

# The Relationship Between Stock Market and Market Efficiency: the Nigerian Experience

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## Abstract

The efficient market hypothesis (EMH) has been subject to debate for decades. The field of behavioural finance was developed in response to the body of anomalous evidence with regard to the EMH. However important the establishment of the EMH by Fama in 1970, the first ideas on a theory of efficient markets can be traced back to the origins of modern economics. Reviewing seminal work underlying the efficient markets theory, and focusing on the development of appropriate methodology to test for weak form market efficiency. The study empirically investigated the effect of stock market on efficient market hypothesis with emphasis on weak form hypothesis for the period of 1986 to 2021. Using descriptive analysis and Ordinary Least Square regression econometric approach to analyze the relationship between stock market and market efficiency in Nigerian. The outcome from the result found that market capitalization has significant effect on share price while value of transaction had insignificant effect on share price in Nigeria, the study therefore concluded there is existence of weak form of efficient market hypothesis in Nigeria stock market.

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## 1. Introduction

Driven by the desire to understand and explain the effects of investors' decisions on financial markets, the debate on the informational efficiency of stock markets is going on now for more than 40 years. In a larger historical perspective, one could go back to the 18<sup>th</sup> century to see that even Adam Smith (1759, 1766) was troubled by the efficiency and self-stabilizing nature of financial and economic markets, which essentially boils down to the question whether or not stock prices are in line with the intrinsic value of the underlying financial asset.

Fama (1970) defines an efficient market as a market in which prices always fully reflect available information and makes a distinction between different types of efficient markets based on three connotations of the concept "available information" i.e. weak form efficient markets (historical price information); semi-strong form efficient markets (all publicly available information); and strong form efficient market (all information, both public and private). In weak form efficient markets it is impossible to persistently generate portfolio returns higher than the market return by trading on past price information i.e. technical analysis of stocks is obsolete (Brown & Jennings, 1989).

A semi-strong efficient market implies that it is impossible to persistently beat the market by using a trading strategy based on public information (e.g. newspapers) i.e. fundamental analysis is ineffective (Kothari, 2001). If markets are strong form efficient, even insider trading on private information will not be able to outperform the market portfolio, besides by pure luck.

The stock market has been identified as an institution that contributes to the economic growth and development of emerging and developed economies. This is made possible through some of the vital roles played such as channelling resources, promoting reforms to modernize the financial sectors, financial intermediation capacity to link deficit to the surplus sector of the economy and a veritable tool in the mobilization and allocation of savings among competitive uses which are critical to the growth and efficiency of the economy (Alile, 1984).

It helps to channel capital or long-term resources to firms with relatively high and increasing productivity thus enhancing economic expansion and growth (Alile, 1997). Ekundayo (2002) argues that a nation requires a lot of local and foreign investments to attain sustainable economic growth and development. The stock market provides a means through which this is made possible. However, the paucity of long-term capital has posed the greatest predicament to economic development in most African countries including Nigeria. Osaze (2000) sees the stock market as the driver of any economy to growth and development because it is essential for the long term growth capital formation. It is crucial in the mobilization of savings and channelling of such savings to profitable self liquidating investment. The Nigerian stock market provides the necessary lubricant that keeps

turning the wheel of the economy. It not only provides the funds required for investment but also efficiently allocates these funds to projects of best returns to fund owners. This allocative function is critical in determining the overall growth of the economy. The functioning of the stock market affects liquidity, acquisition of information about firms, risk diversification, savings mobilization and corporate control (Anyanwu, 1998). Therefore, by altering the quality of these services, the functioning of stock markets can alter the rate of economic growth (Equakun, 2005). Okereke-Onyiuke (2000) posits that the cheap source of funds from the capital market remain a critical element in the sustainable development of the economy. She enumerated the advantages of capital market financing to include no short repayment period as funds are held for medium and long term period or in perpetuity, funds to state and local government without pressures and ample time to repay loans.

The efficiency of stock markets has been a major area of research in financial economics, particularly as it pertains to stock markets of developing economies (Rapulu chukwu, 2010). This is because of the implication of market efficiency to the functioning of the stock market; especially as it concerns investors' returns and thus stimulation of investor's interest in market activities. It is believed that the behaviour of stock prices is explained by the behaviour of investors. Stock market forecasting is marked more by its failure than by its successes since stock prices reflect the judgments and expectations of investors based on information available (Aguebor, Adewole & Maduegbuna, 2010). Remarkably, efforts have been made to apply econometric techniques of model building in the prediction of stock prices in a bid to demonstrate that the market fluctuations are essentially unpredictable (Brealey & Myers, 1996; and Brummelhuis, 2005). Fama and French (1988) have argued that there are long-term pattern in stock prices with several years of upswing followed by more sluggish periods. According to Fama (1965; 1995), a stock market where successive price changes in individual securities are independent is by their definition, a random walk market. Specifically, stock prices following a random walk imply that the price changes are as independent of one another as the gains and losses. The independence assumption of the random walk hypothesis is valid as long as knowledge of the past behaviour of the series of price changes cannot be used to increase expected gains (Aguebor, Adewale & Maduegbuna, 2010). More specifically, if successive price changes for a given security are independent, then there is no problem in timing purchases and sales of the security. A simple policy of buying and holding the security will be as good as any more complicated mechanical procedure for timing purchase and sales (Fama, 1965).

