Asian Journal of Economics, Business and Accounting

13(4): 1-11, 2019; Article no.AJEBA.54249
ISSN: 2456-639X

A New Look at Weekdays Effect of Stock Prices in the Weak Form: Evidence from Nigerian Stock Exchange

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Authors' contributions

This work was carried out in collaboration between both authors. Author JN wrote the first draft of the manuscript. Author AEP edited and made all the corrections. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJEBA/2019/v13i430176
Editor(s):
(1) Dr. Ivan Markovic, Faculty of Economics, University of Nis, Serbia.
Reviewers:
(1) Olutosin A. Otekunrin, Federal University of Agriculture, Nigeria.
(2) Osama Wagdi, Modern University for Technology and Information (MTI), Egypt.
Complete Peer review History: http://www.sdiarticle4.com/review-history/54249

Original Research Article

Received 15 November 2019
Accepted 17 January 2020
Published 25 January 2020

ABSTRACT

Efficiency intensity of stock exchange market has policy implications in any economy. The focus of this work is to assess the intensity of efficiency in the weak form of the Nigerian stock exchange market. This study stands to examine predictability level of Monday trading, Tuesday trading, Wednesday trading, Thursday trading and Friday trading in the Nigerian Stock Exchange (NSE). Monday NSE all share index covered August 6, 2018 to October 28, 2019; Tuesday NSE all share index covered August 7, 2018 to October 29, 2019; Wednesday NSE all share index covered August 8, 2018 to October 30, 2019; Thursday NSE all share index covered August 9, 2018 to October 31, 2019; Friday NSE all share index covered August 10, 2018 to November 1, 2019. The data was analyzed employing Jarque-Bera check for normality, ADF unit root test, graphs and GARCH term. The Jarque-Bera examination for normality indicates that all the data are normally spread. The ADF unit root shows that the factors employed were not stationary @ level series but stationary @ 1st difference. The GARCH term shows that all the variables were not significant at 5% level. From the above findings, stock prices on Mondays, Tuesdays, Wednesdays, Thursdays and Fridays stock prices studied exhibited significant random walk, the investigation therefore

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concludes that, NSE market is efficient in the weak form. It is thus recommended that Government should continue to allow the invisible hands to determine the direction of stock prices in order to boast NSE trading activities.

Keywords: Weak form efficiency; Nigerian stock exchange; Monday effect; Tuesday effect; Wednesday effect.

1. INTRODUCTION

Efficiency dimension of stock market has been a very important concept in the finance literature [1]. Market efficiency hypothesis is laid on inference that market is made up of outsized number of rational, active and profit-oriented individuals who contend to foresee the market prices of stock in the future on the basis of freely accessible information [2]. Stock market efficient hypothesis is a finance theory which states share prices reveal all information and unfailing abnormal gain due to prediction is impossible; the future prices of securities are unpredictable with reverence to presently available information [3]. Meaning that securities for all time traded in the just value on security exchange, making it unfeasible for participants to either sell on overstated prices or purchase undervalued securities. With this, predictability becomes difficult thus impossible to beat the overall market via expert security choice or market timing. The only avenue where a participant can possibly attain higher returns is by going for investments that are with higher risk. Efficient Market Hypothesis (EMH) usually is defined and examined in three diverse forms; including the weak, semi-strong, and the strong [2]. EMH in the weak form postulates that prices reveal all past publicly presented information. EMH in the semi-strong form postulates that price fluctuations reveals precedent information and also reflects current public information. EMH in the strong-form postulates that, prices of stock instantly replicate insider or hidden information. The soundness of the capital market is a key contributor of economic growth and financial stability [4,5]. The Nigerian stock exchange has played a prominent role in capital formation, aid increasing the number of firms to raise the much needed funds for modernization and growth [6]. The Nigeria stock exchange has also helped investors to diversify their investment among variety of assets [7,8,9]. The stock market aid the mobilization of financial resources for pursuing economic expansion and for creating goods and services for the satisfaction and well-being of the general citizenry. It is further hoped that a well-managed and efficient stock exchange would assist the country's quest for high economic growth. The Nigerian stock market has not been stable for recent years; participants and investors in the market have decried non- evidence of organization performance in the prices of their stock traded in the NSE [10].

