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An Empirical Investigation on Efficient Market Test for the Nigerian Stock Exchange (NSE)

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Abstract: *This research was an investigation to prove empirically the existence in the Nigeria Stock Exchange (NSE)of the lowest level of efficiency(weak-form). Monthly data on the (ASI) retrieved from NSE that spanned from January 1985 to December 2018 was utilized in the analysis. The revelation of dependence on changes in stock prices show that past information on prices could be utilized in estimating future prices, and this violates what constitutes a weak-form efficient market. Evidence from significant Z-statistics shows the series is non-random and the returns reveal serial dependence. Theforegoing lead to the conclusion that the NSE does not exhibit randomness neither is weak-efficient.Where the price of stocks showed a correlation that is positive and very significantis areflection of the scenario that points to the fact that these stock prices only have a partial impact as regards effect on the deterministic value of stocks that is fair. There is risk mispricing and the wrong allocation of investment capital. There is an implication that investment funds are not channelled into areas where they are most needed and this result in inhibited development and growth in the economy. Existence of non-randomness on the returns of the ASI could be dependent on a "no change" stock prices or "zero returns", and is a product of the preponderance of stocks in NSE's composite ASI that are traded rather infrequently. The results reported in our unique study could be nested on the nature of the environment's available information set that is characterized by poor availability of reliable information and this as a result of the pattern of movement in the composite price index of the NSE.*

Keywords: *Nigeria Stock Exchange, All Shares Index, Efficient Market Hypothesis, Random Walk Hypothesis*
JEL Classification E 44, G00, G14

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I. Introduction Background of the Study

In a real stock market, most investors do not flow along with the idea that the markets' are completely efficient; hence there are attempts to make gains by identifying stocks that bring in better returns without exposure to additional risks. Different scholars with divergent views still try to achieve better returns than the prevailing market value while being exposed to risks of various levels (Singhvi, 2001; Phan & Zhou, 2014). The literature on the EMH is replete with studies that have considered EMH in economies of both developed and developing countries, though most studies have been based on studies of markets of advanced countries, hence the need to focus more on studies of developing countries (Mobarek et al. 2008; Phan &Zhou, 2014). The researchers' that have looked at the stock market of emerging market economies have concentrated on ascertaining if lowest form of efficiency exists in these markets. Results that do not confirm the presence of the weak-form efficiency, only show support for the existence of semi-strong or strong-form efficiency in an efficient market (Wong &Kwong, 1984).Two leading scholars on EMH is Eugene Fama, and Paul Samuelson who were famously known for their independent work on stock markets (Delcey , 2019).

In summary, the hypothesis concludes that stock markets completely encapsulate all information that market participants require to make timely and efficient decisions. The debates in finance literature for four to five decades have been influenced mainly by the expositions and empirical deductions on the EMH and this has made it an interesting theory in Finance. Osborne (1959) did relate stock market movements to that of the 'Brownian motion' in chemistry which reflects the never-ending and disorderly movement of particles when in a medium such as gas or liquid, this seem to be an adequate representation of the 'random walk' which shows that price is unpredictable. Aktan et al (2018) opined that in an efficient market, daily stock price appreciation or depreciation happens randomly and its impact on investment is the focus of the RWH. Themarket is efficient if it completely accommodates all the information available in the market environment as reflected in the prices of stock. The following models' were used as representatives in thetest for market efficiency, they are; (1) The Fair Game Model;(2) The Submartingale Model; and (3)The Random Walk Hypothesis (RWH) (Fama,1969, Samuelson, 1965).