The stock market, more than ever before, is increasingly becoming one of the most popular investments outlet in recent times due to its high returns and the market has gradually become an integral part of the global economy to the extent that any fluctuation in this market influences personal and corporate financial lives as well as the economic health of a country. Furthermore, the stock market is crucial to the nation's economic development because it, among other functions, performs the vital function of financial intermediation in the economy by taking money from the surplus units in the economy and channelling 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 test stock market efficiency. 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). In an active market made up of knowledgeable investors, securities will be fairly priced to reflect all available information (Fama, 1965). If a market is efficient then the security price, at any given time, will fully incorporate all available information and thus make it impossible for any investor to outperform the market.

This study focuses on the weak form of the EMH bearing in mind that rejecting the null hypothesis of weak form efficient markets naturally leads to the rejection of the semi-strong and strong form of the EMH.

## **2.0 LITERATURE REVIEW**

### **2.1 Market Efficiency**

With a better understanding of price formation in competitive markets, the random walk model came to be seen as a set of observations that can be consistent with the efficient markets hypothesis. The switch of emphasis began with observations such as that of Bagehot (1965), whose proof that properly anticipated prices fluctuate randomly began with the observation that "in competitive markets there is a buyer for every seller. If one could be sure that a price would rise, it would have already risen."

De Bondt and Thaler (1985) asserted that "arguments like this are used to deduce that competitive prices must display price changes... that perform a random walk with no predictable bias."

Brown explains that "we would expect people in the market place, in pursuit of avid and intelligent self-

interest, to take account of those elements of future events that in a probability sense may be discerned to be casting their shadows before them." By presenting his proof in a general form, Brown added rigour to our notion of a well-functioning market. It is not clear to us whether these results ought to be seen as obvious or surprising, nor was it clear to Cowles who wrote that "the theorem is so general that I must confess to having oscillated over the years in my own mind between regarding it as trivially obvious (and almost trivially vacuous) and regarding it as remarkably sweeping. Such perhaps is characteristic of basic results."

Building on Samuelson's microeconomic approach, together with a taxonomy suggested by Arshanapalli. Fama (1970) assembled a comprehensive review of the theory and evidence of market efficiency. Though his paper proceeds from theory to empirical work, he notes that most of the empirical work preceded development of the theory. The theory involves defining an efficient market as one in which trading on available information fails to provide an abnormal profit. A market can be deemed to be efficient, therefore, only if we posit a model for returns. From this point on, tests of market efficiency become joint tests of market behaviour and models of asset pricing. The weak form of the efficient market hypothesis claims that prices fully reflect the information implicit in the sequence of past prices. The semi-strong form of the hypothesis asserts that prices reflect all relevant information that is publicly available, while the strong form of market efficiency asserts information that is known to any participant is reflected in market prices. The literature begins, therefore, with studies of weak form market efficiency.

Fama (1970) summarises the early random walk literature, his own contributions and other studies of the information contained in the historical sequence of prices, and concludes that "the results are strongly in support" of the weak form of market efficiency. He then reviews a number of semi strong and strong form tests, highlighting those that we cover in the next two sections, and concludes that "in short, the evidence in support of the efficient markets model is extensive, and (somewhat uniquely in economics) contradictory evidence is sparse." He concedes, however, that "much remains to be done", and indeed, Fama (1991) subsequently returned to the fray with a reinterpretation of the efficient markets hypothesis in the light of subsequent research.

Studies of the semi-strong form of the efficient markets hypothesis can be categorised as tests of the speed of adjustment of prices to new information. The principal research tool in this area is the event study. An event study averages the cumulative performance of stocks over time, from a specified number of time periods before an event to a specified number of periods after. Performance for each stock is measured after adjusting for market-wide movements in security prices. The first event study was undertaken by Fama, et al (1969), though the first to be published was by Ball and Brown (1968). Using the market model or capital asset pricing model as the benchmark, these event studies provide evidence on the reaction of share prices to stock splits and earnings announcements respectively. In both cases, the market appears to anticipate the information, and most of the price adjustment is complete before the event is revealed to the market. When news is released, the remaining price adjustment takes place rapidly and accurately. The Fama, Fisher, Jensen and Roll study, in particular, demonstrates that prices reflect not only direct estimates of prospective performance by the sample companies, but also information that requires more subtle interpretation.

In Ariel (1972) study of the price effects of secondary offerings, he examines stock price movements when the seller may be in possession of non-public information. On average, share prices fall by an amount that reflects the value of this information. The impact of a secondary distribution on the stock price is largely unaffected by the size of the transaction, which confirms the depth of the market and the substitutability of one security for another. Note, however, that there is some indication of post-event price drift, which may constitute a violation of market efficiency.

