 2011). The logic of efficient market hypothesis is based on the premise that information flows fluently and get immediately included in the current share prices such that tomorrow's price changes are only affected by information that emerges tomorrow (Malkiel, 2005).

From an investor's point of view, stock market participants cannot use the information they have to generate abnormal profits. Besides, the efficient market hypothesis holds that information changes affect share prices. Thus, stock price volatility keeps changing as new information flows into the market hence, may negatively impact the performance of the market as news keep arriving and the ensuing response of traders.

Capital Asset Pricing Model (CAPM)

Sharpe (1964) proposed Capital Asset Pricing Model which uses a single factor, Beta, to price assets. Regarded as the first asset-pricing model, the model presupposes that single factor guides share prices or expected performance. Capital Asset Pricing Model laid the foundation of asset pricing given the simplicity and appealing nature of the model to users. Empirical investigations revealed that an investor can reduce the portfolio risk returns by selecting inversely related assets (Otweyo, 2014). This model as proposed by Sharpe considers market risk as the only source of risk while ignoring other sources.

Capital Asset Pricing Model presupposes that investors are rewarded by taking market-related risk and not company related risks. The argument for this is that a firm's specific uncertainty can be avoided. Capital Asset Pricing Model breaks the total risk into two, namely; systematic and unsystematic risks. This model concerns itself with market specific risk that is given a beta coefficient. The market uncertainty is the main risk that capital asset pricing model deals with usually calculated using the beta coefficient. The model rests on some assumptions, namely; that there is the risk-free rate of return, taxes don't exist, and investors are risk averse amongst others (Ouma and Muriu, 2014).

Arbitrage Pricing Model

Ross (1976) developed the Arbitrage Pricing Theory due to the limitations of earlier asset pricing theories. This theory establishes the theoretical framework to relate stock returns with several variables, which can affect the source of income volatility (Shrestha and Subedi, 2014). Arbitrage Pricing Theory's ability to include multiple factors in the model has made it influential in the pricing of assets. Arbitrage pricing theory's multi-factor model has investor believe that the probabilistic nature of returns is well captured in the structure of the factors in the model (Mutuku and Kirwa, 2015). The Arbitrage Pricing Theory employs macroeconomic or fundamental factors in the pricing of financial assets. These factors are weighed by factor loading which is the beta coefficient sensitivities (Otweyo, 2014). The Arbitrage pricing theory rests on the premise that in an efficient financial market, arbitrage process should be possible. Arbitrage Pricing Theory further assumes some factors which make returns of security to deviate from expectation.

These factors are market and sector related and they contribute to performance of stocks. This multi-factor model was created with the assumption that some factors guide the performance of the stock market. These include sector related and relevant macroeconomic forces (Gatuhi, 2015). Arbitrage pricing theory model assumes that several industry-specific and broader macroeconomic factors exist that impact asset returns besides the beta. Market Beta is the sensitivity of some particular assets to the shifts in returns, on which Capital Asset Pricing Model is anchored, such as the Gross Domestic Product, the rate of inflation and composition of rates of interest and so on, which could impact organizations in several ways (Tripathi and Seth, 2014).

Arbitrage Pricing Theory proposes better results comparatively to Capital Asset Pricing Model because it used multiple factors for explaining shared and systematic risk (Hassan and Awais, 2015). The Arbitrage Pricing Theory, as opposed to Capital Asset Pricing Model, accepts that various types of risks impact an asset's expected return and stock market performance (Ouma and Muriu, 2014).

One striking feature of the literature reviewed above is that there is no consensus among the various works hence this serves as the gap that this study intends to fill.

Research Hypotheses

The following hypotheses are formulated and tested for the study.

H_{O1}: There is no significant relationship between stock price volatility and market capitalisation in the Nigerian stock market.

H_{O2}: There is no significant relationship between stock price volatility and inflation rate in the Nigerian stock market.

Methodology

Nature and Source of Data

The study made use of daily data from January 1997 to December, 2018. Data for the study were sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin, Nigerian Stock Exchange Fact Book amongst others.

