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EMPIRICAL INVESTIGATION OF STOCK MARKET EFFICIENCY AND ALL SHARE INDEX (ASI) VOLATILITY IN NIGERIA

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ABSTRACT

This study empirically investigated stock market efficiency and all share index (ASI) volatility in Nigeria. The study used descriptive statistics and inferential statistics to analyze yearly All Share Index (ASI) data generated for the period, 1985 to 2021. The finding from the study showed that presence of the weak form efficient market in Nigeria. The random movement of the yearly All Share Index (ASI) indicated volatility in the Nigeria bourse in the reference period. The study concludes that active investors cannot beat the market to make abnormal profit in the Nigerian stock market because the market do have a long memory to associate the previous yearly prices. Based on the findings obtained, the study suggests that regulators of the Nigerian Stock Exchange should make information available to investors at free cost and employ more sophisticated system for information dissemination that will checkmate and reduce the application of insider information to make abnormal profit. There is need to increase the breadth and depth of the Nigerian stock market by policy makers via potential investor's enlightenment of the available wealth opportunities in the bourse to entice different investors type to participate and develop the stock market in Nigeria. Continuous research on weak form of EMH is highly suggested in the Nigerian stock market in order to find more conclusions with the aid of more robust model.

Keywords: Stock Market Efficiency, All Share Index (ASI), Volatility, Random Theory.

1.0 INTRODUCTION

The stock market, more than ever before, is increasingly becoming one of the most popular investments channels globally because of its high returns. The stock market is an integral part of the global economy to the extent that any volatility in the market engenders personal and corporate financial lives as well as the economic health of a nation. The stock market is crucial to the nation's economic growth and development because. It performs the important function of financial intermediation in the economy by taking money from the surplus units in the economy and channeling same to the deficit units in the economy. However, the ability of the stock market to perform its role effectively and assure investors of fair returns is contingent on the extent to which it can be said to be efficient. This underscores the essence of studies that seek to examine stock market efficiency and stock market index volatility (Ajao&Osayuwu, 2012). If a market is not efficient then, behaviourally, stocks that outperform the market will inspire positive sentiments among investors while stocks that under-perform may induce panic. Consequently, stocks that under-perform at any given point in time relative to the market are more sensitive to new information (Lulia, 2009). In other words, there is a

negative relationship between the measure of price sensitivity to news and the stock's performance relative to the market. On the other hand, panic drives the price sensitivity to new information than the thrill of investing in a high-return stock does, or simply yet, the downside hurts investors more than the upside helps them (Lulia, 2009).

Critics of the efficiency market hypothesis, argued that the efficient market hypothesis does much better as a description of the world than might be thought about (Markiw, 2009). The critics stressed that there is every reason to doubt that shareholders are always rational and the stock prices are informational efficient every moment because stock prices are influenced by psychological perception (optimism/pessimism) of investors economic outlook. In response, the proponent of the stock market efficiency argued that even if the stock price is not exactly informational efficient but it is very close to it. This is because the fact that a stock price rose or decline in the past is not an indication that it would repeat similar performance in the future.

That is, the correlation between how well a stock performed today and how well it will perform tomorrow is almost exactly zero. In addition, some financial analysts have also laid credence for the efficient market hypothesis on the ground that it enhances investment opportunities of potential investors by mitigating moral hazard and asymmetric information problems associated with buying and selling of shares. The informational efficiency of the market provides an incentive for potential investors to enter new investment venture and include in their portfolio of asset viable assets based on the prevailing market value of the firm. Efficient information about volatility of the Nigeria stock market prices enables financial analysts and researchers to obtain a precise estimate of the volatility process. Volatility is a key indicator in assessing the performance of the stock market in order for both indigenous and foreign speculators to make accurate speculations and decisions on investments. Evidence derived from literature shows that ARIMA and ARCH models have been applied extensively in volatility studies {Hamzaoui and Regaieg (2016), Maana, Kamau and Kisinguh (2015), Maxwell, OmariSasu and Frempong (2015), Basenga, Mwita and Mung'atu (2014), Atoi (2014), Ali (2013), Cao and Tsay (1992), Lin, Mackenzie and Gulledge JR (1986)}.