## 2.2 Strong Form Efficiency

Since the first event studies, numerous papers have demonstrated that early identification of new information can provide substantial profits. Insiders who trade on the basis of privileged information can therefore make excess returns, violating the strong form of the efficient markets hypothesis. Even the earliest studies by Cowles (1933,1944), however, make it clear that investment professionals do not beat the market. While there was evidence on the performance of security analysts, until the 1960s there was a gap in knowledge about the returns achieved by professional portfolio managers. With the development of the capital asset pricing model by Baiz (1961) and Demsetz (1968) it became clear that the CAPM can provide a benchmark for performance analysis. The first such study was Basu (1977) article in Harvard Business Review on the performance of mutual funds, closely followed by Cowles (1966) rival article. The most frequently cited article on fund managers' performance was to be the detailed analysis of 115 mutual funds over the period 1955-64 undertaken by Ariel (1972). On a risk-adjusted basis, he finds that any advantage that the portfolio managers might have is consumed by fees and expenses.

Even if investment management fees and loads are added back to performance measures, and returns are measured gross of management expenses (i.e., assuming research and other expenses were obtained free), Bainz concludes that on average the funds apparently were not quite successful enough in their trading activities to

recoup even their brokerage expenses. Fama (1991) summarizes a number of subsequent studies of mutual fund and institutional portfolio managers' performance. Though some mutual funds have achieved minor abnormal gross returns before expenses, pension funds have underperformed passive benchmarks on a risk-adjusted basis. It is important to note that the efficient markets hypothesis does not rule out small abnormal returns, before fees and expenses. Analysts could therefore still have an incentive to acquire and act on valuable information, though investors would expect to receive no more than an average net return. Cootner (1980) formalise this idea, showing that a sensible model of equilibrium must leave some incentive for security analysis. To make sense, the concept of market efficiency has to admit the possibility of minor market inefficiencies. The evidence accumulated during the 1960s and 1970s appeared to be broadly consistent with this view. While it was clear that markets cannot be completely efficient in the strong form, there was striking support for the weak and semi-strong forms, and even for versions of strong form efficiency that focus on the performance on professional investment managers.

### **2.3 The Weak Form Hypothesis**

The weak-form hypothesis posits 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 (Baiz et al,1999). To Cowles (2006), weak form efficiency means that unanticipated return is not correlated with previous unanticipated returns. In other words, the market has no memory, knowing the past does not help to earn future returns. This version of EMH implies that trend analysis is fruitless. Past stock price data are publicly available and virtually costless to obtain. This version holds that if such data ever conveyed reliable signals about future performance, all investors would have learned already to exploit the signals. Ultimately, the signals lose their value as they become widely known because a buy signal, for instance, would result in an immediate price increase.

In a weak form efficient market, past prices and volume data are already impounded in security prices and no amount of chart reading or any other trading device is likely to consistently outperform the buy and hold strategy.

### **2.4 The Semi-Strong Form Hypothesis**

The version according to Demsetz (1968) states that stock prices already reflect not only historical information but all published information about the company whose securities are under consideration. Such information includes fundamental data on the firm's product line, quality of management, balance sheet composition, patents held, earning forecasts, and accounting practices. Again, efforts to acquire and analyse such information from publicly available sources would confer no advantage. In a semi-strong efficient market, investors would have no publicly available source of information that could lead them to consistently beat the market. Of course, they could expect to make profit in the market, but their profit would be commensurate with the riskiness of the investment. However, such activities as analysing financial statements forecasting earnings, and following advice of a popular investment newsletter would not contribute to increased investment returns and might even lower returns by increasing costs while not adding to profit (Dimson, 1989).

### **2.5 The Beginning of Efficient Market Theory**

Proponents of the EMH argue that if the price of a stock would appear to be too high given past price information, rational investors would bid the price down to make a profit and vice versa. What they call "the wisdom of the crowds" would eventually force stock markets to be efficient (Fox, 2009). More generally, they believe that investors are rational optimizers that are able to make the best possible decisions given certain information (e.g. past price information). Proponents of behavioural finance, on the other hand, believe that investors are not always fully rational and therefore are not able to force the stock market to be efficient at all times (e.g. Shefrin, 2000). They refer to recent bubbles and financial crises to point out that there are different psychological effects that cause human beings to stray from rational decision making.

There is still no consensus on the validity of the EMH. Nevertheless, valid financial models are important for policy makers and investors. One example is the well-known theory of diversification deduced from the optimal portfolio theory (Markowitz, 1952). However, one needs to stay critical even with respect to well-established theories, as the world is not a static environment. When academic theory is flawed it has the potential to set the entire economy astray (Fox, 2009; Nocera, 2009). One example is the housing bubble that caused the 2008 financial crisis. While policy makers, banks and investors were blindly following the bullish market, irrational exuberance was building up underneath (Shiller, 2000). Today, we are still trying to deal with the consequences and even the future of an entire generation is at stake.

Samuelson (1965) proved theoretically that in an informational efficient stock market, where the stock price contains all available information and expectations from market participants, prices fluctuate randomly. Fama (1965a) empirically showed that financial markets follow a random walk. Additionally, technical and

fundamental analysis cannot possibly yield risk-adjusted excess returns (Fama, 1965b). Fama and Blume (1966) pointed out that no economic profits could be made using technical trading rules, like the filter rule in Alexander (1961, 1964), as trading costs are too high. Roberts (1967) was the first to coin the term efficient market hypothesis (EMH) and suggested a distinction between several types of efficiency.