Random walk hypothesis or theory asserts that, prices of stock are characterized by random walk process. [11] did a broad work in this subject and found that the serial correlation was not significant in the changes of stock price over time which confirms the randomness. Having confirmed randomness of price movements, it means that knowledge of historical prices of a stock or decisions based on the trend would not enhance investment decisions. This is strongly against the basis of technical analysis of securities because the size and direction of the next price change is random in relation to current available knowledge. Meaning the knowledge of pattern or trend is not helpful in forming opinion on future prices.

EMH has been a controversial theory and has generated serious debate in the investment finance literature. Over the years of research, epistles in the financial literature have not come to a consensus on the absence or presence of the validity of EMH hypothesis [12]. In testing EMH in the weak form, several studies result have shown random walk in stock markets outside the Nigerian stock exchange; including the work of [13,14,15,16]. Others outside the Nigerian stock market did not found random walk; including [17,18,19,20,21]. Only few researches have investigated EMH in the weak form in the Nigeria stock market. [5] examined the NSE and revealed the movement of security prices not to be completely random; [22] revealed different results for different periods. The stock market returns from 1990 to 2010 revealed that, the security market is inefficient in the weak form, the security market returns from 2010 to 2017 revealed the market is efficient in the weak form. Still in the Nigerian stock exchange, [23,24] investigated weak form of

market efficiency and found non-random situation. Overall, there has not been consensus as to the intensity of efficiency in the NSE. The above studies employed monthly, weekly and daily data to examine weak form of market efficiency. From the reviewed epistles and knowledge in our disposal, no research has employed the NSE all share index to examine Monday's influence, Tuesday's influence, Wednesday's influence, Thursday's influence and Friday's influence; whether previous days can be use to foresee the upcoming stock prices or not. Thus, this research stand to fill the existing gap by employing recent data from the all share index in the NSE to ascertain weak form market efficiency.

2. REVIEW OF RELATED LITERATURE

2.1 Efficient Market Hypothesis

The theory of efficient market originated with the Ph.D work of Fama in 1960, which asserts that in any given period, prices of stock in total reflect all presented information. The fact that all sellers and buyers have access to the same presented information which endlessly comes surprisingly into the market, prices of stock fluctuations becomes random which will respond to strange information for the stock market. In the work, Eugene Fama opined that, efficiency exists in three forms; weak, semi-strong and strong. In the weak form, prices of stock immediately reveal all presented information of precedent prices. It assumes that by relying on previous prices, trends in security prices in the stock market cannot be predicted. This study intend to measure weak form of market efficiency in the Nigerian stock exchange market.

2.2 Empirical Review

Efficiency of emerging stock markets assumes superior importance [22]. The market efficiency hypothesis opined that investors cannot outperform so long as the stock market remain efficient [5]. EMH has been a contentious discuss over the time. Several researchers have ascertained weak form of market efficiency. Yang et al. [25] analyzed EMH in the weak form of EU carbon emission and found mixed results via joint multiple variance tests.

Almujamed et al. [26] ascertained to know if share returns in Kuwait stock exchange show signs of regular patterns that could be employed to predict stock price changes in the future between 1998 and 2011. The study examined the market in the weak form with general linear model. Kuwait stock exchange was inefficient in weak form as patterns and trends were found in the stock prices.

Naimat and Sajjad [27] investigated EMH in the weak form, evidence from Karachi stock exchange in Pakistan from 1991 to 2015. The research utilized the Philip Perron unit root, ADF unit root and autocorrelation technique. The daily and weekly stock prices were inefficient in the weak form, but were efficient when monthly stock prices were used.

Papaioannou et al. [13] tested market efficiency of electricity industrial sector via a new composite measure in the stock markets in Nordpool, Spanish, Greek and Italy. Through the application of variance ratio test, all electricity markets were found efficiently operating in the weak form.