Model Specification

The researcher employed the Autoregressive Distributed Lag (ARDL) also known as Bounds Cointegration test model and Autoregressive Conditional Heteroskedasticity (ARCH) to evaluate the relationship between stock price volatility and the Nigerian stock market. In specifying the model, the all share price index is used as a proxy for stock market behaviour.

$$\Delta logASI = \alpha_0 + \alpha_1 \Delta logCAP_t + \alpha_2 \Delta logINF_t + \alpha_3 \sum_{k=1}^{p} \beta i \ \Delta logCAP_{t-k} + \alpha_4 \sum_{k=1}^{q} \mu i \ \Delta logINF_{t-k} + e_t \quad ---(1)$$

Where:

Δ Log ASI = log of All share index
Δ Log CAP= log of market capitalization
Δ Log INF = log of inflation
α_0 = constant
α_1 to α_4, βi, μi = model parameters
e_t = stochastic error term

Estimation Techniques

Tsay (2005) noted that the form in which variance evolves over time distinguishes one volatility model from another. Conditional heteroscedasticity models are however classified into two, which include the class that uses exact functions to govern evolution of δ_t^2, while the second category uses stochastic equations to describe δ_t^2. The ARCH family belong to the second category. Thus, the above ARCH specifications were used to generate the volatility series of stock prices in the study. After which, the trend of the variables was analysed using graphical and visual methods of analysis. Finally, pre-estimation, estimation and post-estimation were conducted to determine the interactions between the Nigerian Stock Exchange and stock price volatility.

Unit Root Tests

Prior to modeling the stock price volatility series, the study determines the order of integration of the variables. The model applies the Augmented Dickey Fuller (ADF) test based on the following regression:

$\Delta y_t = \varphi + \beta_t + \alpha y_{t-1} + \sum_{i=1}^{k} d_i \Delta y_{t-1} + \mu_t$ …….. (2)

Where:

μ_t = white noise

$\Delta y_{t-1} = y_{t-1} - y_{t-2,}$

$\Delta y_{t-2} = y_{t-2} - y_{t-3}$

Equation (3) below tests the null hypothesis of whether there is unit root at trend, intercept and non-stationary alternative. The Phillip Peron (PP) test was conducted on the return series. The PP test is computed from the equation below:

$y_t = \delta_t + \gamma y_{t-1} + \gamma \Delta y_{t-1} + \ldots\ldots + \gamma_p \Delta y_{t-p} + \mu_t$ …… (3)

Where:

$\delta_t = 0, \varphi \; or \; \varphi + \beta_t$

Empirical Results and Findings

Table 1: Descriptive Statistics

	ASI	CAP	INF
Mean	-0.386	4543.167	1.025
Median	-0.097	2566.400	0.821
Maximum	0.982	14027.700	8.709
Minimum	-2.376	103.000	-6.459
Std. Dev.	0.775	4355.950	1.781
Skewness	-0.465	0.540	0.538
Kurtosis	2.120	1.840	6.760
Jarque-Bera	18.056	27.513	167.615
Probability	0.000	0.000	0.000
Sum	-101.798	1194853.000	269.688
Sum Sq. Dev.	158.013	4.97E+09	831.419
Observations	264	264	264

Source: Author's computation with the aid of E-views (2019).

Table 1 presents the statistical description of the selected variables which are volatility series of all share index (ASI), market capitalization (CAP) and inflation rate (INF). In the period under review, the mean statistic indicates that ASI, CAP and INF average -0.386, ₦4,543.17 billion and 1.025% respectively, while the mid observations of these variables when subjected to magnitude arrangement from lowest to highest, or vice-versa, are -0.097, ₦2,566.4 billion and 0.821% respectively.

In addition, except ASI that is negatively skewed, other series are positively skewed, thus indicating that they have a long right tail. The kurtosis statistic indicates the peakedness or flatness of the series. None of the variables appear to be mesokurtic judging by the kurtosis statistic, implying their relative non-normalities (as later revealed by the Jarque-Bera statistic). Specifically, both ASI and CAP are platykurtic since their kurtosis values are lower than the threshold of 3, while INF is leptokurtic as its kurtosis value is greater than 3. Meanwhile, both kurtosis and skewness statistics cannot singularly provide information relating to the normal distribution of a series, hence, the Jarque Bera statistic combines Skewness and Kurtosis properties to give a more reliable result. Therefore, following the probabilities of the Jarque-Bera statistic being lower than the maximum of

10% significance level, the null hypothesis of normality of the series is rejected, thus indicating that the series are not normally distributed.