The All-Share Index (ASI) on the Nigeria Stock Exchange (NSE) is used as proxy for stock market prices in order to assess volatility by measuring the trends and thereby examining the forecasting performance of the Nigeria Stock Exchange (Ibrahim, 2017). The author noted that volatility in the Nigeria stock exchange has been experiencing instability over the years. The issue with volatility of stock market price refers to the fluctuations that may be observed in stock market prices over time. The major reason for the ups and downs in the stock market may be traced to macroeconomic instability. Since the stock market operate in a macroeconomic environment, it is therefore necessary that the environment must be an enabling one in order to realize its full potentials. The problem with forecasting the stock market price is that the return distribution can change considerably over time. Volatility is an extremely complex thing to forecast because of the inherent instability of the variable (variability of the random). Volatility forecast sometimes may be uncertain, since it is just a mere projection based on some econometric technique in most cases.

In assessing stock price volatility in a typical stock market, the autoregressive conditional heteroscedasticity (ARCH) models and the generalized autoregressive conditional heteroscedasticity (GARCH) models are commonly adopted because they are capable of controlling for dynamism in variances. Mostly in the empirical findings, researchers have applied extensively several models such as the series of ARCH models and GARCH models, differently to develop a model for volatility forecasting in the Nigerian stock market prices. However, in existing literature, it is not proven which of these modeling techniques is superior in developing a model to investigating volatility in the Nigeria stock market prices. Therefore, this study contributes to existing knowledge by assessing the weak form efficient market hypothesis alongside with the volatility of stock prices in the Nigerian bourse using the GARCH model. Moreover, in lieu of the conflicting opinions, empirical studies on stock market efficiency in relation to the volatility of stock market index have not been extensively examined in the context on developing countries like Nigeria. The goal of this study therefore is to investigate stock market efficiency, especially the weak form efficient market and stock price volatility in the context of Nigeria. To achieve this aim, the following specific research questions are raised:

i. Is there existence of stock market efficiency in Nigeria?
ii. Is there evidence of all share index volatility in the Nigerian stock market?

1.2 Objective of the Study

The general objective of this research is to investigate stock market efficiency and stock price volatility in Nigeria, The specific aims of the study is to:

i. Ascertain the existence of stock market efficiency in Nigeria; and
ii. Find out if there is evidence of all share index volatility in the Nigerian stock market.

2.0 LITERATURE REVIEW

2.1 Conceptual Review

2.1.1 Stock Market

Masoud (2013) defined stock market as a very sophisticated market place where stocks and shares are the traded commodities. At the same time, it is central to the creation and development of a strong and competitive economy. Information on stock market provides investors with the status of the market value of their assets, and this serve as guide to businessmen on their investments. Since people are rational, they would rather invest in gainers than losers. The transaction activities in the stock market are extremely imperative for the generation of capital within the economy. Stock market is important for decisions on business investment, because financing investment spending is affected by share prices. According to Bodie, Kane and Marcus (1998), stock market indexes provide guidance concerning the performance of the overall stock market.

The volatility of stock market prices can be regarded as the variability changes of stock price that could arise often referred to as market shock which is considered by investors as a measure of risk. Volatility clustering occurs when periods of large price change are followed by periods of large price change for a long period, and periods of little price change are followed by periods of little price change for a long period. Stock market volatility is a

measure for variation of price of a financial asset over time. Volatility measures the tendency of stock price to rise and fall sharply within a period of time. Volatility clustering is evident when large variation tend to be followed by large variation regardless the sign (positive or negative), and small variation tend to be followed by small variation for a long period. Aas and Dimakos (2004), define volatility clustering as a strong autocorrelation in the absolute values of returns. They further stated that a simple method for detecting volatility clustering is calculating the autocorrelation function of the absolute values of returns.

2.2 Theoretical Literature

The theoretical literature concerning the efficient market hypothesis is categorized into three depending on the notion of what is meant by the term "all available information" (Fama, 1991). The first type is the weak-form hypothesis which is based on the historical sequence of prices. The weak-form hypothesis asserts that stock prices already reflect all information that can be derived by examining market trading data such as the history of past prices, trading volume, or short interest. This version of the hypothesis implies that trend analysis and the developing of trading rules by financial analyst in predicting future stock price movement that would allow them to earn abnormal rate of return is fruitless. A plethora of studies on the weak-form hypothesis concluded that changes in the price of stock price follow a random walk. This implied that changes in stock price are impossible to predict from available information and thus consistent with the notion of an efficient market. This second type is the semi-strong-form hypothesis, which posits that all publicly available information regarding the company's past performance as well as the prospects of the company is already reflected in the stock price. Such information includes, in addition to past prices, fundamental data on the firm's product line, quality of management, balance sheet composition, patents held, earning forecasts, and accounting practices. The third is the strong-form version of the efficient market hypothesis, which states that stock prices reflect all information relevant to the firm, even including information available only to company insiders and those who have access to the company's policies and plans. In the light of the three versions of the efficient market hypothesis, a large number of literatures have emerged both in the developed and emerging stock markets of the word.

