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Efficient Market Hypothesis and Nigerian Stock Market

Philip Ifeakachukwu NWOSA (Corresponding Author)
Department of Economics, Accounting and Finance
Bells University of Technology, Otta, Ogun State
E-mail- nwosaphilip@yahoo.com

Isiaq Olasunkanmi OSENI
Department of Economics, Accounting and Finance
Bells University of Technology, Otta, Ogun State
E-mail- osenibells@ymail.com

Abstract

The paper examined the weak-form efficient market hypothesis in the Nigerian stock market, using a sample data spanning the period 1986 and 2010. The study adopted a serial auto-correlation and regression method of analysis. The variables used in the study were tested for stationarity using the Augmented Dickey Fuller and Philip Perron test. The result showed that the variables are stationary at first differencing. The result of the serial auto-correlation and regression analysis both revealed that the Nigeria stock market is informational inefficient, that is stock price does not exhibit random walk. The study recommended that to enhance informational efficiency of the Nigerian stock exchange especially in this era where the lost of the global financial crisis have dominated the minds of investors, there is the need to ensure strong and adequate supervision by the regulatory authorities and also the need for a greater development of the Nigeria stock market through appropriate policies which would enhance the informational efficiency of the market.
Keywords: Weak-form, Efficient Market Hypothesis, Stock Price, Serial Auto-correlation, Regression method.

1. Introduction

Over the years, mainstream economist (classical and neoclassical), have consistently maintained that, an unregulated market price is the best yardstick reflecting true scarcity or worth of a commodity. Relatedly, the efficient market hypothesis is based on the notion that stock prices is informational efficient –reflecting all available information about the value of an asset in the financial market at every moment. This therefore implies that in an efficient market, stock prices are equal to the true worth of the stock, defined as discounted future cash flows.

According to efficient market hypothesis, changes in stock prices are impossible to predict from available public information and the only thing that can move stock price is news that changes the market's perception of a firm's asset value. Thus when good news about a firm's prospect becomes public, the value and stock price of the firm both appreciate and when the company prospect deteriorates both the value and stock price of the firm depreciates. This claim by the efficiency market hypothesis that neither technical analysis which is the study of past stock prices in an attempt to predict future stock price nor even the fundamental analysis, which is the analysis of financial information such as company's earnings, asset price, etc, which is thought to be important indices for choosing undervalued shocks; have been confronted with mix reactions from researchers, academics and policy analyst (Malkiel, 2003).

One the one hand, 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 efficient market hypothesis on the other hand 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: first, it enhances investment opportunities of potential investors by mitigating moral hazard and asymmetric information problems associated with buying and selling of shares. Secondly, 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; and finally, the efficient market hypothesis had help in reducing the transaction cost of trading the ownership structure of the physical asset and has opened ways for the emergence of optimal ownership structure.

In lieu of the conflicting opinions, empirical studies on the informational efficiency of major stock market have been extensively examined while interesting research on stock market development in developing countries has been on the increase. This present study is an endeavor in this direction, by analyzing the extent to which the Nigerian stock market has been informational efficient. The testing of the efficient market hypothesis is of particular interest in Nigeria because of its implication for both foreign and local investors who make their decision based on current make values and the expected risk-return trade-off that are associated with such investments. Also, an informational efficient stock market is essential for the positive relationship between developed stock markets' activities and economic growth to occur (Lagoarde-Segot and Lucey, 2008), especially in the wake of the various financial reforms implicated by the central bank of Nigeria to jump start market stock from its decline state following the global financial crisis in 2008.

The rest of the paper is structured as follows. In addition to the introduction, section two presented the theoretical background. Section three presented a review of related studies while section four discussed the methodology on which this study is based. Section five presented the analysis of empirical results while section six contains summary and policy implications.

2. Theoretical background

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 literature have emerge both in the developed and emerging stock markets of the word. Some of these literatures are reviewed below.

3. Literature 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. 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). Hence, only South Africa could be 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. The study recommended that stock markets should undergo technological and regulatory modernization in order to improve informational efficiency.

Aga and Kocaman (2008) examined the efficiency market hypothesis in Istanbul stock exchange market. The study used a 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 recently 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: firstly, 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. The study concluded that Indian stock market is approaching towards informational efficiency at least with respect to three macroeconomic variables, viz. money supply, national income and interest rate.

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) while others have examined the major determinants of stock market development in Nigeria (Edo, 1995; Osinubi, 1998). To the best of the author’s knowledge only Olowe (1999) and Vitali and Mollah (2010) have examined the efficiency market hypothesis for the Nigerian stock market.