Graphical Analysis

Graphical illustration shows the movements, trends, fluctuations, structural breaks and discontinuities in the series. The figures below show the graphical expression of the variables. The trends in the variables are captured in Figures 1 and 2. Figure 1 shows the trend in the volatility series of the all share index and market capitalization. There is no gainsaying the fact that they strongly moved in a positive version, especially before the emergence of the global financial crisis of 2008. A critical point of note from the graph is that the rising trends in the series became halted by a drastic fall around mid-2008. This was supposedly caused by the global financial crisis of the same year. This crisis paralyzed several financial transactions in many financial markets of the world. Nigeria was not an exception, as the spill-over of the crisis was observed by her financial markets (money and capital). The extent of the effect of this crisis was seen in the periods after 2008 when both series could not positively relate. Also, it is even seen that after the fall in 2008, the trends of the capital market variables have been significantly fluctuating, thus implying that the market appears not to have been fully recovered from the impact of the shock of the crisis.

Figure 2 reveals the trends of volatility series of the all share index and inflation, the latter experiences high fluctuation followed by mild fluctuation, especially after 2010. In all, whether or not stock market volatility (captured by all share index volatility) drives market capitalization and inflation is yet to been determined as this cannot be captured by mere graphical illustration.

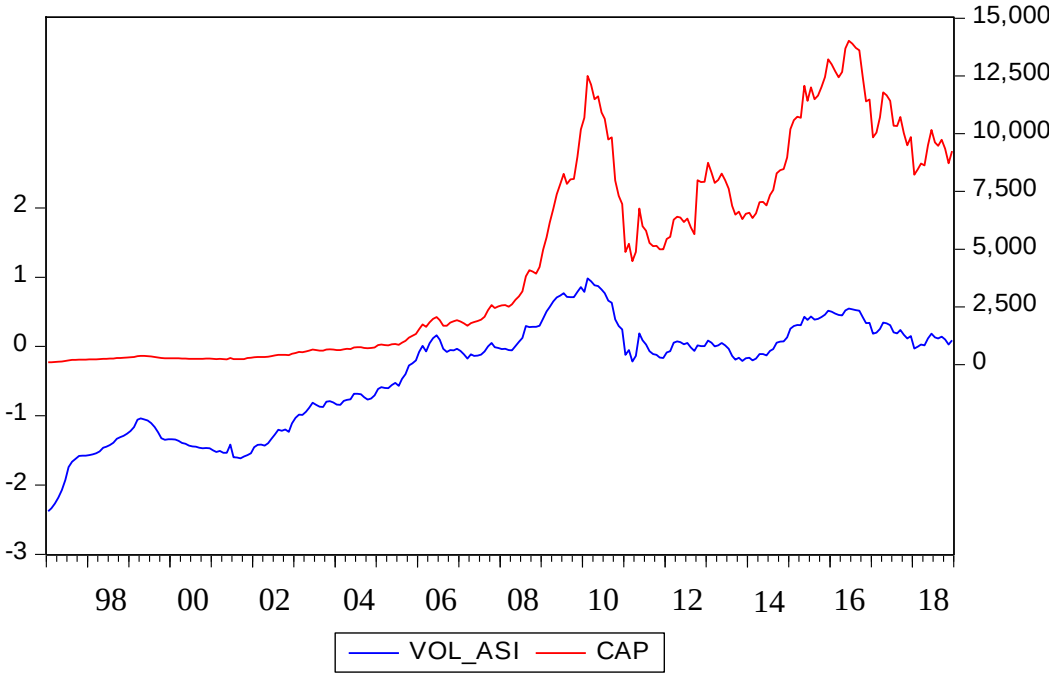

Figure 1: Relationship between Volatility Series of All Share Index and Market Capitalization