Fama (1970) defined an efficient market as a market that fully reflects all available information. He introduced three types of informational efficiency: weak form, semi-strong form and strong form efficiency. Summarizing empirical results from weak form, semi-strong form and strong form efficiency tests, Fama concluded that financial markets are efficient in at least the weak sense. Although some price dependencies were found, they never sufficed to be used in profitable trading mechanisms. Fama (1970) also pointed out a joint-hypothesis problem. Essentially, it is argued that it is impossible to ever correctly test the efficient market hypothesis, because no academic consensus is found on the true underlying asset-pricing model. Whenever a test of market efficiency would reject the efficiency hypothesis, there is always the possibility that it is simply due to the underlying asset pricing model finding an incorrect theoretical asset value. The only conclusion that can be made from efficiency tests is that a market is efficient or not with respect to a certain underlying asset pricing model. Alternative definitions of market efficiency were proposed by, for example, Jensen (1978): A market is efficient with respect to information set  $\theta_t$  if it is impossible to make economic profits by trading on the basis of information set  $\theta_t$ ; or Malkiel (1992) who stated that a stock market is efficient whenever the prices of stocks remain unchanged, despite information being revealed to each and every market participant.

## 2.6 Empirical Literature

Nwosa P. I and Oseni I. O (2021) examine the efficient market hypothesis and Nigerian stock market using serial auto-correlation and regression approach of analysis and the study findings from the result of the serial auto-correlation and regression analysis both shows that the Nigeria stock market is informational inefficient, that is stock price does not exhibit random walk.

Adebanjo J. F., Awonusi F and Eseyin O. (2021) examine the extent of development of the Nigerian and Ghanaian stock markets. It investigates their responsiveness to market information. The study used Partial Autocorrelation (PACF) test, Partial Auto Correlation test and Kolmogorov Smirnov to test for observable trends to test for independence of stock prices. It used the runs test and the distribution patterns to test for randomness of stock prices; the findings revealed that the movements of stock prices in the stock market were found to be independent. The trends of stock prices in the stock markets were not random. Yet, there was an observable movement in the pattern of stock prices trends. The result of the Partial Auto Correlation test indicates that the movements of stock prices were independent. Moreover, the result of the runs test and the distribution patterns show that the movements of stock prices were not completely random.

Ejem, C. A, Ogbonna, U. G and Okpara, G. C, (2020) investigates the efficient market hypotheses controversy and Nigerian stock exchange relations. In the study Nigerian Stock Exchange and Efficient Market Hypothesis was done using All Share Index (ASI) with daily data gathered from January 02, 2014 to May 20, 2019 which has (1333 observations) and annual data from 1985 to 2018 (34 observations) collected from the Nigeria Stock Market fact books. The study employed econometric approach of unit root test, GARCH Model and the Autocorrelation cum partial autocorrelation method for the assessment of weak form hypothesis on the daily and annual all share index in the Nigerian Stock market. The results of these evaluations indicated a meaningful nexus between the price series and their lagged values implying that stock price series do not follow a random walk process in Nigerian stock market. Thus, affirming that the Nigeria Stock Exchange is not efficient in weak form.

Adigwe, Ugbomhe and Alajekwu (2017) examined whether a selected African stock exchanges provide evidence of weak form efficiency in the recent time period January 2013 to December 2015. The study covered 13 out of the 28 Stock Exchanges in Africa, representing 38 nations' capital markets. The Jarque-bera statistics test of normal distribution and Augmented Dicker Fuller test of stationarity for stock market efficiency were employed. The data obtained from the monthly All Share Index data of the markets are log transformed to arrive at stock market returns used for the data analyses. Findings from the result indicated that (1) African stock market follows normal distribution; (2) succeeding price changes are not independent and move randomly in African stock markets. The study concluded that African stock markets are weak form inefficient within the period under study.

Tuan, Jae-Hoon and Doureige (2016) investigated the weak-form efficiency of five ASEAN stock markets. It applies the automatic portmanteau test and the automatic variance ratio test to moving sub-sample windows of stock market returns. The empirical results showed that the Thai and Singaporean stock markets are weak form efficient for the period investigated (1999-2015). The other stock markets except for Malaysia showed improvement in efficiency post the global financial crisis of 2007. The findings revealed evidence that supports the adaptive market hypothesis and confirms the positive impact of the ongoing financial liberalization processes in the ASEAN region.

Kim, Doucouliagos and Stanley (2014) analyzed the available evidence on the efficient market hypothesis (EMH). Meta regression analysis was applied to 1,560 estimates of the Variance Ratio test of the efficiency of Asian and Australasian stock markets. The study test if there is evidence of violation of the EMH and also explain the heterogeneity in the reported test results. The meta-regression analysis specifically accommodated the possibility of publication selection in favour of accepting the null hypothesis of market efficiency. The study found that Asian stock markets are, on average, not informationally efficient. However, market efficiency has improved over time and market capitalization and economic freedom influences stock market efficiency; more developed and less regulated stock markets are more efficient.