Kapoor [28] researched on EMH in the weak form in India from 2015 to 2016 with run test method. The test results revealed that, price changes was not random, indicating inefficiency of the stock market.

Tas and Atac [14] investigated RWH and concentrated on stock exchange market of Instabul from 2000 to 2013. Run test and ADF unit root test were used for the analysis. The stock exchange market of Instabull was revealed efficient in the weak form.

Agustin [29] analyzed the Indonesia Sharia stock index between 2017 and 2019 in the weak form. Autocorrelation test, run test, paired sample t-test and Arimatest were employed for the analysis. It was revealed from the results that Indinesia Sharia stock market was inefficiently operating in the weak form.

Watundu et al. [15] employed GARCH, ADF test of unit root and test for volatility of Uganda stock exchange. The security market was found efficient in the weak form.

Kalu and Joseph [30] analyzed EMH in the weak form and focused on the Ugandan securities exchange from 2011 to 2016. The research indicated different results as linear models showed market efficiency in the weak form while non-linear models indicated evidence of inefficiency in the weak form.

Palma [21] investigated weak form of market efficiency of the Brazillian foreign exchange market, evidence from the artificial neural network model. The results show that Brazillian foreign exchange market not efficient for the study period, indicating that investors can obtain abnormal gain through arbitrage.

Shaalan [31] researched market efficiency of Saudi capital markets in the weak form. The study empirically analyzed sub indices and Tasi index of the Saudi markets between 2002 and 2010. The results from Shapiro Wilk test of normality, RWH box-Ljung, ADF unit root, Philip Perron unit root and run test indicated market inefficiency at the weak form.

Heymans and Santana [20] seeked to know efficient the Johannesburg stock exchange in the weak form of market efficiency. Johannesburg stock exchange revealed efficient in the weak form via the application of joint sign test, Chow Denning variance test and automatic variance ratio test.

Rossi and Gunardi [32] investigated EMH and security market anomalies in European countries (France, Germany, Italy and Spain). The results from GARCH and regression methods indicated strong proof of comprehensive calendar anomalies.

Awan and Subayyal [33] ascertained weak form of EMH and concentrated at the Gulf stock markets (Kuwait, Bahrain, UAE, Oman, Qatar and Saudi Arabia). Auto-correlation and run test were employed for analyzing the daily closing stock indices. The study shows that both test provided evidence that the stock prices from all the Gulf markets were not following the random walk model.

Kyriazis [19] carried out a study on the opportunities and efficiency of Cryptocurrency scurities markets with rescaled range and detruded fluctuation analysis. Random walk was rejected and speculation was feasible through trading since the market was predictable.

Falaye et al. [5] used partial auto-correlation and run test to examined weak form of market efficiency in the stock exchange of Nigeria. The movements of the stock prices were not completely random.

Christos et al. [16] utilized autocorrelation technique to test the sectorial market efficiency of the dynamics in Moscow stock exchange. The degree of autocorrelation was close to zero, giving the support that the Moscow exchange was found efficient in the weak form.

Kilic and Fatih [34] investigated efficient market hypothesis in Turkey with ADF test of unit root test, linearity test and descriptive statistics. All indices indicated non-linear behavior.

Fadda [18] analyzed daily closing prices in Europe from 2006 to 2016. With the application of Lo and Mackinlay test of variance, the results indicated that, all the indices fail to accept the RWH.

Katabi and Raphael [17] empirically ascertained daily returns in Dares Salam stock exchange to find out if Dares Salam exchange market is efficient in the weak form. The ADF test of unit root, run test, serial correlation and variance test application revealed that the Dares Salaam stock exchange market was inefficient in the weak form.

Andabai [22] used returns from the NSE and utilized ADF unit root to ascertain the weak form of EMH in two periods (1999-2010; 2010-2017). The outcome of randomness and serial independent as received from the ADF test of unit root indicated that, the Nigerian security market was not random, thus the market was inefficient between 1990 and 2010. But the market was efficient between 2010 and 2017.