This study is an improvement on Olowe (1999) by covering a larger data from 1986 to 2010. Between 1999 and 2010, some fundamental financial policy measures have been experienced in the

Nigerian financial sector. Among these are: the adoption of the universal banking in 2001; the upward review of bank capital base in 2005 to #25billion and the introduction of a new monetary policy framework (Monetary Policy Rate (MPR)) to replace the Minimum Rediscounted Rate (MRR) in 2006. This policy initiative is believed to have impacted on the performance of the Nigerian stock market and the values of stock prices traded in the market. A major limitation to the study by Vitali and Mollah (2010) is that, it is now known that as far as the power of recent time series test is concerned, the span of data is more important than the number of observation (see Campbell and Perron, 1991). Demetraides and Hussein (1996) further argued that it is preferable to use data sets containing fewer observations over a long period than data sets containing more observations over a short period of time. Therefore, unlike Vitali and Mollah (2010) which used daily index prices over the period 1999 to 2009, this study considered a longer data span by utilizing monthly index stock prices over the period 1986 to 2010. In addition to the above, a well-established and informational efficient stock market does not only mobilize capital and diversify risks between financial agents but also provide different types of financial securities capable of generating long term fund that can stimulate economic growth. It is in the light of the above, that this study examines the weak-form of the efficient market hypothesis for the Nigerian stock exchange over the period 1986 to 2010.

4. Methodology

As agued above, one way to test the weak-form version of the efficient market hypothesis is to find out whether the historical sequence of stock prices of a given stock are independent of one another or whether they are related to one another. Thus, in this study we text the weak-form of the efficient market hypothesis using the serial correlation analysis and the regression analysis.

4.1 The Serial Correlation Analysis

The first statistical technique adopted in this study to examine the weak-form hypothesis is the random walk model. Formally, the random walk model can be written as:

$$P_t = P_{t-1} + \mu_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where P_t is the price at time t, P_{t-1} is the price in the immediate preceding period and μ_t is the random error term. The price change, $\Delta P_t = P_t - P_{t-1}$ is simply μ_t which is the noise or random variable, is assumed to be unpredictable from previous price changes. Thus, the serial correlation coefficient which measures the degree of dependence between itself (μ_t) and its value of nth period earlier (μ_{t-n}), is defined as:

$$r_n = \frac{\text{cov } ariance\left(\mu_t, \mu_{t-n}\right)}{\text{var } iance\left(\mu_t\right)} \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

If the calculated serial correlation coefficient is not statistically different from zero in a statistical sense, we can conclude that the random walk model is valid, that is, previous stock price movement cannot be used to predict future behavior of stock price movement.

4.2 The Regression Analysis

The second statistical technique adopted to examine the weak form hypothesis is a regression model. In this model we assume that the natural logarithm of prices $P_t = In\ P_t$. Thus the equation is expressed simply as:

$$InP_t = a_1 + a_2 InP_{t-1} + u_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

which require us to test for α_2 equal to one (Law, 1982).

5. Empirical Results

5.1 Unit Root tests

This empirical work commenced its analysis by testing the stationarity status of the times series used in this study. If the series at its level form is non-stationary but became stationary after first differencing, the series is said to contain a unit root. To examine the stationarity properties of the times

series, two different unit root tests were utilized namely: the Augmented Dickey-Fuller (ADF) test, the Phillips-Perron (PP) test. The result of the unit root tests is presented in the tables below.

As observed from the ADF test on Table 5.1, the times series was non stationary at level but became stationary after first difference, implying that the variables are of order one. Hence, the null hypothesis on stationarity was rejected in the series. The PP test results reported on the other half of the Table also confirmed the ADF test result.

5.2 Serial Correlation and Regression Analysis

It is observed from Table 5.2 (see appendix) that the coefficients of the lag variables were positive and significant; and as stated by Batuo Enowbi *et al*. (2009), the positive sign of the significant serial correlation coefficients indicates that successive daily price changes tend to have the same sign, that is, a positive (negative) stock price at time *t* is likely to be followed by a positive (negative) change in stock price at time *t+1*. This implies that stock prices can be explained by previous stock prices and that the Nigeria stock market is information inefficient. In addition, the result from the time series regression estimate as shown on Table 5.3 revealed a rejection of the weak-form informational efficiency of the stock market. The regression estimate showed that the lag value of stock price is significant. This implies that previous stock price can successfully predict current stock prices. The results from both empirical estimates contradicts evidences from literatures that the stock market is informational efficient and that stock prices exhibit randomness.

6. Conclusion

Prior to the global economic crisis of 2008, the Nigerian stock market has experienced significant positive developments as reflected in its market capitalization, liquidity, turnover and increase in value of stock prices. The shape decline in stock prices following global financial crisis has raised the need to examine the weak-form informational efficiency hypothesis of the Nigerian stock market. The efficient market hypothesis is based on the proposition that stock price fully reflect all available information in the market and investors cannot use available information or any trading rules to earn extraordinary returns or use available information to exploit the market. Although empirical evidence from developed and other emerging stock markets supports the efficient market hypothesis, however our empirical analysis revealed that the Nigerian stock market is not informational efficient. That is, stock price does not possess all available information in the market and as such financial analyst can earn above normal return from stocks by using previous stock prices to predict the pattern of future price changes and future stock return. Similar evidence on the weak-form informational inefficiency of the Nigerian stock market have also been reported by Olowe (1999) and Vitali and Mollah (2010). To enhance informational efficiency of the Nigerian stock exchange especially in this era where the lost of the global financial crisis have dominated the minds of investors, there is the need to ensure strong and adequate supervision by the regulatory authorities. This would prevent any stock price bubble while as the same time it would ensure that information about stock price is a true reflection of the value of shares. Also, there is the need for a greater development of the Nigeria stock market through appropriate policies which would enhance the informational efficiency of the market.