Saymeh (2014) empirically tested the weak efficient form hypothesis for two emerging stock markets, which are: Amman Stock Exchange, (ASE) and Turkish Stock Exchange (BORSA Istanbul) through examining their monthly indexes for the period 2000-2011. Data used in the empirical analysis were collected from historical records of ASE and BORSA Istanbul markets for the period 2000-2011. Tests used were: Ljung Box Autocorrelation, Runs, Dickey-Fuller Unit Root, and Individual Variance Ratio tests. The results of the study indicated debatable results. Runs tests have rejected the Random Walk characteristics while Augmented Dickey-Fuller tests have approved that both markets are weak form efficient. Autocorrelation tests have rejected the Random Walk Hypothesis for both markets; However, Variance Ratio tests have revealed mixed results as they approved BORSA Istanbul and rejected ASE as being Weak Form Efficient. Based on these test results, there were not enough evidences to consider ASE and BORSA Istanbul as Weak Form Efficient markets.

Lim, Huang, Yun and Zhao (2013) reviewed the efficiency of the two official stock markets in China. The sample included the daily closing prices of A-share and B-share indexes in both the Shanghai and Shenzhen stock exchanges for the period of January 1st, 2006 to December 31st, 2010. Three different approaches are employed; namely, serial correlation test, runs test and variance ratio test. Statistical evidence from serial correlation test showed that returns are correlated in both Shanghai and Shenzhen indexes and therefore the markets are weak-form efficiency.

Nguyen, Chang and Nguyen (2012) investigated whether the Taiwan Stock market is weakly efficient by modifying and estimating Dockery and Kavussanos' multivariate model using a set of panel data. The empirical findings suggested that the Taiwan stock market is not informationally efficient, which may be attributable to the lack of broadness and depth of the market.

Habibour, Ezazul, Sakhawat and Mahmud (2016) attempted to find out evidence for the weak form of market efficiency i.e. random walk using the daily data on returns for stock prices on the Dhaka Stock Exchange (DSE). The efficiency of the DSE was tested by using the all-share price index, DSE general price index, and DSE broad index covering the period from January 1, 1993 to June 30, 2015 by employing the runs test, serial correlation test, and variance ratio test. These tests are also applied to the share price of fifty selected individual companies. The runs test results showed that the share price of all the three indices does not follow a random walk. While returns on the DSE broad index showed little evidence in favour of random walk by the autocorrelation test and the DSE general index showed some signs of efficiency by the variance ratio tests under homoskedastic and heteroskedastic assumptions. Therefore, the DSE is not weak-form efficient. This result implies that daily changes in stock prices reflect past prices, suggesting that investors can predict future stock prices to a great extent using past price patterns and can often earn abnormal profit.

Njuguna (2016) examined the efficiency of the Tanzania stock market. The study attempted to answer whether the Tanzania stock market is weak-form efficient. The study applies a battery of tests: the serial correlation test, unit root tests, runs test and the variance ratio test using daily and weekly data with a sample spanning from November 2006 to August 2015 for the Dares Salaam Stock Exchange (DSE) all share index and from January 2009 to August 2015 for the DSE share index. Overall, the results of the market efficiency are mixed. The serial correlation test, unit root test and the runs test do not support weak-form efficiency, while the more robust variance ratio test supports weak-form efficiency for the DSE. The main contribution of the study is that the market efficiency of the Tanzania stock market has increased over the sample period.

Julio, Abdunasse and Edgardo (2016) investigated the informational efficiency of the Colombian stock market with regard to the information contained in the exchange rates as well as the yield to maturity. Since the underlying data is non-normal with time-varying volatility we make use of tests that are based on bootstrap simulations with leverage adjustments in order to create reliable critical values. The results showed that neither the exchange rates nor the yield to maturity is causing the stock price index. This is interpreted as empirical support for the efficient market hypothesis in that the Colombian stock market is with regard to these two main variables.

In Romania, Alexander (2015) examined the growing body of empirical research on efficient market hypothesis. The study concluded that testing for market efficiency is difficult and there is a high possibility that, because of changes in market/economic conditions, new theoretical model should be developed to take into consideration all changes. As a reasons, it is important to continue the empirical studies to decide if capital markets are or are not informational efficient.

Sheefeni (2015) analysed the strong form efficiency of the capital market in Namibia using the autoregressive conditional heteroskedasticity and general autoregressive conditional heteroskedasticity modelling techniques. These tests were applied on the monthly data for the period covering the year 1997 to 2012. The results from the study showed that there is no evidence of strong form efficiency in Namibia's stock market. However, there is evidence of weak form efficiency. Therefore, investors in Namibia Stock Exchange cannot predict stock prices or returns in the short term or from historical prices or returns or from volume traded.

Abubakar (2017) organized and summarized existing theoretical and empirical seminal works on Efficient Market Hypothesis (EMH) for educational purposes. The theoretical models focused on random walk model which describes the behaviour of stock returns in an efficient stock market, that successive price changes are independent. The empirical implications of the theoretical model have been tested on the basis of types and forms of information available to an investor i.e. weak form, semi- strong form, and strong form efficiencies. The literature is almost unanimously in support of the random walk hypothesis for the weak form of efficient market hypothesis. On semi-strong form and strong form tests, the results are mixed. Especially for strong form whose tests are based on constructs that are not readily observed. The empirical survey of literature was extended to stock market anomalies which include calendar anomalies (such as day of the week effects, monthly (January) effects, and holiday effects), firm size effect, price/earnings ratio effect, momentum, book to market equity, and weather effect. Literature from this section revealed the existence of systematic discrepancies in returns corresponding with the various anomalies which is inconsistent with the theory of efficient market.