2.3 Theoretical Framework

The EMH is the theoretical base of this study. This is so because the W-F version of EMH explained vividly whether the past series of stock prices are stochastic in pattern or they are related to one another. That is the randomness in price series ensures that successive stock prices are uncorrelated and similarly circulated. In the words of RWT; current return (P_t) are free and unrelated to previous return$[(P_{t-1}), P_{t-2}), P_{t-3}) \ldots\ldots]$and prospect return ($P_{t+1}$) prediction is not supported. The RWT can be express in Autoregressive (AR) model given as;

$$P_t = \gamma_0 + \gamma_1 P_{t-1} + \gamma_2 P_{t-2} + \gamma_3 P_{t-3} + \varepsilon_t \quad (3)$$

Where:

P_t = current prices, γ_0 = constant, P_{t-1} to P_{t-3} = prices in the three (3) immediate preceding period, $\gamma_1 - \gamma_3$ = coefficient to be estimated, ε_t = perturb term.Plethora of robust random estimation techniques such as poker test, seasonal/non-seasonal differences, sensitivity analysis Weiner process, LOMAC single variance ratio, among others have been used in the

literature to test the W-F ME in stock markets. Since this work is centred on frontier bourse of Nigeria which is not sophisticated for using more advance tests. Therefore, the PNP test of SCT, RT and K-S test are used in this study. These tests best suit emerging and frontier markets and the desire test with more advanced techniques is less imperative (Mphoeng&Moalosa, 2019; Hawalda, et al, 2017; Malhotra, Tandon & Tandon, 2015; Su, Roca & Wong, 2015; Rehman & Qamar, 2014; Sultan, Madah & Khalid, 2013; Said & Harper, 2015).

2.4 Empirical Review

Following the pioneering work by Fama (1965) on the US stock market, a number of studies have attempted to test the efficiency market hypothesis in different stock markets of the world. For example, Vitali and Mollah (2010) examined the weak-form of market efficiency in Africa by testing the Random Walk Hypothesis (RWH) through multi-approach specifically unit root, auto-correlation, runs and variance ratio tests on the daily price indices of Egypt, Kenya, Mauritius, Morocco, Nigeria, South Africa and Tunisia over the period 1999-2009. The empirical results reject the RWH for all stock markets indices over the whole sample period with the exception of South Africa over the second sub-period (2007-2009). Only South Africa was regarded as a weak-form efficient market. Rejection of the RWH in the African stock markets indicated that stock prices do not fully reflect all historical information.

Aga and Kocaman (2008) examined the efficiency market hypothesis in Istanbul stock exchange market. The study used computed index called return index-20 and also used a times series model to test the weak-form of the efficient market hypothesis for the period spanning 1986 to 2005. The result obtained from the times analysis revealed that there is evidence of a weak-form of efficient market hypothesis in Istanbul stock exchange market. Cavusoglu (2007) examined the weak form of the efficient market hypothesis for the Athens Stock Exchange through approaches accounting for conditional heteroscedasticity. The study also examined the influence of changes in economic conditions on stock returns and on conditional volatility. The study covered the period 1999 to 2007, using the daily FTSE/ASE-20 stock price index. The findings from the study did not provide evidence on the weak form of the efficient market hypothesis.

Bhattacharya and Murherjee (2002) examined the nature of the causal relationship between stock prices and macroeconomic aggregates in India. The study adopted the techniques of unit–root tests, co-integration and the long–run granger non–causality test proposed by Toda and Yamamoto (1995). The study utilized Bombay Stock Exchange Index and the five macroeconomic variables, viz., money supply, index of industrial production, national income, interest rate and rate of inflation using monthly data for the period 1993 to 2001. The major findings of the study are that there is no causal linkage between stock prices and money supply; stock prices and national income and between stock prices and interest rate. Secondly, index of industrial production lead the stock price, and thirdly, there exists a two – way causation between stock price and rate of inflation.