Ogbulu [23] employed autocorrelation, ADF unit root test, Philip Perron unit root, variance analysis, descriptive statistics, Granger causality test, ARCH-GARCH and regression method to evaluate the stock returns in the NSE from 1999 to 2013. The aim of the study was to ascertain the weak form of EMH in the Nigerian stock exchange. The study results show that the Nigerian stock exchange was inefficient for the study period.

Onwukwe and Ali [24] investigated market efficiency in the insurance firms quoted in the Nigerian stock exchange, using insurance sector returns from 2009 to 2016 with descriptive analysis, run test and autocorrelation as techniques for the analysis. The normality results from Jarque-Bera indicated non-normal distribution. Null hypothesis of independency was rejected in the return series from the run test results. The Ljung-Box Q test and autocorrelation test showed evidence of serial correlation in the

stock prices. The insurance sector in all was inefficient in the weak form.

From the above, it is crystal clear, both from advance and developing economies, the subject of random walk remains a serious debate, measurement of various stock markets produce conflicting results and conclusions. Research in the Nigerian security market in regards to its intensity of efficiency remains also inconclusive. This study employs recent data and robust econometric tools to investigate the level of market efficiency in the Nigerian stock exchange market.

3. METHODOLOGY

3.1 Study Design

This is a descriptive work, which aim is to describe the pattern and behavior of the Nigerian stock market, mainly with reverence to how security prices react quickly to presented information.

3.2 Source of Data and Empirical Tests

All Share Index is employed to determine the security market in terms of the extent and trend of the general price movement [10]. All Share Index combines the total behavior of stocks in the market [35]. It expresses the entire market index, which shows the attribute of stock in the exchange. The All-Share Index as a result serves as a key indicator of stock market efficiency.

Secondary data from the Nigerian stock exchange; All Share historical weekly were collected; Monday (EMHMO), Tuesday (EMHTU), Wednesday (EMHWE), Thursday (EMHTH) and Friday (EMHFR). Monday NSE all share index covered August 6, 2018 to October 28, 2019; Tuesday NSE all share index covered August 7, 2018 to October 29, 2019; Wednesday NSE all share index covered August 8, 2018 to October 30, 2019; Thursday NSE all share index covered August 9, 2018 to October 31, 2019; Friday NSE all share index covered August 10, 2018 to November 1, 2019.

The study employed three empirical tests namely ADF unit root, normality test of Jarque-Bera and Generalized Conditional Heteroscedasticity (GARCH) test by [36] to investigate the random walk pattern of the NSE. The justification following the application of the three tests: weak-form of efficiency requires that the return series are non-stationary at level. The research, so employed the ADF test of unit root to ascertain if the NSE ASI for the period is stationary at level or non-stationary. Stock market efficiency requires that the return series are normally distributed; hence, the Jarque-Bera test of normality is employed to test the normal distribution of the data. Efficiency in the stock series requires volatility, thus GARCH test is used to test if the stock series volatile or not. In addition, graphs are also employed to show the pictorial behavior of the stock series.

3.3 Descriptive Analysis

The descriptive statistics on Table 1 shows that the mean NSE all share indexes under review for Monday is 30477.85; Tuesday is 30504.75; Wednesday is 30411.52; Thursday is 30348.87 and Friday is 30380.81. The maximum value revealed that Monday is 36384.42; Tuesday is 36333.80; Wednesday is 36299.82; Thursday is 36232.66 and Friday is 35446.47; while the minimum values indicates that Monday is 26384.45; Tuesday is 26244.39; Wednesday is 26310.77; Thursday is 26355.35 and Friday is 26293.30. Probabilities from the Jarque-Bera revealed that all the days are normally distributed; Monday with a probability of 0.574852; Tuesday with a probability of 0.559915; Wednesday with a probability of 0.640277; Thursday with a probability of 0.651389 and Friday with a probability of 0.622650 respectively at 5 percent.

The ADF test of unit root results on Table 2 indicated that none of the variables (EMHMO, EMHTU, EMHWE, EMHTH and EMHFR) was stationary at level (order of 0). However, all of the variables became stationary at order one 1(1).