Fama (1969) was able to further elaborate on the above by definition of what an available information set was, By sub diving it into three levels; (a) Weak-form; (b) Semi-strong form; and (c)Strong-form. The EMH has become a major cornerstone in finance theory. The hypothesis states that present stock prices intrinsically reflect all that is needed to be known in a market, excluding information asymmetry and this shuts out the usefulness of the operationsof speculators or arbitrageurs. However, findings from various studies have revealed that the notion behind the EMH may be questionable (Hasan et al, 2012; Ioana-Andreea and Mihai-Cristian, 2013). Shiller (2013) opined that the assumptions of the possibilities of market efficiency are only half-way-true; and Woolley (2014) disclosed the fall of the basic assumptions behind the EMH, where the study demonstrates that share prices connection with the presentations of the hypothesis do not support or explain recent market behaviour and asset pricing. Empirical results from studies on the NSE have been mixed, hence the need for an empirical test that adopts monthly times series data.

This research is aimed at determining whether the NSE is weak-form efficient with the observations of the main composite index (All Shares Index) of the NSE. Besides that, the market behaviour of the ASI will be examined and analysed. Two basic questions are culled from the foregoing; (1) is the EMH weak form efficiency (Random Walk Hypothesis) valid for the NSE? (2) has NSE become efficient gradually in recent years? These questions will assist in determining if EMH's is weak-form efficient and whether there is the validity of the RWH in the NSE. The rest of the paper issubdivided as follows; section two comprises of the review of relevant literature, section three, four and five, research methodology, findings and conclusion.

II. Review of Relevant Literature

Controversy has trailed research on the EMH in the last forty years since its propagation. The contributions of researchers' have moved from a purely theoretical basis in analysing EMH to a far more robust empirical analysis. According to Aruturian, and Korkos (2013), the movement has been into a rather deep empirical analysis using mathematical calculations of asset pricing models such as CAPM (Capital Asset Pricing Model), there is alsothe introduction of behavioural finance as well as the application of volatility tests to prove the existence of an efficient capital market. Fama (1969) was able to set the main background on what he was advocating as regards information availability (whether historical, public or private) that investors have access to. His theorem was broken into three forms for testing the efficiency of any given market such as; Weak-form, Semi-strong and Strong-form tests. Fama (1969) had earlier boosted his model adopting empirical analysis, in which securities where observed to be following an uncertain path or pattern that shows random movement instead of a specific pattern. Analysis to prove the existence of EMH is done for three models. These are the fair game (Martingales) model/Expected return, the Submartingale and the model that is anchored in movements in a non-specific pattern (Random walk) Fama (1969).

2.1Fair game (Martingale)/Expected Return Model

The model that expresses this form is typically stochastic concerning an information set that is symbolized by I_t, this can be referred to as a fair game if it exhibits these properties;

$E\,(X_{t+1}/I_t) = 0$.. (1)

This is nested in the existence of a zero interest rate, the given model reveals that for a market to be called efficient;

$E\,(r_{t+1}/I_t) = 0$.. (2)

r_{t+1} – returns for a future time period

I_t – information at the present

i.e a zero expected rate of return or in terms of price changes.

$E\,(_{t+1}/I_t) = 0$.. (3)

(t+1) – Change in price of stocks

I_t – present information set

i.e a zero expected price change

I_t is true that the fair game martingale model which states that

$E\,(P_{j,t+1}/I_t) = P_{j,t}$.. (4)

Alexakis (1992) explained the Martingale Model as a situation where the price of a stock is j, $P_{j,t}$ is a martingale, and that is the best forecast of price $P_{j,t+1}$ that could be constructed based on the current information(I_t), I_t would just equal $P_{j,t}$ assuming $P_{j,t}$ is in I_t. What the martingale model implies is that an investor with information I_t which may contain the history of dividend, earnings, sales, cost, even macroeconomic data, like GNP, interest rates, or money supply will predict an expected rate of return an uninformed investor would predict, the martingale model says that the information set I_t, is useless in predicting expected return rates of return, in the sense that information I_t has been fully reflected in stock prices

Fama (1991) was exposited on elements constitutes efficiency of a market if it fulfils certain condition such as;

1 – The absence of transaction costs for the traded securities.