Dima and Milos (2009) investigated the efficiency market efficiency on Bucharest Stock Exchange using daily observations (from 10.04.2000 to 08.04.2009). The findings of the revealed that there is a limit to the informational efficiency of the market (in its weak form),

given the prolonged financial instability experienced within the Romanian economy. Also, Dragotă et al. (2009) tested the weak-form of information efficiency of the Romanian capital market using a database that consists in daily and weekly returns for 18 companies listed on the first tier of the Bucharest Stock Exchange and in daily and weekly market returns estimated by using the indexes of the Romanian capital market. The study adopted a multiple variance ratio and the findings of the study revealed that most of the stock prices are informational efficient.

Gilmore and McManus (2003) tested the efficient market hypothesis in its weak form for Czech Republic, Poland and Hungary for the period 1995 to 2000; the findings of the study rejected the random walk hypothesis. Chun (2000) found that the Hungarian capital market was weakly efficient. Vosvorda et al. (1998) tested the EMH for the Prague Stock Exchange for the 1995 to 1997. The findings of the study reject the weak form market efficiency. Macskasi and Molnar (1996) using Ljung-Box Q-statistics tested for the efficiency market hypothesis on Budapest Stock Exchange (BSE) and found that BSE was not efficient because it offered the possibility of excessively high returns. Gordon and Rittenberg (1995) tested the efficiency market hypothesis on the Warsaw Stock Exchange (WSE) efficiency and found that either the weak form efficiency does not apply to WSE or "prices do not adequately reflect information at a given point of time, thereby resulting in sufficient time lags of which investors can take advantage". Dickinson and Muragu (1994), through serial correlation analysis and runs test, have provided results for the Nairobi Stock Exchange that does not contradict the weak-form efficiency. With respect to the Nigeria economy, empirical studies have been devoted to investigating the role of stock market in economic growth (Obadan, 1998; Onosode, 1998; Emenuga, 1998; Nyong, 1997).

Empirically, evidences from literature reviewed show that ARCH series and ARIMA model have been applied more extensively on volatility studies than other methods; in accordance with the works of the followings; Hamzaoui and Regaieg (2016), Maana, Kamau and Kisinguh (2015), Maxwell, Omari-Sasu and Frempong (2015), Basenga, Mwita and Mung'atu (2014), Atoi (2014), Ali (2013), Cao and Tsay (1992), Lin, Mackenzie and Gulledge JR (1986). They all contribute to literatures on volatility studies that autoregressive models are capable of specifying time variation in both conditional skewness and kurtosis, and thereby taking into consideration the past behaviour in model estimation. Autoregressive models attribute the feature of controlling changing variances in model estimation. The autoregressive models entail linearly unpredictable stochastic processes which are conditionally leptokurtic and conditionally heteroskedastic, thus, they possess the tendency to be more accurate for longer forecasting time-horizon. Other volatility forecasting models in literature include Artificial Neural Network following an evidence in the work of Neenwi, Asagba and Kabari (2013), Bayesian TVC model which works efficiently on random walk model, and appears to be flexible in special cases of forecasting environment (Canova, 1993). However, this generates the research question of the best model of the most frequently used models (that is, ARCH and ARIMA models). Objective-wise, this study attempts to fill the knowledge gap by comparing ARIMA and ARCH family models purposely to estimate the most efficient model for volatility forecasting of the Nigeria stock market prices.

2.3 METHODOLOGY

The variables under study are historical in nature, thus this study used the longitudinal research design. The entire stock market performance index is the population of this study, while the All Share Index (ASI) is purposively selected as the sample of the study, which capture changes in all the prices of shares (total price gains and losses for all securities) exchanged on NB floor, since this study is concern with stock price movement. This study scope encompasses yearly All Share Index in the Nigeria Bourse from 1985 -2021.In other words, The data required for this study is the NSE All Share Index which is the variable capable of measuring the volatility performance of the Nigeria Stock Exchange. The nature of the data is secondary. The All Share Index on Nigeria Stock Exchange is used as an indicator to measure the value of the Nigeria Stock Market. The data to be used for the study is adopted from Central Bank of Nigeria (CBN) Statistical Bulletin. Monthly data of All Share Index on the Nigeria Stock Exchange is in unit, ranging from 1985 to 2021. Descriptive statistics and unit root test constitute the primary tests carried out on the variables. The properties and patterns of the variables were described in a meaningful way with descriptive statistics, while the time series stationary status of the variables were ascertain with Augmented Dickey-Fuller (ADF) and Philip-Peron (P-P) test given as; $\Delta Y_t = \alpha + \beta t + \delta Y_{t-1} + \gamma \sum_{i=1}^{m} \Delta Y_{t-i} + \varepsilon_t$ … … … … … … … … … … … … … … … … (1)