From the GARCH result, the Monday effect (EMHMO) has a probability value of 0.3591, Tuesday effect (EMHTU) has a probability value of 0.2165, the Wednesday effect (EMHWE) has a probability value of 0.5389, the Thursday effect (EMHTH) has a probability value of 0.3132 and Friday effect (EMHFR) has a probability value of 0.7644, all indicating insignificant, meaning that previous stock values of Mondays, Tuesdays, Wednesdays, Thursdays and Fridays do not influence current values thus, the market is efficient in the weak form.

Table 1. Nigerian Stock Exchange (NSE) All share index (ALSI) weekdays effect

	EMHMO	EMHTU	EMHWE	EMHTH	EMHFR
Mean	30477.85	30504.75	30411.52	30348.87	30380.81
Median	30609.06	30736.88	30821.80	30583.21	30672.79
Maximum	36479.42	36333.80	36299.82	36232.66	35446.47
Minimum	26384.45	26244.39	26310.77	26355.35	26293.30
Std. Dev.	2418.643	2468.595	2396.616	2341.946	2340.370
Skewness	0.249717	0.193436	0.179362	0.167929	0.103626
Kurtosis	2.600739	2.472159	2.552156	2.548625	2.446007
Jarque-Bera	1.107284	1.159942	0.891709	0.857296	0.947541
Probability	0.574852	0.559915	0.640277	0.651389	0.622650
Sum	1981060.	1982808.	1976749.	1972677.	1974753.
Sum Sq. Dev.	3.74E+08	3.90E+08	3.68E+08	3.51E+08	3.51E+08
Observations	65	65	65	65	65

Source: Eviews 10 software output, 2019

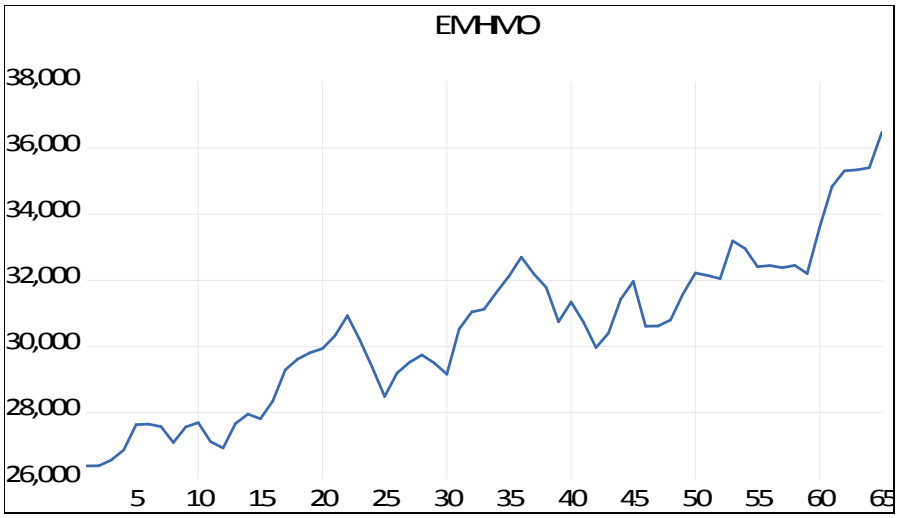

Fig. 1. Graphical representation of GARCH result, the Monday effect (EMHMO)
Source: Eviews 10 software output, 2019