2 – Entire market can assess the whole information available virtually no cost.
3 – All the participants in the market agree on the impact of available information on existing market prices.

2.2 Submartingale Model

When a small adjustment is made on the martingale model, the impact on returns expected is positive instead of being zero as was the case in the martingale model. What this indicates is an increases security prices over time. That is the risk inherent in the capital that makes returns on investment to be projected as positive (Gimba, 2012). It was Fama (1969) that suggested this model has an important practical implication for testing if markets are efficient. A mathematical representation would be:

$E (P_{j,t+1} /I_t > P_{j,t}$ ....(5)

$E (P_{j,t+1} /I_t – P_{j,t} = E (r_{j,t+1}/I_t) > 0$ ....(6)

$P_{j,t}$

Price sequence of a security $P_{j,t}$ follows a Submartingale in reference to I_t(information set) if the expected value, of next periods price that is projected in connected to I_t (information set), is greater than subsisting price or for situations as regards returns this model says that expected returns are always positive Alexakis (1992). Hence, no trading role that is anchored on I_t(information set) can produce bigger expected positive returns than either buy or refrain from buying strategy for the time duration under consideration.

2.3Restating theRandom walk model

This model can be transformed into a testable model by being distinguished between three different but nested forms (Stassen, 2009). As was stated earlier Fama (1969), saw market efficiency as a situation where prices express the effect of the whole information available as regards the price of a stock. The future disconnected value of revenue flows that will be generated or earned by investors is seen as intrinsic in the amount of a particular stock price. Stock prices in a market do truly encapsulate all information as regards that stock and reveals a firm's future profitability where there is market efficiency. Gimba (2015) believed that in an efficient market, price changes must be a response only due to additional information. Hence, share prices must also fluctuate unpredictably.

2.4 The Restatement of the hypothesis.

The martingale/fair game model cannot hold where risk aversion by investors holds. What is needed is a construct that gives an anchor that incorporates the equilibrium returns expected in the conditions of risk. Markowitz and Sharpe developed a model called the Capital Asset Pricing Model (C.A.P.M.). The EMH can be restated using the above model. In the CAPM, in a situation where a stock market is efficient, the risk-adjusted returns on every security is equal; where differences amongst/between these assets in expected rates exists, the risk premia that results are coming from unavoidable uncertainty which affects all securities each to a different measure; such risk is called systematic risk (Alexakis, 1992). Systematic risk in stock prices can be computed through the CAPM, and the term used is beta, (), coefficient. What this coefficient shows is how returns expected on a given security co-varies with a return for the entire market (that market return represents returns on all securities of some index that represents all securities such as Nasdaq, FTSE, Dow Jones, S & P 500 index). All Shares Index (ASI). When the beta () equals to one

() = 1

The return on a particular security varies in one to one relationship with the market, when the beta () equals to two or greater than one () = 2, () > 1, the return on a particular security moves in two to one relationship with the market or moves in a relationship with the market or in a relationship greater than one with the security.Where () < 1, the security moves with the market in a relationship less than one. The beta () can be estimated by a regression of excess return on the asset (R_1 - r_f) on the excess return of the market ($R_m – r_f$), assuming that the expected return on the asset is a linear function of the asset level, as measured by the beta () coefficient (Alexakis, 1992). When an analysis is made, the expected return must lie on the same straight line, that straight line is called (Security Market Line) represented by an equation.

$(R_j) = r_j + (R_m – r_f)_j$ ....(7)

Alexakis (1992) was able to further express the formula to represent a Fair game.

$Z_{j,t} = R_{j,t} – (R_{j,t}/n_{j,t})$ ....(8)

$E (R_{j,t}/n_{j,t}) = r_{ft} + (E (R_{mt}/_{nmt}) – r_{ft})_{njt}$ ....(9)

$E (Z_{j,t}) = 0$ ....(10)

With $E (1R_j,t/n_{j,t})$ – the expected rate of return of the jth asset during this period, given a prediction of its systematic risk $n_{j,t}$.