In addition to the above, the findings of this study raised an important issue about the Nigeria stock market which requires further analysis. Given the findings of this study that the stock is informational inefficient, attempts should be made by future studies to identify the phenomena of inefficiency in the Nigeria stock market. Extending the study in to this area would definitely enrich the policy implications and the robustness of the study findings. It will also extend the frontier of the knowledge beyond where this study stops.

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Table 5.1 Unit Root Test Result

Augmented Dickey-Fuller (ADF) Test				**Phillip-Perron (PP) Test**		
Variables	**Level**	**1st Difference**	**Status**	**Level**	**1st Difference**	**Status**
price index	-1.7960	-5.2723*	I(1)	-1.8660	-15.4974*	I(1)
Test Critical values						
1%	-3.4534	-3.4534		-3.4530	-3.4530	
5%	-2.8716	-2.8716		-2.8714	-2.8714	
10%	-2.5722	-2.5722		-2.5721	-2.5721	

Note: * implies stationarity at one percent significance level.

Table 5.2 Serial Correlation Result Estimate

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.|********	.|********	1	0.992	0.992	286.39	0.000
.|********	.|. |	2	0.984	-0.014	569.10	0.000
.|********	.|. |	3	0.975	-0.028	847.92	0.000
.|*******|	.|. |	4	0.967	-0.016	1122.8	0.000
.|*******|	.|. |	5	0.958	-0.012	1393.5	0.000
.|*******|	.|. |	6	0.949	-0.034	1660.0	0.000
.|*******|	.|. |	7	0.939	-0.014	1922.2	0.000
.|*******|	.|. |	8	0.929	-0.025	2179.8	0.000
.|*******|	.|. |	9	0.920	0.026	2433.1	0.000
.|*******|	.|. |	10	0.911	0.002	2682.3	0.000
.|*******|	.|. |	11	0.901	-0.034	2927.0	0.000
.|*******|	.|. |	12	0.891	0.000	3167.4	0.000
.|*******|	.|. |	13	0.881	-0.052	3403.1	0.000
.|*******|	.|. |	14	0.870	-0.013	3634.1	0.000
.|*******|	.|. |	15	0.859	-0.031	3860.0	0.000
.|*******|	.|. |	16	0.848	-0.051	4080.7	0.000
.|****** |	.|. |	17	0.836	-0.021	4296.0	0.000
.|****** |	.|. |	18	0.824	0.033	4506.2	0.000
.|****** |	.|. |	19	0.813	-0.022	4711.2	0.000
.|****** |	.|. |	20	0.801	-0.017	4911.0	0.000
.|****** |	.|. |	21	0.789	-0.010	5105.5	0.000
.|****** |	*|. |	22	0.776	-0.065	5294.5	0.000
.|****** |	.|. |	23	0.763	0.036	5478.1	0.000
.|****** |	.|. |	24	0.751	0.010	5656.7	0.000
.|****** |	.|. |	25	0.739	-0.016	5830.2	0.000
.|****** |	.|. |	26	0.727	0.005	5998.8	0.000
.|****** |	.|. |	27	0.715	0.011	6162.4	0.000
.|***** |	.|. |	28	0.703	-0.003	6321.4	0.000
.|***** |	.|. |	29	0.691	-0.010	6475.6	0.000
.|***** |	.|. |	30	0.680	-0.009	6625.1	0.000
.|***** |	.|. |	31	0.668	0.002	6770.1	0.000
.|***** |	.|. |	32	0.656	0.003	6910.6	0.000
.|***** |	.|. |	33	0.645	-0.006	7046.7	0.000
.|***** |	.|. |	34	0.633	0.003	7178.5	0.000
.|***** |	.|. |	35	0.622	-0.003	7306.1	0.000
.|***** |	.|. |	36	0.610	-0.001	7429.6	0.000

Table 5.3 Regression Result Estimate

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.057306	0.017132	3.344879	0.0009
LASP(-1)	0.995162	0.002036	488.7426	0.0000
R-squared	0.998808	Mean dependent var		8.232055
Adjusted R-squared	0.998804	S.D. dependent var		1.817180
S.E. of regression	0.062841	Akaike info criterion		-2.689480
Sum squared resid	1.125456	Schwarz criterion		-2.663978
Log likelihood	387.9403	F-statistic		238869.3
Durbin-Watson stat	1.721772	Prob(F-statistic)		0.000000