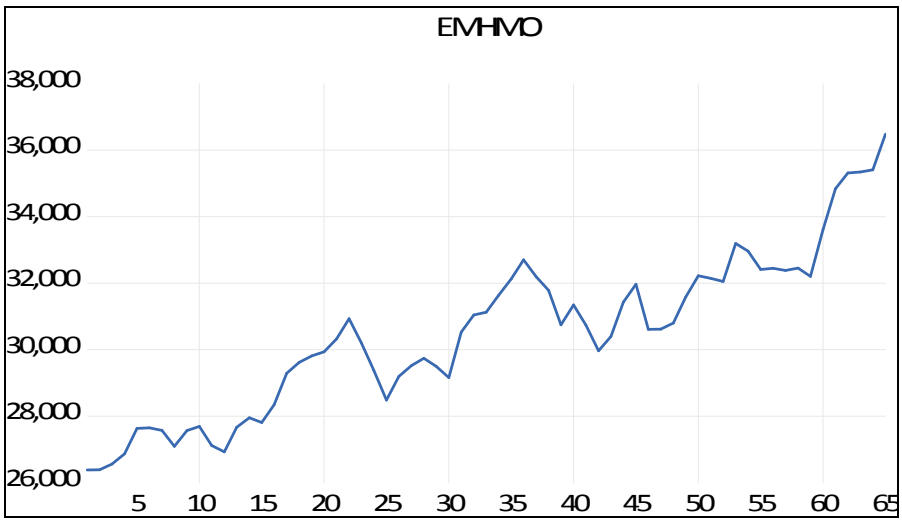

Fig. 2. Graphical representation of GARCH result, the Tuesday effect (EMHTU)
Source: Eviews 10 software output, 2019

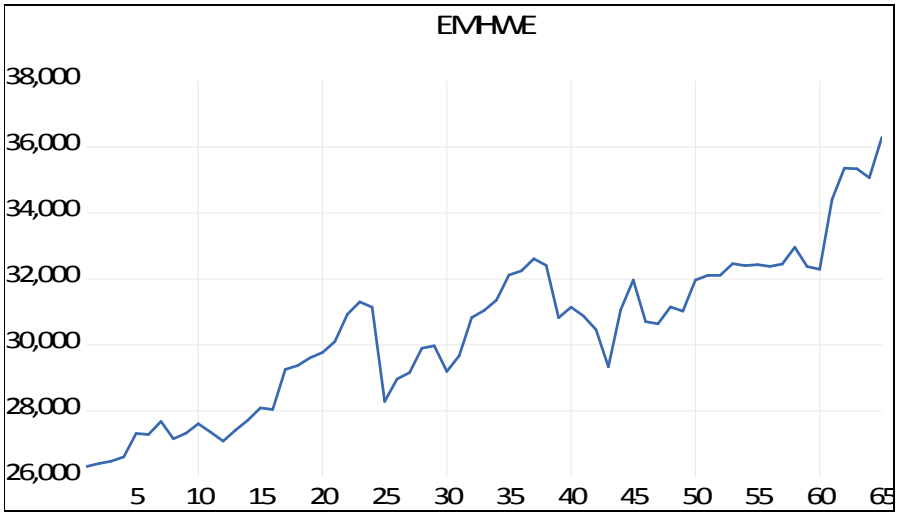

Fig. 3. Graphical representation of GARCH result, the Wednesday effect (EMHWE)

Source: Eviews 10 software output, 2019

Table 2. Nigerian Stock Exchange (NSE) All share index (ALSI) weekdays effect

Variables	Signif. levels	ADF @ level			ADF @ 1st diff		
		ADF test val.	Crit. Val.	P. val.	ADF test Val.	Crit. Val.	P. val.
EMEMO	1%	-2.834938	-4.110440	0.1907	-6.478732	-4.113017	0.0000
	5%		-3.482763			-3.483970	
	10%		-3.169372			-3.170071	
EMHTU	1%	-2.578975	-4.107947	0.2911	-6.934339	-4.113017	0.0000
	5%		-3.481595			-3.483970	
	10%		-3.168695			-3.170071	
EMHWE	1%	-2.747204	-4.107947	0.2220	-7.910529	-4.110440	0.0000
	5%		-3.481595			-3.482763	
	10%		-3.168695			-3.169372	
EMHTH	1%	-2.816753	-4.107947	0.1969	-8.025822	-4.110440	0.0000
	5%		-3.481595			-3.482763	
	10%		-3.168695			-3.169372	
EMHFR	1%	-2.530994	-4.107947	0.3128	-7.096308	-4.113017	0.0000
	5%		-3.481595			-3.483970	
	10%		-3.168695			-3.170071	