$E (R_{mt}/B_{nmt})$ the expected market of return given a prediction of its systematic, n_{mt}.

$n_{j,t}$ the estimated systematic risk for the J^{th} security based on past period information set I_{t-1} and r_{ft} the hypothesis states that if there is any deviation between actual return R_J from the expected return, it should be random. Where there is a situation where the expected return is either above or below the security market line, it is an indication that the market is inefficient, that security is thus expected to give a risk required level, that is it is underpriced (overpriced) and consequently, an investor can profit from, the deviation.

2.5 The Weak-form

In this type, historical data(information) on previous prices is the anchor on which prices of particular securities are reflected fully and in returns, hence no individual investor can gain in excess over and above other investors based on this available information set (Nisar and Hanif, 2012). Gimba (2015) saw this as the lowest level of efficiency and as such defines a market as efficient if current prices do encapsulate information in past prices. According to him, here past prices may not be useful as a predictive tool for stock price movements in the future. Hence, an investor/trader cannot thus make abnormal returns by using only the historical stock prices.

2.6 Semi – Strong form

Here publicly available information is fully encapsulated and fully reflected by the prices and this publicly accessible information should be in the possession of all investors and participants such that no particular investor can gain excess returns on the basis of the reflected information set, (Nisar and Hanif 2012).

2.7 Strong-form

In a strong-form efficient market, all information in the public and private domain is completely covered or factored into current prices and all investors are fully aware of such information in a way that ensures none can gain excess returns based on this information set (Nisar and Hanif, 2012). Gimba (2015) posited that this type implies that private information (insider information) is hard to obtain in that would assist any particular investor to make abnormal returns because, if a market participant wants to have it, the investor has to compete with many investors that participate in this market. Farmer (2014) opined that idea that financial markets' summarize whole market information in a way that enables marketparticipants make very make snap conclusions in the market. For a situation of efficient markets' to come about on the basis of information, the scenario here is that more investors are informed, the price system, is seen as a source of useful information "The equilibrium number of individuals that have and don't have relevant information for a given economy will depend on certain limitations, including information cost and timing of that information produces low transaction costs (Grossman and Stiglitz; 1980).

Fama (1991) buttressed this fact when he stated that the lower the cost of transaction in a given market, then the market becomes more efficient. An important assumption for this level of efficiency is that insider information cost is always zero. But such an assumption, in reality, will be difficult to see, hence this level is not likely possible.

2.8 Empirical Tests

Market efficiency happens if; the market doesnot lack any bit of information relevant to the determination of security prices. It acts as though there is rational expectation Alexakis (1992). What an empirical research like this investigates are; whether there is past available information which can help determine future returns profitably, to violating the martingale model. Also to investigate whether factors not related to fundamental values influence stock prices. Two main methods and tools a utilized in testing market efficiency, theseare; (1) Fundamental Analysis, and (2) Technical Analysis.