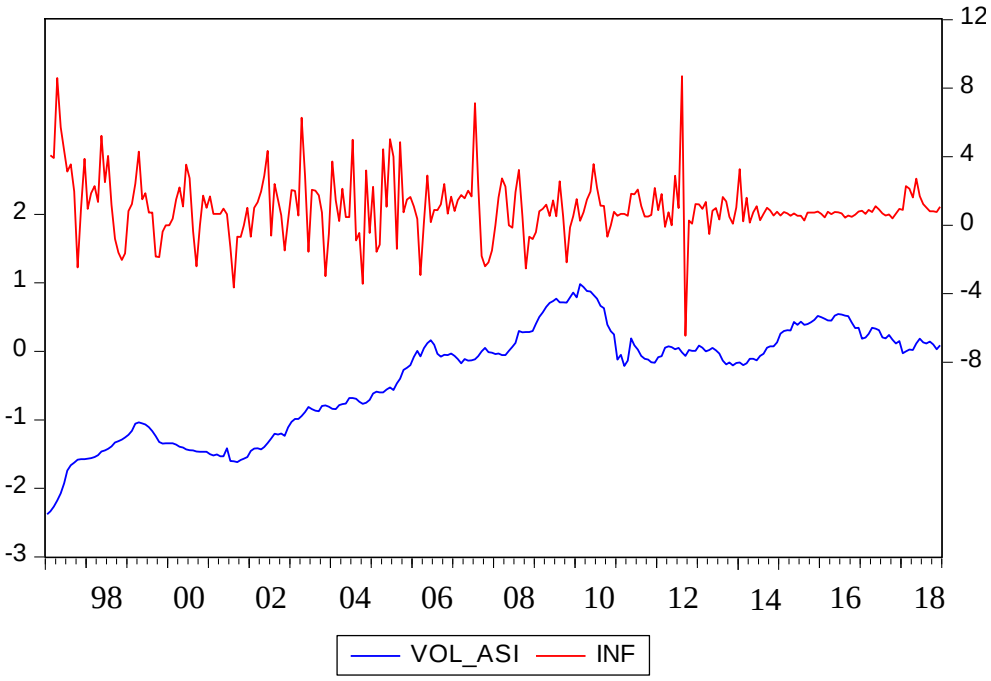

Figure 2: Relationship between Volatility Series of All Share Index and Inflation

Unit Root Test

To determine the order of stationarity of the series, the Augmented Dickey-Fuller unit root test was applied. The results are presented in Table 2. Expectedly, volatility series of all share index and inflation observe stationarity at level for all the unit root models (models without intercept, with intercept, and with intercept and trend), except the former that is not trend-stationary. However, market capitalization is not stationary at level, until it is differenced once. It can therefore be concluded that the series have mixed integration order, that is, I(0) and I(1). This necessitates the need to check if they observe long-run relationship, since non-stationary series can either be cointegrated or produce spurious results.

Table 2: Augmented Dickey Fuller Unit Root Test

Variable	LEVEL			FIRST DIFFERENCE			I(d)
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	
Log (ASI)	-3.656*	-2.949**	-1.675	--------	---------	---------	I(0)
Log (CAP)	3.263	-2.227	-0.690	-13.100*	-13.671*	-13.840*	I(1)
Log (INF)	-7.120*	-12.796*	-12.869*	-------	-------	--------	I(0)

Source: Author's computation with the aid of E-views (2019)

****, ** and *** indicate significance at 1%, 5% and 10% critical levels respectively. The 1, 5 and 10 percent critical values are -2.574, -1.942 and -1.616 for Model 1, -3.455, -2.872 and -2.573 for Model 2 and -3.993, -3.427 and -3.137 for Model 3 respectively. Models 1, 2 and***

3 are unit root tests without intercept and trend, with intercept and with intercept and trend respectively.

Cointegration Test

As a result of the mixed order of integration of the series under the unit root above, the ARDL Bounds cointegration test proves most appropriate to determine if there is long-run relationship between stock price volatility and market capitalization of the variables. The test provides two critical values to be checked against the F-statistic value in order to make conclusion on either the rejection of the null hypothesis of no cointegration among the series, or otherwise. If the F-statistic exceeds the upper critical bound, that is, I (1) bound, at the chosen significance level, then the null hypothesis is rejected. If the F-statistic gives a value below the lower critical bound, that is. I(0) bound, the null hypothesis is not rejected. It is inconclusive, if it falls between the I(0) and I(1) critical bounds.

As shown in Table 3 below, the F-statistic value of 7.5 is greater than the upper critical bound even at the 2.5% significance level (6.68). Hence, there is an established long-run relationship among the variables. Following this cointegration test result, the study presents both the short run and long run estimates of the ARDL estimation technique.