Ajayi, Ojo-Agbodu and Adesina (2017) investigated whether the martingale property holds in the Nigerian stock market. A transfer function approach was utilized for the study in which a martingale specification framework was constructed to check if the martingale property holds in line or against the specification conditions for the transfer function technique in the Nigerian stock market. Daily returns from the Nigerian stock market spanning January 1, 2005 to December 31, 2013 were used for the study. Findings from the study revealed that the Nigerian stock market does not exhibit martingale property and hence is weak-form inefficient.

Ikeora, Charles-Anyaogu and Andabai (2016) empirically examined the presence of weak form efficiency in the Nigerian stock market using time series data, 1985-2014. The data used to conduct the research is the All-Share Index (ASI) converted to stock market returns. Time series econometrics techniques were conducted for the analysis. The study revealed that the large differences between the Mean and Standard deviation of the variables in the descriptive statistics suggested that the stock market is highly risky. The study showed that in the recent period, 2011 to 2014, it is found that stock returns are normally distributed. The results of the test of serial independence or randomness as obtained from Runs ADF tests show that in periods 1985 to 1992, 1993 to 1999, 2000 to 2010 and the whole period 1985 to 2014, the Nigerian stock market is dependent and not random thus inefficient, which indicated that investor can predict the markets returns. However, stock returns for period 2011 to 2014, market follow random walk, so investor cannot predict the market returns in the period. Finally, the result showed that previous stock market return has 15% positive relationship, and 0.23 0.23% predictive powers. Thus the study concluded that the NSE was not efficient in the weak form between 1985 and 2010, however, it has become efficient from 2011 up to 2014.

Ogbulu (2016) investigated the efficiency level of the Nigerian Stock Exchange (NSE) across different data estimation intervals with reference to the weak-form variant of the Efficient Market Hypothesis (EMH). The study employed daily, weekly, monthly and quarterly aggregate stock price data using the NSE All Share Index series from 4<sup>th</sup> January, 1999 to 31<sup>st</sup> December, 2013 to test for the weak-form efficiency of the NSE using a combination of seven (7) statistical and parametric tools namely- Autocorrelation tests, the ADF and P-P unit root tests, Variance Ratio tests, the Normality/Random Walk tests, the Granger Causality test, the ARCH-GARCH test and Regression test. The empirical results of the investigation indicated that on balance the NSE is weak-form inefficient when daily, weekly, monthly and quarterly prices are examined irrespective of the estimation interval and the parametric test employed in the tests. It is to be noted from the findings that the NSE is still weak-form inefficient despite the implementation of various capital market reforms undertaken in the recent past as well as the adoption of automation and ICT in the operations of the Exchange.

Obayagbona and Igbinsosa (2015) investigated the weak-form market hypothesis in the emerging capital market of Nigeria from January 2006 to December 2011. It used three tests of randomness based on autoregressive technique to check for the presence or otherwise of autocorrelation in daily stock prices and returns from the Nigerian Stock Market. All the tests including the Z-statistics for both stock prices and their returns show significant indications of dependence in return series and hence, of non-randomness. The overall results suggested that the emerging Nigerian Stock Market is not efficient in the weak form.

Nwidobie (2014) examined the random walk theory: an empirical test in the Nigerian capital market. Analysis of all-price-index (API) data of shares of listed firms on the Nigerian Stock Exchange from January 2000 to December 2012 using the Augmented Dickey Fuller (ADF) test showed that share price movements on the Nigerian Stock Exchange do not follow the random walk pattern described by Fama (1965), and thus the random walk hypothesis is not supported by findings in the Nigerian capital market. Results also indicated the

existence of market inefficiencies in the Nigerian capital market necessitating the inflow of cheap and free information about security fundamentals into the market for share pricing by the forces of demand and supply.

Kelikume (2015) assessed the efficient market hypothesis for a major developing African economy-Nigeria being the most populous country in Africa and the second financial hub in Africa, next only to South Africa. The study seeks to test the efficiency of the Nigerian stock market, using a wavelet unit root test approach with different lags. Also, a battery of traditional unit root testing procedure was used to arrive at a robust result. The wavelet-based unit root tests showed clear and conclusive evidence that the Nigerian Stock Market follows the random walk behaviour during the period of the study. The result obtained shows the Stock market in Nigeria is efficient. In other words, stock prices fully reflect all available information in the Nigerian Stock Market and investors, armed with the available information or the trading rules, cannot exploit the market to earn extraordinary returns.

Ayakeme (2015) reviewed an empirical analysis of stochastic implications of stock price movements in the Nigerian capital market using the Runs and GARCH techniques to analyze monthly stock data for the period January 2006 to December, 2011. The results of the Runs Test do not support random movements of stocks in all the sectors, indicating homoscedasticity. The GARCH estimated model also showed volatility clustering in all the sectors except the Agricultural sector, which implies weak form inefficiency of the Nigerian capital market.

Osazevaru (2014) empirically tested for the presence or otherwise of volatility clustering in the Nigerian stock market. Using time series data of share prices for the period 1995 to 2009, the Autoregressive Conditional Heteroskedasticity (ARCH) model and Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model were estimated. The estimates indicated that the market exhibited volatility clustering. The rate at which the response function decays is found to be 1.1783 and quite high. It is suggested that aggressive trading on a wide range of securities be encouraged as this will increase market depth and hence reduce volatility.