$\Delta Y_t = \alpha_0 + \pi Y_{t-1} + \mu t$ … (2)

Where: ΔY_t = change in dependent variable; α = drift; t = deterministic trend; m = largelag length; ε_t = white noise process.The presence of unit root is the H_O hypothesis of the P-P and ADF test.

Model Specification

This study adapted the Autoregressive model in Eq (3) where share prices were substituted with ASI. The functional form of the model is given as;

$ASI_t = f(ASI_{t-1}, ASI_{t-2}, ASI_{t-3})$ … … … … … … … (4)

The estimated version of the model with standard assumption of homoscedasticity is stated as;

$$ASI_t = \alpha_1 + \delta_1 ASI_{t-1} + \delta_2 ASI_{t-2} + \delta_3 ASI_{t-3} + \varepsilon_t \quad (5)$$

Where:

ASI_t = Daily, weekly, monthly and yearly all share index at current time.

$ASI_{t-1}, ASI_{t-2}, ASI_{t-3}$ = Lagged values of all share index

α_1 = intercept

δ_1, δ_2 *and* δ_3 = unknown coefficient to be estimated

ε_t = stochastic perturb term.

The data was also analyzed using and the generalized autoregressive conditional heterocedasticity (GARCH) (1, 1) model. The GARCH (1, 1) was used to modeled all share index volatility as common in previous studies by Salisu and Ogbonna (2021); Banerjee (2021); Bora and Basistha (2021). The GARCH model by Boller-slev (1986) was an offshoot of ARCH model introduced by Engle (1982). A GARCH model enables conditional changes to be dependent on its previous lags (Topcu et al., 2021). GARCH models convert the AR process from the ARCH model into an ARMA process by adding an MA process (Topcu et al., 2021).

The generalized auto regressive conditional heteroscedasticity (GARCH) is employed to analyze the volatility associated with all share index volatility. GARCH emanates from the family of ARCH model. The ARCH family models consist of ARCH (q), GARCH (p, q), TGARCH (p, q), EGARCH (p, q) and PGARCH (p, q). ARCH (q) model gives the variance of a series using its past variance. The "q" stands for the order of the past variance. The GARCH (p, q) is the improvement of ARCH (q) model because it comprises of an order of past conditional variance and past residual in determining conditional variance. The "p" is the order of the past residual term while the "q" remains the order of the past conditional variance.

The idea behind ARCH model is that the current value of a variable like the all share index is determined by its previous value(s). The GARCH model employed in this study has the following form:

$$ht = z + \varepsilon_t \sim M\,(0, \sigma^2 t) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

$$\sigma^2 t = \varphi + \propto_i \varepsilon_{t-1}^2 + \cdots + \propto_s \varepsilon_{t-s}^2 + \beta_i \sigma_{t-1}^2 + \cdots + \beta_r \sigma_{t-r}^2 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where $\varphi > 0$ and $\propto_i \geq 0$, $\beta_i \geq 0$.

Test of Data Independence

The serial (auto) correlation test model of independence of successive stock return in Eq (5) is given as;

$$LY = n \times (n+2) \sum_{k-1}^{m} \frac{P^{2k}}{n-k} \sim \delta^2 \qquad (3)$$

Where: P^k = serial correlation coefficients of lag k; and n = sample size

Data Estimation Procedure

The OLS ARIMA framework is used to explore the influence of lag stock returns on current year returns. The randomness in stock returns is determine by the Ljung Box Q-statistics SCT; this quantitatively reveals the extent of closeness between a given time series and itself lag version over subsequent period intervals (Hamid, Suleman, Akash & Shah, 2010). The random walk theory is used to know if data string is randomly manifesting with a specific distribution in stock return (Elango & Hussein, 2007;Pandey, 2003;Omar, Hussain, Bhatti &Altaf, 2013). These processes are run for yearly All Share Inde (ASI) data stream considered in the sample.