Table 3*:* ARDL Bounds Cointegration Test

Test Statistic				
F-Statistic		7.50		
Critical Value Bounds				
Significance	10%	5%	2.5%	1%
I(0)	4.04	4.94	5.77	6.84
I(1)	4.78	5.73	6.68	7.84

Author's computation with the aid of E-views (2019)

Model Estimation Result

Two models are basically estimated in this study, following the two proxies for the stock market, that is, market capitalization and inflation. The results of the unit root and co-integration tests reported and discussed above determines which type of regression model is considered for each estimation. The first fold of estimation which determines the effect of stock price volatility on market capitalization is carried out using both short-run model (error correction model) and long run (static) model within the framework of the Autoregressive Distributed Lag (ARDL) technique which has the ability to deal with series with mixed integration order, but at the maximum of first difference. The second model, which is meant to establish the effect of stock price volatility on inflation, simply considers the simple ordinary least square due to the level-stationarity of both series.

Results for Model 1 (Market Capitalization (CAP)

Table 4 below presents the short- and long-run relationship between all share index volatility and market capitalization. It is discovered that one of the principal drivers of market capitalization in Nigeria in both short-run and long-run is stock price volatility. Volatility in the Nigerian stock market has a great implication on the size of the stock market, often measured by the market capitalization that explains the size of the firms listed on the stock market. Meanwhile, the impact is positive, thus indicating that the more

volatile the stock price is, the higher the level of market capitalization. This is in line with the works of Salamatu et. al (2019), Chege et. al. (2014), Bikker et al (2010) amongst others. The reverse is also the case if the stock price volatility is erroneously reduced. In specific terms, a 1% rise in the level of stock price volatility (proxied by the all share index volatility) will increase market capitalization by about 1.032% in the short-run and 2.25% in the long-run, and vice-versa.

These results are not totally unexpected. This is because in a sound and well-functioning financial system, the stock market is often volatile and as such, entices investors. For clarity, high volatility in a financial market indicates that it is efficient as it creates opportunities for good speculation and high returns. In light of this, both domestic and foreign investors are often encouraged to invest in such market because of the likely evidence of high returns that will follow. The investors tend to be induced to purchase the listed firms' securities and consequently raise market capitalization. This scenario explains the reason for the positive relationship between all share index volatility and market capitalization in Nigeria.

It is however worthy of note that the impact is greater in the long-run than in the short-run. Some investors are often risk-averse. In the face of stock price volatility that dies out quickly, it can greatly hamper stock returns, hence their adverse disposition to investing in the stock market following an immediate evidence of volatility in the market. A persistent volatility, such as is the case of Nigeria, could thus be seen to be responsible for the higher long-run impact on market capitalization, as the investors tend to be convinced to invest in the long-run due to the volatility persistence.

Meanwhile, the error correction term (ECT) indicates that the short-run disequilibrium is adjusted for on a monthly rate of 1% (or 12% annually) to establish long-run relationship. The R-squared indicates that all share index volatility explains variation in market capitalization to the tune of 54.7%, while the remaining 45.3% are accounted for by other factors likely to affect market capitalization, but not considered in this study. All other reliability indicators show that the model is efficient. For example, the F-statistic which tests the overall significance of the model indicates that the model is significant while the Durbin-Watson statistic shows that the model is devoid of serial correlation.

S Table 4: Regression Results for Model 1 (CAP)

Variable	Coefficient	Std. Error	t-Statistic
Short-run Estimates			
D(ASI)	1.032*	0.022	45.997
ECT	-0.010*	0.003	-3.042
Long-run Estimates			
D(ASI)	2.350*	0.263	8.940
C	9.288*	0.370	25.134

Source: Author's computation with the aid of E-views (2019).

**** and *** indicate significance at 1%, and 5% critical level respectively.***

R^2 = 0.547, **Adjusted R^2** = 0.511, **F-Stat. (Prob.)** = 213.046 (0.000)

Durbin-Watson Stat. = 2.006

Results for Model 2 (Inflation (INF)

The second model as earlier indicated relates to the impact of stock price volatility on inflation rate, and this is done by ordinary least square (OLS). Unlike market

capitalization, Table 5 below shows that all share index volatility inversely affects inflation, as informed by the negative sign of the volatility series. The more volatile the Nigerian stock market is, the lower the economy's price level. Price level in Nigeria is improved by 0.32% following a percent rise in stock market volatility. Since reduced price level is a sign of economic viability, the negative relationship between all share index volatility and inflation rate is a plus to the Nigerian economy.