Yadirichukwu and Ogochukwu (2014) tested the weak form of efficiency to stock market indexes of Nigeria between 1984 and 2012 using the monthly stock market indexes of the country within the period. Also to look at the effect of interest rate on the expected average annual monthly market share performance in Nigeria. The study adopted unit root test and t-test to investigate efficient market hypothesis based on monthly annual share index panel data. Johansson co integration test was used to establish relationship between the monthly share prices. VAR model and granger causality were used to test for impact of interest rate on market share index. The result revealed that there exist random walk model confirming no market efficiency based on the annual result. However, no random walk model was confirmed in the monthly stock returns hence, there was market efficiency in the monthly transaction in Nigeria stock exchange. Variance ratio was able to monitor the performance of the stock market.

Mohammed (2013) empirically established the effect of the recent announcement by the CBN of the bailout of eight banks listed on the Nigerian stock Exchange on their stock prices. Using the standard event study methodology, the study found the presence of approximately -2.20% abnormal return and positive and statistically significant cumulative abnormal return of 2.98% on the announcement day. Furthermore, the study found evidence of positive significant cumulative abnormal return before the announcement date, which persistent several days even after the announcement was made public. The study concluded that bank bailout announcement is associated with positive stock price response for the recipient banks in Nigeria.

Oladapo and Ayowole (2013) investigated empirically the efficiency of the Nigerian Stock Market and to test whether professionally managed funds beat the market index or not. The average monthly returns data of five banks over the period 2007 to 2011 were used. The "market model" for estimating residuals was used to test the efficiency of the Nigerian Stock Market. The abnormal return of the professionally managed portfolio was found to be insignificantly different from zero. The result indicated that the Nigerian Stock Market is efficient in the strong form.

### 3.0 METHODOLOGY

The study employs ordinary least square regression technique to test the relationship between stock market and weak-form efficiency. The model of this study expresses Annual Average of All-Share Index (ASI) measuring overall price performance as a function of Value of Transactions (VOT) and market Capitalization (MCAP) both lagged by a year. This is so because in a weak-form efficient stock market, price behaviour is determined by previous or past information in the stock market. The model is specified as follows:

$$ASI = f(LVOT, LMCAP) \dots \dots \dots 3.1$$

Where;

ASI= All-Share Index

LVOT= Value of Transactions lagged by a year

LMCAP= Market Capitalization lagged by a year

The econometric form of equation (3.1) is represented as:

$$ASI = \beta_0 + \beta_1 LVOT + \beta_2 LMCAP + \mu \dots \dots \dots 3.2$$



Where:

$\beta_0$ = Intercept/constant parameter

$\beta_1$ - $\beta_2$ = Coefficients of each independent or explanatory variable

$\mu$ =Stochastic or Error term

The model is estimated using time series annual data for the period 1986-2019. The data needed for the study are secondary in nature; implying data is obtained from published source. The source of data is central bank of Nigeria (CBN) statistical Bulletin.

#### 4.0 RESULT AND INTERPRETATION OF FINDING

This chapter presents the analysis of data gathered for the purpose of this study. It begins with the descriptive statistics test followed by the interpretation and discussion of empirical results.

##### 4.1 Descriptive Analysis

The data presentation for this description analysis consists of time series data spanning between 1986 through 2019.

	ASI	MCAP	VOT
Mean	3.799697	2.792352	4.497424
Median	4.039933	2.821186	4.761054
Maximum	4.763355	4.280520	6.371230
Minimum	2.214314	0.832509	2.352954
Std. Dev.	0.776112	1.180019	1.399066
Skewness	-0.792502	-0.240716	-0.209380
Kurtosis	2.314098	1.671998	1.487054
Jarque-Bera	3.852658	2.577348	3.183139
Probability	0.045682	0.025636	0.003606
Sum	117.7906	86.56290	139.4202
Sum Sq. Dev.	18.07051	41.77334	58.72161
Observations	31	31	31

**Table 4.1: Descriptive Result**

**Source:** Author's Computation

The descriptive statistics of the stock market returns of the Nigerian Stock Market is presented on Table 1. Normality of distribution is one of the basic assumptions underlying the weak-form efficiency (Simons & Laryea, 2006). Thus, if NSE monthly returns follow normal distribution, it means that we cannot predict the future price or returns from the mean of today's price or return. When this happens, it shall be concluded that the NSE is weak-form efficient, otherwise, it can be said that the market is weak-form inefficient. Mean, standard deviation, Skewness, kurtosis, and Jarque-Bera have been used to test the hypothesis of normality of the study. The results show that the returns are not normally distributed. Mean stock returns are positive with large volatility (standard deviation) for Nigeria. This suggests that the stock market is highly risky.

Generally, values for skewness (zero) and kurtosis (3) represents that the observed distribution is perfectly normally distributed. Cluster 1 has peaked kurtosis (2.314098) and negative skewness (-0.792502), cluster 2 has peaked kurtosis 1.671998 and negative skewness (-0.240716), cluster 3 has peaked kurtosis 1.487054 and negative skewness (-0.209380). These show the presence of platykurtic distribution in all the clusters.