Source: Eviews 10 software output, 2019

Table 3. GARCH equation estimation results summary

Variables		GARCH (-1)
EMHMO	P. Value	0.3591
	Remark	Insignificant
EMHTU	P. Value	0.2165
	Remark	Insignificant
EMHWE	P. Value	0.5389
	Remark	Insignificant
EMHTH	P. Value	0.3132
	Remark	Insignificant
EMHFR	P. Value	0.7644
	Remark	Insignificant

Source: Eviews 10 software output, 2019

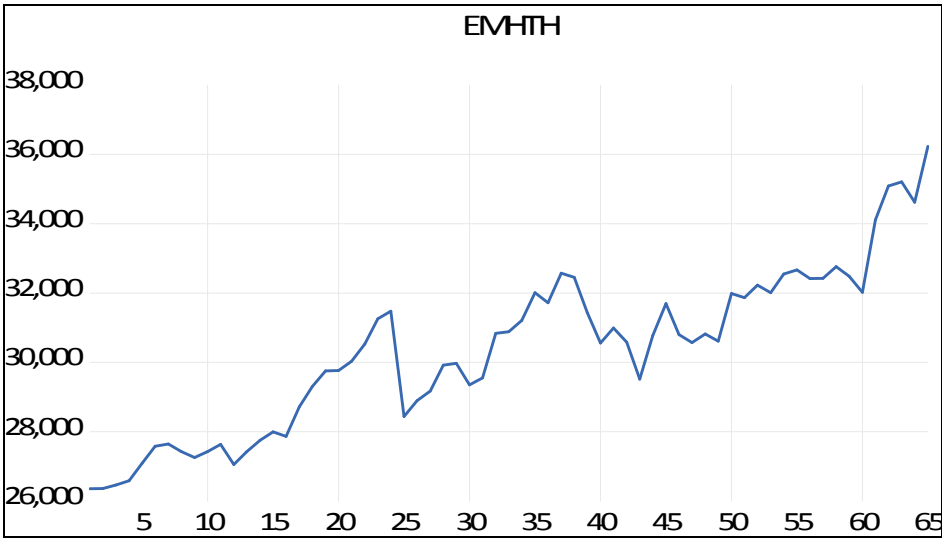

Fig. 4. Graphical representation of GARCH result, the Thursday effect (EMHTH)
Source: Eviews 10 software output, 2019

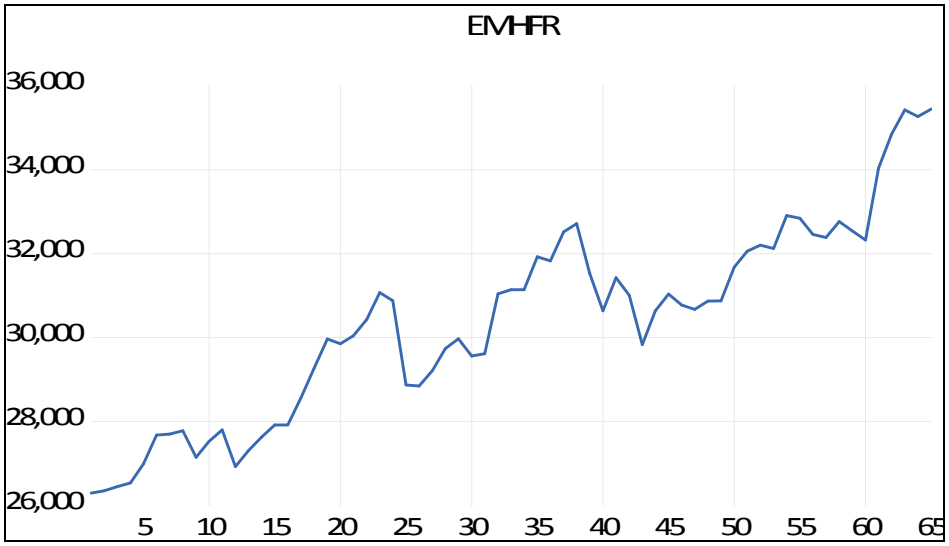

Fig. 5. Graphical representation of GARCH result, the Friday effect (EMHFR)
Source: Eviews 10 software output, 2019