2.9 Empirical Literature Review

Ever since the propagation of the EMH by Fama, the EMH has generated so many controversies concerning its worldwide existence. Finance literature is replete with abundant empirical studies that have investigated the possible proof that market efficiency exists (Aruturian and Korkos, 2013). Major tools that are adopted in trying to statistically determine market efficiency are; serial correlation runs test, spectral analysis and test of unit-root and these have been used to study and examine weak-form market efficiency (Truong, 2006). The study by Chaudhori and Wu (2003) adopted the methodology that was used Zivot and Andrews (1992) to see if random walk exists in the pattern of price changes, a scenario that defines a critical aspect of the hypothesis in 17 financial markets in emerging market countries. Their findings show that out of all the countries analysed, ten showed the non-existence of random walk at the level of significance of 5% and even 1%. Runs test was also used and it revealed the presence for all countries examined of the weak-form efficiency. Though, in a far more extensive study by Worthington and Higgs(2003) utilizing both parametric and non-parametric test to determine if there is weak-form efficiency for Venezuela, Colombia, Argentina, Brazil, Mexico and Peru. Their findings led to the discovery of the non-existence in the stock market of the random walk as regards price movements.Another test by Phan and Zhou(2014) looked at the Vietnamese market to determine its level of efficiency. The study adopted runs test, autocorrelation for a period that spanned July 2000-July 2013. Their findings led to a conclusion of the non-existence of the hypothesis as regards a random walk, for the stock market in three cycles and also for the two whole periods.Theirfindings provideproof that for the preceding ten years, randomness of sock price movement has improved.Researchers on the market efficiency in the Middle East like Omran and Farrar (2006) thatinvestigated markets in Israel, Turkey, Jordan, Egypt and Morocco, discovered from findingsevidence that led to the rejection ofthe RWH for markets that were studied. Chancharat and Valadkhani were referred to by Anotonian and Korkos (2013) as having examined structural breaks in markets of 18 countries. The Zivot and Andrews (1992) and Lumsdaire and Papell(LP)models were adopted to determine the occurrence of random walk in emerging markets in the research.

The findings for the initial test showed that for 14 of these countries, the presence of random walk was validated. In many emerging countries there is the problem of thin trading as was identified by Fisher (1966) and this causes hindrance to effective economic analysis. Thin trading indicates limited participation of would be investors in the stock market and the function of the stock market as a meeting place for surplus units and deficit units is limited.

For Chinese markets, many researchers have over the years carried out empirical investigations, such as; Groenwold et al (2003) that tried to prove that the Chinese stock markets were efficient'. Their findings revealed the existence of market inefficiency because present stock prices were estimated from previous prices. These findings reinforced an earlier study by Mookerjee and Yu (1999) that showed that both Shanghai and Shenzen stock exchanges were not weak-form efficient. Lee et al (2001) adopted variance test to test the efficiency of Chinese markets. The evidence derived, confirm that the RWH does not hold for the stock markets in China.The Chinese economy might show signs of being a serious capitalist economy, yet it is still a strongly centrally planned and thus does not portend a possible existence of an efficient stock market in the near future. Studies on African stock exchanges, such as was conducted on data from financial markets like the in South Africa (JSE) showed the existence of efficiency in the weak-form (Magnusson and Wydick, 2002). Appiah – Kusi and Menyah (2003) in a similar research a year later concluded that same stock exchange is not weak-form efficient.

Olowe (1999) and Vitali and Mollah (2010) tested for market efficiency, found the market to be informational, not efficient and there was existence the RWH for stock prices in the Nigeria Stock Exchange. Gimba (2015) carried out empirical study the NSE, show evidence of a weak-form inefficient. This shows non randomness in the NSE.

III. Research Methodology

The investigation to determine efficient markets has broadly been concerned with seeking evidence that shows that investors using of a past information set could have generated excess returns as they follow some pattern of selling and buying while reflecting the whole information set (Alexaxis,1992). An attempt, at adopting technical analysis is useless in a weak efficient market in that price pattern is non-existent. But in a market that is Semi-strong the adoption of fundamental analysis is useless. Using econometric models to reflect an efficient market, the security return is seen as the dependent variable; the explanatory lagged variables can prove it's statistically insignificance, showing it is encapsulated in the current price of stocks.

3.1 Empirical Analysis for Efficiency in the Weak-form

The test adopts two approaches to prove this form of efficiency. Statistical tools and Testing independence.

3.2 Statistical tools

Where the statistical tests prove the presence of RWH for independence of price changes, the conclusion will be that there exist no possible mechanical trading roles, this is revealed by patterns in previous price changes and this can make the expected profits of an investor greater than what would be the case where a buy or hold scenario trading strategy is considered. The statistical tools adopted include; Descriptive statistics, Dynamic regression and Spectral analysis. All these do run tests as t detect patterns in price changes.