4.0 DATA PRESENTATION

Table 1: Summary Statistics

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	J-Bera	Prob
ASI	17245.95	20128.9	57990.22	127.3	14946.08	0.511178	2.551831	1.921019	0.382698

Source: Researcher's Computation Using E-views (2023)

The mean of all share index is 17245.95 and with a maximum mean of 57990.22. This represents high valueof shares traded in the reference period. The standard deviation of 14946.08 shows

the tendency of the share prices traded to nose dive in the Nigerian bourse. All variables have a long tail to the right as shown by the respective positive Skewness value. The property distribution of the variables is neither peak nor flat rather relatively normal as revealed by the Kurtosis coefficient that can be approximated to 3.0. The Jarque-Bera (J-B) prob. statistics for all share index (ASI) is not significant at 5% confidence. This shows that share prices were not normally distributed in the referenced period.

Table 2. Stationarity test

ADF Test					PP Test			
Variables	ADF Stat	Critical V.	Order	Remark	P-P Stat	Critical V.	Order	Remark
ASI	-3.00833	-3.54033	I(0)	NS	-3.00833	-3.54033	I(0)	NS
ΔASI	-6.08622*	-3.54849	I(1)	S	-7.91326*	-3.54428	I(1)	S

NS = Not Stationary, S = Stationary

Source: Researcher's Computation Using E-views (2023)

The ADF and P-P statistics in Table 2 unanimously reveals that the variant ASI is stationary at both level and first difference and integrated of 1(0) and I(1). Thus, the hypothesis of non-stationarity is not accepted in the series.

Table 3. OLS regression results

Dependent Variable = ASI				
Variables		**Coefficient**	**t-stat**	**Prob**
	C	3247.457	1.554572	0.1305
Explanatory	ASI(-1)	0.800403*	4.667253	0.0001
	ASI(-2)	-0.24745	-1.11778	0.2725
	ASI(-3)	0.329925	1.946607	0.061
R^2		0.75527		
Adj R^2		0.730797		
F-stat		30.86		
Prob(F-stat)		0.00		
D.W stat		1.97		

**** = Significant at 1% Level of Significance***

Source: Researcher's Computation Using E-views (2023)

Tables 3 reveals that the coefficients of the one, two and three lagged values of yearly all share index has significant effect on current period of yearly all share index. It portend that the one, two and three period lag of yearly all share index have meaningful impact on current year all share index while the one and two period lag considered for have significant influence of current year ASI. This shows that past prices in the Nigerian stock market can be used to predict lead prices of shares on yearly basis. This is evidential in the F-stat coefficient of the entire model that is significant at 5% confidence level that there is significant association between lag prices taken together and current prices of shares in the Nigerian stock market.

The result in table 3 have a good fit of the regression line since a minimum of 73% for yearly All Share Index of total systematic variation in current stock price is explained by previous share prices as shown by the adjusted version of R^2 in table 3 after adjusted for degree of freedom. 27% not explained is captured by the error term. The D.W statistic for the regressions can be approximated to 2.0 which may show the absence of autocorrelation in the model. However, the DW statistic is no longer reliable in ascertaining this because of the lag explained variables in the model right hand. Hence, higher order correlation test becomes imperative, to ascertain the variables randomness.