This inverse relationship results from the fact that the volatile nature of the Nigerian stock market attracts investments from domestic investors. This thus reduces the purchasing power of the people and greatly checks inflation. Results from Table 5 also shows that all share index volatility accounts for about 1.9% variation in inflation in Nigeria, indicating that a host of other factors are responsible for a significant proportion of influence on the price level. The Durbin-Watson statistic suggests the absence of autocorrelation in the model as its value can be approximated to the threshold of 2.

Table 5: Regression Results for Model 2 (INF)

Variable	Coefficient	Std. Error	t-Statistic
ASI	-0.320**	0.142	-2.250
C	0.904*	0.122	7.438

Source: Author's computation with the aid of E-views (2019).

**** and ** indicate significance at 1%, and 5% critical level respectively.***

R^2 = 0.019, **Durbin-Watson Stat**. = 1.554

Post Estimation

Table 6 below presents the results of the post estimation test as a further evidence of the reliability of the estimates of the model. The error series generated from the estimated model satisfy the normality assumption since the Jarque-Bera test reveals that the null hypothesis of the series being normally distributed cannot be rejected at 1% critical level. Breusch- Godfrey LM test is also adopted to determine if the residuals are serially correlated. With the null hypothesis being absence of serial correlation, the null hypothesis cannot be rejected at 1% level of significance.

The results indicate further that the residuals of the estimated model have time invariant variance, as the null hypothesis of no heteroscedasticity cannot be rejected at 1% significance level. The Ramsey Reset test is carried out to determine if the model is linear or correctly specified. The null hypothesis of correct specification of the model cannot be rejected at the 1% critical level. Therefore, the estimated model satisfies all the assumptions of the classical linear regression model, implying that the estimates obtained are reliable, consistent, efficient and suitable for forecasting.

Table 6: Post-estimation Test Result

Test	F-Stat (Prob.)	
	Model 1	**Model 2**
Jarque-Bera	311 (0.221)	150.621 (0.092)
Breusch-Godfrey	0.157 (0.855)	7.740 (0.111)
ARCH	0.055 (0.815)	26.144 (0.075)
Ramsey-Reset	0.162 (0.688)	4.514 (0.035)

Source: Author's computation with the aid of E-views (2019).

Conclusion

Attempt has been made in this paper to examine the effect of stock price volatility on the Nigerian stock market with particular emphasis on all-share index volatility, inflation rate and market capitalization spanning the period, January 1997 to December, 2018. Three procedural steps were followed in carrying out the analysis, namely: pre-estimation analysis, model estimation and post-estimation analysis. The pre-estimation analysis includes descriptive statistics and graphical illustration of the variables where formal tests such as unit root and cointegration tests were carried out. The Augmented Dickey-Fuller (ADF) unit root test was used to examine stationarity of the variables under consideration and the results indicated mixed order of integration. Except market capitalization (CAP) that was stationary at first difference, the two other variables, namely inflation (INF) rate and all share- index volatility ASI) are stationary at level.

For proper model estimation, Autoregressive Distributed Lag (ARDL) model was carried out as appropriate for variables with mixed integration properties for the first model, while the simple ordinary least square (OLS) was used for the second model due to their stationarities at level.

The relevant post-estimation tests carried out to establish the fulfillment of the classical regression assumptions and the reliability of the estimates yielded good results. The diagnostic tests were normality, linearity, serial correlation and heteroskedasticity tests. The results showed that the models were linear, normally distributed, homoscedastic and serially uncorrelated.

Results of analysis from this study between stock price volatility and market capitalization is positive indicating that the more volatile the stock price is, the higher the level of market capitalization which is in line with the studies of Salamatu, et. al. (2019), Chege et. al. (2014), Bikker et. al. (2010) that concluded that stock volatility has a significant effect on stock market.