3.3 Empirical test for Semi-strong efficiency

These tests are concerned with whether available information tests like registration technique e.g. a test Semi-strong efficiency exists where prices respond to unanticipated part of any announcement and react quickly.

$P_t = a_0 + a_1F_{xt} + a_2 U_{xt} + t$ .... (11)

3.4 Test for Strong-Efficiency

The test has been conducted in two ways; by investigating returns based on insider trading and by evaluating the performances of mutual funds etc.,.

3.5 Further statistical tests
There are two popular tests of market efficiency that will be considered here;
(1) Augmented Dickey-Fuller (ADF) test
(2) Run test and (3) Autocorrelation Function (ACF) test

(1)Augmented Dickey-Fuller (ADF) test is the most popular of the stationarity test, are used to test the unit root hypothesis.
If a times series has unit root it means it is non-stationary and it follows a random walk
It is based on two possible equations

$Y_t = Y_{t-1} + U_t$.. (11)

The Null Hypothesis can be defined
1 – H_o: = o or H_o: P = 1
ADF tests result for the random walk model with a drift

$\Delta Y_t = B_1 + \delta Y_{t-1} + U_t$... .(12)

(1) The Run test (Geary test)
The random walk hypothesis is tested by tabulating the number of sequences of consecutive positive and negative returns, (Vulic, 2015). The null hypothesis states that successive outcomes are independent, the total expected number of runs is distributed as normal with the following mean:

$$E(R) = \frac{n + 2n_A n_B}{n} \quad \text{...} (13)$$

and standard deviation

$$\delta R = \sqrt{\frac{2n_A n_B (2n_A n_B - n)}{n^2 (n-1)}} \quad \text{........ ....} (14)$$

n = total number of observations
nA = number of first-run cycle
nB = number of second-run cycle
R = number of runs
Test for serial dependence is carried out by comparing the actual number of runs; a_r is the price series, to the expected number µ.
The Null Hypothesis is;
H_o: E (runs) = E (R) and checks a random walk hypothesis for a two-valued data sequence.
Elements in the sequence can be tested to validate the hypothesis of mutual independence from each other. If the number of observations is larger, what it reveals is a distribution that is equal to normal distribution.
Hence the Run test uses a standard normal Z distribution

$$Z = \frac{R - E(R)}{\delta R} \text{...} (15)$$

Where critical value is less than the Z value, the Null hypothesis will be rejected (at an appropriate significance level).

3. Autocorrelation Function
The autocorrelation function (ADF) test is used to identify the degree of autocorrelation in a time series. What it measures is the degree to which current and lagged observation of time series of stock returns correlate.
(i) If the time series has a unit root, the autocorrelation function slowly decreases starting from a value of one and
(ii) First value which differs from zero refers to a partial correlation function.
If one time series has two unit-roots, ACF acts the same way as for one unit root series, but the partial correlation function has only two non-zero values.

IV. Results

4.1 Normality Tests
Normal distributions have symmetry around the mean, but if there is skewness in the distribution, it is not seen as a normal distribution. The coefficient of kurtosis in a distribution that is normal is 3. Where there is kurtosis (>3) it means the distribution is leptpkurtic or distribution that is peaked. But where it is (<) it is platykurtc or a flat distribution. The data reflected by Table A1 indicates a mean return of 27373.2475 while the deviation from the mean is 189376.47043. We discovered that the resultant distribution is positively skewed and non-symmetric with a (positive) coefficient of skewness of 18.709 indicating that there are more positive extreme values than negative(extreme value) for the sample period. The distribution has a kurtosis because the

returns are 363.209 which is above 3. The price of the series is leptokurtic and is evident therefore that the distribution is peaked.

Table B2 presents the results the Kolmogorov-Smirnov goodness of fit test. The results lead to a rejection of the null hypothesis based on the fact that the probability of the computed Z-statistic is less than the *p*-value, 0.05.