Table 4. Ljung-box Q-statistic Test

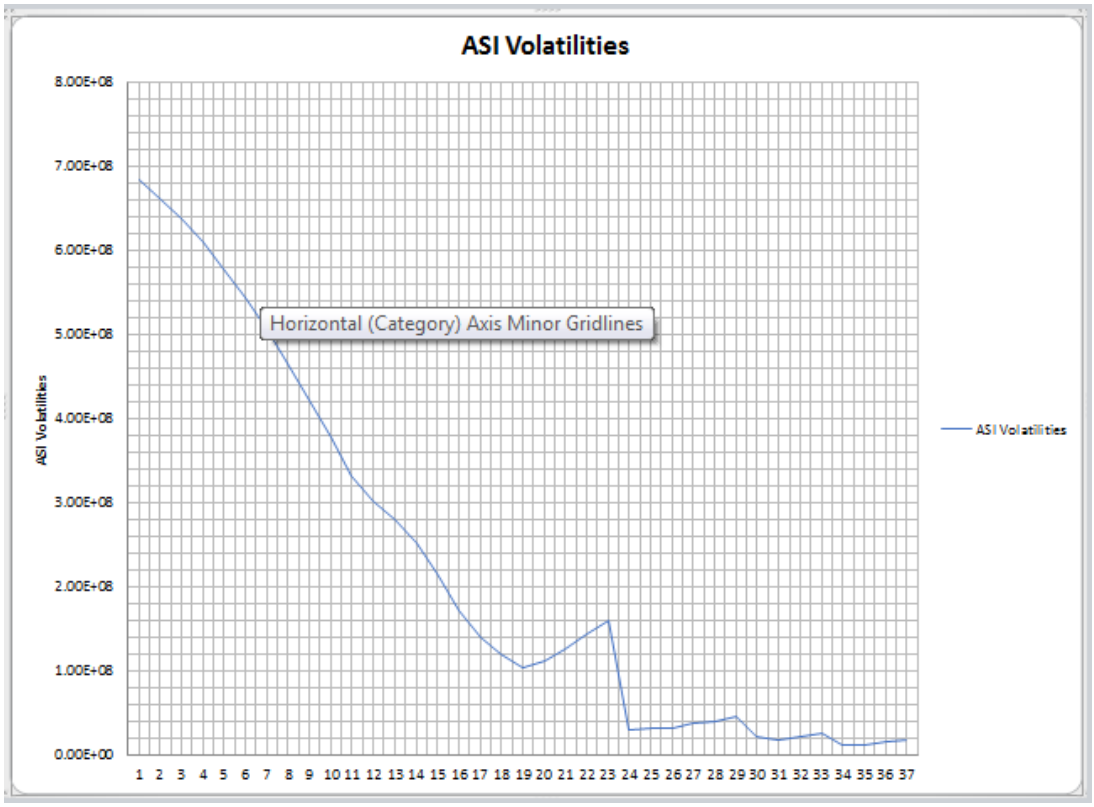
	ASI Yearly	
Lag	*Q-Stat*	*Prob.*
1	0.0036	0.952**
2	0.1828	0.913**
3	0.2584	0.968**
4	1.006	0.909**
5	1.4838	0.915**
6	2.621	0.855**
7	2.621	0.918**
8	2.7579	0.949**
9	3.4944	0.941**
10	6.106	0.806**
11	6.106	0.866**
12	6.1741	0.907**
13	6.4209	0.929**
14	6.9878	0.935**
15	7.7937	0.932**
16	7.9372	0.951**
17	7.9471	0.968**
18	8.0322	0.978**
19	8.0469	0.986**
20	8.1569	0.991**

Source: Researcher's Computation Using E-views (2023)

Data independence test in table 4 indicates evidence of possible dependence in the prime and higher expected value of the return distributions. The Q-statistics coefficient for yearly All Share Index for the 20 lags accepts the null hypothesis (H_0) for the entire sample. This means that *Q*-statistics are significant for all the lags with acceptable probability that is less (>) 0.05. This shows the absence of autocorrelation in the residuals. From the analysis, it can be said that this decision is not bounding on yearly ASI because the rule of thumb emphasize that the Q-statistics for all the lags considered must be insignificant with high prob. value that is > 0.05. This portends that there is weak form of the efficient market in Nigeria. The finding is inconsistent with past studies like Ogiemudia and Isibor (2017), Obayagbona and Igbinosa (2014) and Ajao and Osayuwu (2012) respectively in Nigeria.

Findings revealed that successful past prices of stock can be used to determine future direction in the Nigerian stock market. This is reflected in the significant nexus between lag of yearly ASI considered and current value of the ASI in table3. The test of randomness (Q-statistics) further confirms almost all of the asymptotic significant prob. value is greater than 0.05; this suggests that the entire autocorrelation integer is insignificant for all variables. This implies that volatility in share prices traded on the floor of the Nigerian stock exchange does follow RW process and the Nigerian stock market is weak form information efficient because stock price changes are serially unrelated. This further consolidates the OLS regression results in table 3. Furthermore, the Q-statistics values reveals that shows the presence of randomness and does not negates the weak form efficiency of the Nigerian stock market in the referenced period. This connotes that stock prices successive changes traded on the Nigerian stock market are random and by implication volatile. That is price movement tends not to follow a specific pattern. This means that distribution pattern does follow a normal curve. This agrees with Q-statistic position. Implying that the Nigerian stock market is weak form formation efficient in reflecting past information in stock price. This study findings are consistent with Hawaldar, Rohit and Pinto (2017) in Bahrain; Mobarek (2000); Poshakwale (1996); Khan and Khan (2016) in Pakistan; Mphoeng and Moalosi (2019) in Botswana, Ekechi (2002); Inegbedion (2009); Falaye et al (2018); in Nigeria whom previously studied similar test employing stock price index data from the NB. However, this findings are inconsistent with the outcome of Ogochukwu (2016); Ajao and Osayuwu (2012); Udoka (2012), and Olowe (2002) in the literature.