Unlike market capitalization, the all share index volatility inversely affects inflation, as informed by the negative sign of the volatility series. The more volatile the Nigerian stock market is, the lower the economy's price level. This inverse relationship results from the fact that the volatile nature of the Nigerian stock market attracts investments from domestic investors.

Conclusively, the level of volatility of any financial market has implications on other aspects of the market and the economy as a whole. With the stock market being the most prominent domestic financial market, its volatility has often been proved to not only drive other happenings in the market and investment decisions of the people, but also the macro economy hence regulatory authorities should keep abreast of the level of the volatility in the stock market so as to bring profitable investments to investors.

References

Ajayi, J. A. & Ogbulu, M. O. (2018). Test of the Semi- Strong Efficiency Theory in the Nigerian Capital Market: An Empirical Analysis, *LASU Journal of Management Sciences*, 4(1),1-12

Andrew, H. & Peter, M. (2007). Can Macroeconomic Variables Explain Long-Term Stock Market Movements? A Comparison of the United States of America and Japan. *REPEC Online Journal Directory,* 6(3), 3-13.

Antonov, A., Konikov, M. & Spector, M. (2015). The Free Boundary SABR: Natural Extension to Negative Rates. *Available online at http://ssrn.com/abstract=2557046.*

Aroni, J. M. (2011). Factors Influencing Stock Prices for Firms Listed in the Nairobi Stock Exchange. *International Journal of Business and Social Sciences,* 2(20), 303-311.

Bikker, J. A. et. al. (2010). Stock Market Performance and Pension Fund Investment Policy: Rebalancing, Free Float, or Market Timing? *International Journal of Central Banking*, 10(2), 53 –79,

Chege, T. et. al. (2014). Return Volatility and Equity Pricing: A Frontier Market Perspective. Available online at http://ssrn.com/abstract=2520737Fama, E. (1970). Efficient Capital Markets: A Review of Theory and Empirical Work. *Journal of Finance,* 25, 383–417.

Fama, E.F. (1991). Efficient Capital Markets: II, *Journal of Finance,* 46 (5), 1575-1617.

Gatuhi, S. K. (2015). Macroeconomic Factors and Stock Market Performance in Kenya. *Unpublished Thesis.* Jomo Kenyatta University of Agriculture and Technology http/www.meragesschoolofbusiness.com.

Grzelak, L., & Oosterlee, K. (2016). From Arbitrage to Arbitrage Free Implied Volatilities. *Journal of Computational Finance,* 20(3), 1-19.

Hassan, W., & Awais, M. (2015). Behaviour of Macroeconomic Forces to Predict Stock Returns: Empirical Evidence from Global Financial Markets. *European Academic Research,* 3(3), 3674 – 3698.

Hussainey, K.et al (2011). Dividend Policy and Share Price Volatility, U.K Evidence, *Journal of Risk Finance,* 12(1), 57-68.

Junkun, K. (2012). Macroeconomic Determinants of Stock Market Behaviour in South Africa, *Unpublished M.Sc. Thesis*, Rhodes University, South Africa.

Kirwa, L. N., & Mutuku, C. (2015). Macroeconomic Variables and the Kenyan Equity Market: A Time Series Analysis. *Business and Economic Research,* 5(1), 1-10.

Kiymaza, H., & Berument, H. (2003). The Day of the Week Effect on Stock Market Volatility and Volume: International Evidence. *Review of Financial Economics,* 12, 363–380

Leitao, A., Grzelak, L.A., & Oosterlee, C. W. (2017). On an Efficient Multiple Time, Step Monte Carlo Simulation of the SABR Model. *Encyclopaedia of Quantitative Finance,* 17(10), 1549-1565.

Malkiel, B. (2005). Reflections on the Efficient Market Hypothesis: 30 Years Later. *The Financial Review,* (40), 1-4.

Mgbame, C. O., & Ikhatua, O. J. (2013). Accounting Information and Stock Volatility in the Nigerian Capital Market: A Garch Analysis Approach. *International Review of Management and Business Research,* 2(1), 265 – 281.

Milan, B. & Peter, M. (2018). Oil market volatility and stock market volatility, *Finance Research Letters, Elsevier*, 26(C), 204-214.

Muiruri, P. M. (2014). Effects of Estimating Systematic Risk in Equity Stocks in the Nairobi Securities Exchange (NSE): (An Empirical Review of Systematic Risks Estimation).