This is followed by a robust runs test that is non-parametric in revealing that there are deviations from data analysis results as well as from a normal distribution.

4.2 Runs Tests

Table C3 shows runs test result that reveals the evidence that leads to our accepting the alternative hypothesis that indicates that randomness and independence of price of securities as they change is rejected based on the face of a calculated Z statistics of -19.728 which lies outside the critical values of ±1.96 and ±2.576 at the levels of 1% and 5% significance respectively. A Z value that is significant, but negative indicates the real figure on runs is fewer than expected. This negative Z value reveals the occurrence of autocorrelation as regards the series returns. It has been established earlier that when the Z value is significant, it shows the existence of non-randomness based on the return series serial dependence returns. From the results, the existence of the weak-form or RWH is not evident in the NSE.

V. Conclusion

Theresults showa violation of weak-form efficiency, since past data on stock prices is effective in predicting future price movements. The positive correlation in stock price changes is significant and this indicates stock prices have only partially reflected the fair value of stocks; hence investment capital can be wrongly priced or wrongly allocated. This further implies that investment resources are not channelled to their most productive uses, thereby hampering the growth and development of the domestic economy. A stock market that is efficient even in the lowest form would be a perfect allocator of resources based on the dynamism of effective demand and supply of funds in the domestic economy. Without such a system, a greater involvement of the government in such roles will result in a crowding out of the private sector in the economy.

There is evidence that index returns on the NSE are non-random and this might be due to "no change" in prices, or "zero returns", which in turn is a result of the fact that most NSE's ASI stocks are infrequently traded.The results reported in this study could also be attributed to the peculiar nature of the information environment characterized by poor dissemination of information relating to changes in price in the exchange. Hirota and Sunder (2002) concludes that the paucity of information relating to securities in markets can cause speculation and or herding mentality amongst investors, ultimately resulting in correlated movements in price that is large. The foregoing is indicative of poor information availability and the absence of market conditions that attract massive foreign investment in the capital market. The present macroeconomic dynamics also does not favour external participation in the domestic stock market.

To this end, policymakers and the regulatory authorities need to intensify efforts to vigorously pursue extensive reforms to improve the quality of the information environment. One useful strategy to achieve this would be to encourage more institutional investors to participate in the NSE. Price formation process in the market can be improved by the superior capacityof institutional investors to conduct extensive security analysis. Furthermore, the regulatory authorities need to ensure that the effectiveness of support institutions are in line with international best practices, since it is easier to attract investors into markets that have strong, transparent and effective institutions. The Nigeria stock Exchange was one of the most vibrant in African continent and reached its peak before and around the period prior to the global financial crises of 2008. The NSE is yet to recover to its previous peak trading volume, despite the attempts by regulators to reinvigorate the market,

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TABLES

Table A 1. Statistical properties of stock returns

N	Mean	Std. Dev	Minimum	Maximum	Skewness	Kurtosis
408	27373.2475	189376.47043	111.30	3732148.00	18.709	363.209

Source: Authors own computation using SPSS 20

Table B 2. Kolmogorov-Smirnov goodness of fit test

No. of Observation	Mean	Std. Dev.	Most extreme absolute diff	Positive	Negative	Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
408	27373.25	189376.47	0.443	0.423	-0.443	8.943	0.0000

Source: Authors own computation using SPSS 20

Table B 2. Kolmogorov-Smirnov goodness of fit test

No. of Observation	Mean	Std. Dev.	Most extreme absolute diff	Positive	Negative	Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
408	27373.25	189376.47	0.443	0.423	-0.443	8.943	0.0000

Source: Authors own computation using SPSS 20

Table C3. Results of runs test

Total cases	Mean	Cases< Mean	Cases> mean	No of runs	Z-statistic	Asymp. Sig. (2-tailed)
408	11032.06	204	204	6	-19.728	0.0000

Source: Authors own computation using SPSS 20