Figure1: Analysis of Volatility Associated with All Share Index (ASI) in the Nigerian Stock Market



The result from figure 1 clearly shows the swings associated with the all share index in the Nigerian capital market in the reference period. It can be observed that in the reference period, there occurred a down ward swing (volatility) in the all share index. There was a rise in the value of all share index (ASI) in 1985 and began to fall from 1988 to 2002 and rose from 2003 till 2008, slightly trying to rise and maintain unstable rise thereafter. The reason for this may not unconnected with several macroeconomic factors which combined to affect the efficient working of the capital market in Nigeria.

Figure 2: Presentation and Analysis of GARCH Result

Dependent Variable: ASI
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 03/26/23 Time: 21:19
Sample: 1985 2021
Included observations: 37
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	26934.57	2194.993	12.27092	0. 10000
	Variance Equation			
C	2254013	564277.1	3.994514	0.0001
RESID(-1)^2	-0.15859	0.000298	-532.228	0.0000
GARCH(-1)	1.130568	0.000544	2077.451	0.00000

R-squared	0.43189	Mean dependent var	17245.95
Adjusted R-squared	0.40189	S.D. dependent var	14946.08
S.E. of regression	17884.69	Akaike info criterion	21.96794
Sum squared resid	1.15E+10	Schwarz criterion	22.14209
Log likelihood	-402.407	Hannan-Quinn criter.	22.02933
Durbin-Watson stat	1.188703		

The generalized autoregressive conditional heteroscedasticity result in figure 2 above portrays the volatility associated with the all share index (ASI) in the reference period.Figure 2 present the result of the GARCH (1,1) model which is used to estimate the existence of volatility in stock market index (ASI). The outcome clearly shows there is presence of high

persistent and clustering shock in the volatility at the 5% significance level. The coefficients of the ARCH andGARCH are both positive which indicates that the model satisfy the stability condition. The coefficient of the GARCH term is greater than one, indicating that the volatility in the stock market index for the scope under consideration is not extreme. The findings establish the presence of time-varying conditional volatility of All Share Index (ASI). This denotes that the effect of today's shocks remains in the forecasts of variance for many periods in the future with respect to the all share index (ASI). The implication is that the all share index have not majorly experienced swings in Nigeria, However, the empirical finding is to an extent, consistent with previous researches conducted by Gourinchas (2020); FAZ (2020); Boot, Carletti, Kotz, Krahnen, Pelizzon and Subrahmanyam (2020); Megginson and Fotak (2020).

5. CONCLUSION AND RECOMMENDATIONS

This study empirically investigated stock market efficiency and all share index (ASI) volatility in Nigeria. The study used descriptive statistics and inferential statistics to analyze yearly All Share Index (ASI) data generated for the period, 1985 to 2021. The finding uphold the tenets of technical analysis which assumes that the stock market has memory as such past prices have relationship with future prices of stock over the studied period. Changes in successive share prices of the shares traded in the Nigerian stock market did not follow a particular pattern; thus is random and did not negates the underlying assumptions of the Random Work Theory (RWT) which suggest that in efficient market share prices are stochastic. Hence, the Nigerian stock market is weak form efficient. This study concludes that active investors cannot beat the market to make abnormal profit in the Nigerian stock market because the market does have a long memory to associate the previous yearly prices. However, in practice this memory is relatively week in the long period as large portion of the lags considered in the yearly were significant. This portray that the Nigerian stock market might be absolutely weak form efficient in the long run as some trace of efficiency was observed. Based on the findings obtained, from the foregoing analysis we made the following recommendations:

1. Regulators of the NB should make information available to investors at free cost and employ more sophisticated system for information dissemination that will checkmate and reduce the application of insider information to make abnormal profit.
2. There is need to increase the breadth and depth of the Nigerian stock market by policy makers via potential investor's enlightenment of the available wealth opportunities in the bourse to entice different investors type to participate and develop the stock market in Nigeria.
3. Continuous research on weak form of EMH is highly suggested in the Nigerian stock market in order to find more conclusions with the aid of more robust model.

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