4. DISCUSSION OF FINDINGS

Results from the ADF unit root tests, the results exposed that none of the variables (EMHMO, EMHTU, EMHWE, EMHTH and EMHFR) was stationary at level series; rather all became stationary at 1st difference. The non-stationarity of data at level series and becoming stationary at first difference indicates that the behavior of the NSE ASI conforms to and is consistent with market efficiency at the weak form, which asserts that financial time series act as random walks. The outcomes from the Jarque-Bera test of normality exposed that all the variables are distributed normally, indicating that the Nigerian security exchange is efficient in the weak form. The Generalized Conditional Heteroscedasticity (GARCH) test indicated that none of the variables statistically significant at 5% level, indicating that the market is efficient at the weak form. The Monday (EMHMO), Tuesday (EMHTU), Wednesday (EMHWE), Thursday (EMHTH) and Friday (EMHFR) graphs also concur with the Jarque-Bera test of normality, ADF test of unit root results and the GARCH test indicating that the NSE is weak form efficient,

meaning no participant can make excessive benefit by predicting the market. This shows that no investor in the NSE can devise statistical or other technique to outperform the NSE on regular basis.

Comparing the findings of this study with those of earlier studies elsewhere, the results of the tests conducted seem to be consistent with the findings of [14], who examined random work hypothesis in Istanbul stock exchange from 2000 to 2013 with ADF unit root and run test. The results are also in agreement with the findings of [16], the study tested sector market efficiency of the dynamics in Moscow but is not consistent with the work of [18,26,31] that found market inefficiency in Europe, Kuwait and Saudi Arabia respectively. In the Nigerian context, the results of this research is not in agreement with that of [5] that investigated weak form market efficiency in the Nigerian stock exchange with partial autocorrelation and run test techniques and found inefficiency in the stock market.

5. CONCLUSION

The focus of this research is to assess the weak form efficiency of the Nigerian stock exchange market. Monday NSE all share index covered August 6, 2018 to October 28, 2019; Tuesday NSE all share index covered August 7, 2018 to October 29, 2019; Wednesday NSE all share index covered August 8, 2018 to October 30, 2019; Thursday NSE all share index covered August 9, 2018 to October 31, 2019; Friday NSE all share index covered August 10, 2018 to November 1, 2019. The data was analyzed employing Jarque-Bera for normality, ADF unit root tests of stationarity, graphs and GARCH term. The Jarque-Bera test of normality indicates that all the variables are normally distributed. The ADF unit root shows that all the variables were not stationary at level series but stationary at first difference. The GARCH term shows that all the variables are not significant at 5% level. The results consistently revealed that the Nigerian stock exchange market is efficient in the weak form. From the findings, the stock prices on Mondays, Tuesdays, Wednesdays, Thursdays and Fridays studied exhibited significant random walk, the study therefore concludes that the Nigerian stock exchange market is efficient in the weak form.

6. RECOMMENDATIONS

In view of the research findings, the following recommendations are suggested:

i. Continuous effort should be made by government to guide against insider information in the Nigerian stock exchange.
ii. Government should put policies in place that will allow the invisible hands to dictate the direction of prices in the market.
iii. Government should improve the quality of ICT in the Nigeria stock exchange to boast the trading activities in the market.

7. SUGGESTIONS FOR FURTHER STUDIES

This study focused on evaluating Nigerian stock exchange efficiency level in the weak form. The study concentrated in assessing the effects of previous Mondays, Tuesdays, Wednesdays, Thursdays and Fridays. The Jarque-Bera test of normality, ADF unit root test, graphs and the GARCH Models were used. It will be appropriate to also employ other statistical tools for testing the efficiency of the Nigerian stock exchange in order to compare the results and ascertain consistency and reliability.

Finally, studies can be conducted on both semi-strong and strong forms efficiency of the stock returns of the Nigerian stock exchange markets.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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