International Journal of Academic Research in Accounting, Finance and Management Sciences, 4(4), 228–248.

Nazir, N., Ali, A., & Sabir, H. (2014). Impact of Dividend Policy on Stock Price Volatility: A Case Study of Pakistani Capital Market. *European Journal of Business and Management*, 6(11), 49-61.

Ogum, G., Beer, F., & Nouyrigat, G. (2005). Emerging Equity Market Volatility: An Empirical Investigation of Markets in Kenya and Nigeria. *Journal of African Business,* 6 (2),139-154.

Ojong, et. al. (2015). The Impact of Stock Price Volatility on the Performance of the Nigerian Stock Market for the period 1990 to 2011, *Archives of Business Research*, 13(4), 78-92.

Olowe, R.A. (2009). Stock Return, Volatility and the Global Financial Crisis on the Nigerian Capital Market Performance: An Empirical Investigation (2000-2008). *European Journal of Humanities and Social Sciences,* 16(1) 46-57.

Onakoya, A. B. (2013). Stock Market Volatility and Economic Growth in Nigeria (1980 - 2010). *International Review of Management and Business Research,* 2(1), 201 – 209.

Onthatile, T. O. (2017). Stock Returns Behaviour and the Pricing of Volatility in Africa's Equity Markets. A *Thesis* Submitted to Wits Business School, University of the Witwatersrand, Johannesburg, South Africa

Otweyo, E. S. (2014). Market Factors that Affect Returns for Companies Quoted at the Nairobi Securities Exchange. *Unpublished Project,* KCA University.

Ouma, W. N., & Muriu, P. (2014). The Impact of Macroeconomic Variables on Stock Market Returns in Kenya. *International Journal of Business and Commerce,* 3 (11), 1-31.

Praptiningsih, M. (2011). The Indonesian Stock Market Performance during Asian Economic Crisis and Global Financial Crisis. *Challenges of the Knowledge Society,* 74, 1503-1514.

Profilet, K. A., & Bacon, F. W. (2013). Dividend Policy and Stock Price Volatility in the U.S. Equity Capital Market. *Proceedings of ASBBS Annual Conference Las Vegas,* 20(1), 219 – 231.

Raju, M. T., & Ghosh, A. (2004). Stock Market Volatility – An International Comparison. Securities and Exchange Board of India, *Working Paper* Series 8.

Ross, S. A. (1976). The Arbitrage Pricing Theory of Capital Asset Pricing. *Journal of Economic Theory*, 13, 341-360.

Salamatu, M. K. et. al. (2019). Impact of Calendar Anomaly Effects and Stock Price Volatility on Performance of Stock Market Return in Nigeria, International Journal of Innovative Finance and Economic Research, 7(4), 50-73.

Sharpe, W. F. (1964). Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk. *Journal of Finance,* 19(3), 425–442.

Shrestha, P. K., & Subedi, B. R. (2014). Determinants of Stock Market Performance in Nepal. *NRB Working Paper* series *24*.

Tripathi, V., & Seth, R. (2014). Stock Market Performance and Macroeconomic Factors: The Study of Indian Equity Market. *Global Business Review,* 15(2), 291–316

Tsay, R. S. (2005). *Analysis of Financial Time Series.* John Wiley and Sons incorporated, New York.

Wabwire, J. M. et.al. (2013). The Effect of Initial Public Offer Announcements on Market Returns of Listed Stocks at the Nairobi Stock Exchange. *International Journal of Research in Management,* 3(2), 84-119.

Wafula, M. M. (2016). The Effect of Share Price Volatility on Stock Market Performance at the Nairobi Securities Exchange. A *Research Project* submitted to School of Business, University of Nairobi

Wagner, H. (2007). Volatility's Impact on Market Returns, Retrieved *from www.investopedia.com.*

Wang, X. (2010). The Relationship between Stock Market Volatility and Macroeconomic Volatility: Evidence from China. *International Research Journal of Finance and Economics,* 49, 1450-2887.

Zakaria, Z., Muhammad, J. & Zulkifli, A. H. (2012). The Impact of Dividend Policy on the Share Price Volatility: Malaysian Construction and Material Companies. *International Journal of Economics and Management Sciences,* 2(5), 01-08.