As the value of skewness and kurtosis of stock return series of NSE are not equal to 0 and 3 respectively, this suggests that data are not normally distributed. From the results of the calculated Jarque-Bera statistics and p-values for all the indices, it is seen that the p value are less than (0.05) at the 5% level of significance which implies that the null hypothesis cannot be accepted. Thus, the hypothesis of normal distribution is rejected at the conventional 5% level for all the period. Therefore, this suggests that the returns of the NSE do not follow the theory of random walk.

##### 4.2 Presentation of Ordinary Least Square (OLS) Results

The table present the ordinary least square results conducted on the specified model. The OLS results reveal the relationship that exists between the dependent variable and of the explanatory variable.

**Table 4.2: OLS Results**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.260578	0.204547	11.05165	0.0000
MCAP	0.846518	0.170051	4.978034	0.0000
VOT	-0.183362	0.143426	-1.278441	0.2116

$R^2=0.930815$ , Adjusted  $R^2 = 0.925873$ , F-Statistic =188.3563, DW statistic= 0.123695

**Source:** Author's computation

From the table above, the model can be mathematically expressed in the short run as:

$$ASI = 2.260578 + 0.846518MCAP - 0.183362VOT + \mu t$$

#### 4.2.1 Interpretation of OLS Results

From the above OLS result, it could be inferred that the constant parameter is positively or directly related to ASI. The coefficient of the constant parameter ( $B_0$ ) is 2.260578. This implies that if all the explanatory variables are held constant, ASI which is the explained variable will increase by 2.260578 units. The coefficient of market capitalization is 0.846518 and this implies the existence of a direct relationship between ASI and MCAP in the short run. Therefore, a change increase in MCAP will lead to about 0.846518 increase in share price. The coefficient of value of transaction is (-0.183362) which is negatively related to ASI. By implication, a unit change in value of transaction will bring about a decrease effect of about 0.183362 in share price of the capital market.

The coefficient of multiple determination denoted as  $R^2$  with a value of 0.930815 shows that approximately 93% of total variation in ASI can be explained by value of transactions and market capitalization while the remaining 7% is being explained by the stochastic/error term in the model.

**Table 4.3: Result of p-value test**

Variable	p-value	p-value ≤ 0.05	p-value ≤ 0.1
ASI	0.0000	Yes	Yes
MCAP	0.0000	Yes	Yes
VOT	0.2116	No	No

**Source:** Author's Computation

From the table above, it can be inferred that only MCAP is statistically significant at both 5% and 10% significance levels in explaining any changes that occur in the value of ASI while VOT is statistically insignificant at 5% significance levels.

The t-test result suggests that market capitalization follow random walk model because the probability value associated with the t-calculated value is less than 0.05 critical value, hence statistically significant at 5% while value of transaction do not. This, of course, implies that Nigerian stock market to a significant extent follow random walk and is efficient in weak form from the annual expected stock returns.

#### 4.3 Discussion of Findings

Jarquebera test was conducted to determine whether changes in stock prices are normally distributed or identically distributed random variables. The Jarque-Bera test statistics shows that null hypotheses of normality are rejected at 5% significance level. It means that changes in stock prices are not identically distributed random variables. The finding is at variance with the *a priori* expectation and weak form efficient market theory. The finding affirms that in Nigeria, that was investigated weak form efficiency of Nigerian stock market exists and found that the NSE is efficient in weak form.

The Durbin-Watson test for autocorrelation shows evidence of the presence of positive autocorrelation in the model. The findings from both models do not support the strong form efficiency in the Nigerian stock market but rather suggest weak form efficiency.

The economic implication arising from these findings are that there is evidence that investors in Nigerian stock market cannot predict stock returns in the short term or from historical returns or from volume traded. Of course one cannot rule out the possibility of beating the market based on privately available information with them. With regard to the firms, it suggest that the securities of firms cannot outperform the market and the present market price is to a certain extend a true reflection of the present situation of their security.

#### 5.0 Conclusion

The debate on efficient markets has come a long way. In fact, many of the most renowned 19<sup>th</sup> and 20<sup>th</sup> century economists have contributed to it to some extent. From our review of the literature and methodology to test the EMH, the study found that there exists market efficiency in Nigeria's stock market but in the weak form efficiency and not in the strong form. This suggests that the current values do not have memory and thus, past

values cannot be used to predict the current value. The weak form efficiency on the Nigeria capital market is attributable to its correlation with the NSE which was also found to be weak form efficient for the period investigated.

Next to a better understanding of the past, our review also provides some perspective for the future. Most importantly, we believe that the concept of efficiency should be reframed. Considering efficiency to be an absolute and binary state of financial markets has spurred controversy. The idea of efficiency being a time-variant and relative characteristic can pave the way for reconciliation between adherents of the EMH and proponents of behavioural finance. In this regard, presenting alternative methodologies enabling a more dynamic approach to efficiency and the alternative theoretical framework by Lo drawing from evolutionary biology can be important tools for future research.

On the whole, the study concluded there is existence of weak form of efficient market hypothesis in Nigeria stock market. The investors who follow the price trend in order to predict price or determine when to buy and sell their stock in order to make more return are merely wasting their time.

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