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Weak-form Efficiency of the Insurance Industry: Empirical Evidence from Nigeria

Abstract

This paper evaluated the insurance sector of Nigeria Stock Exchange (NSE) for evidence weak-form efficiency using daily returns from January 2009 to February 2016. The study employs descriptive analysis, non-parametric runs test and autocorrelation function as well as Ljung-Box Q statistics in conducting the evaluation. Descriptive statistics of the insurance sector return series showed negative skewness and leptokurtic distribution. Estimates from the Jarque-Bera normality test showed that the insurance sector returns did not follow normal distribution. Results of the runs test reject null hypothesis of randomness in the return series of the insurance sector in the period studied. Furthermore, the autocorrelation functions and the Ljung-Box Q tests provide evidence of serial correlation in the stock returns of the insurance sector. Overall results from the study suggested that the insurance sector of NSE is not weak-form efficient. Consequently, technical analysis on the insurance sector of the NSE may not be fruitless.

Keywords: Efficient Market Hypothesis; Stock Returns; Weak-form Efficiency; Nigeria Stock Exchange

JEL Classification: G14; G22

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Abstrak

Penelitian ini bertujuan untuk mengevaluasi sektor asuransi pada Nigeria Stock Exchange (NSE) dan untuk membuktikan efisiensi bentuk lemah menggunakan tingkat pengembalian (return) *harian dari Januari 2009 sampai Februari 2016. Penelitian ini menggunakan analisis deskriptif, uji coba non-parametrik dan fungsi autokorelasi serta statistik Ljung-Box Q dalam melakukan evaluasi. Statistik deskriptif tingkat pengembalian sektor asuransi menunjukkan kemiringan negatif dan distribusi leptokurtik. Perkiraan dari uji normalitas Jarque-Bera menunjukkan bahwa sektor asuransi kembali tidak mengikuti distribusi normal. Hasil* runs test *menolak hipotesis nol tingkat pengembalian secara acak sektor asuransi pada periode yang diteliti. Selanjutnya, fungsi autokorelasi dan uji Ljung-Box Q memberikan bukti korelasi serial pada tingkat pengembalian saham sektor asuransi. Hasil keseluruhan dari studi tersebut menunjukkan bahwa sektor asuransi NSE tidak efisien bentuk lemah. Akibatnya, analisis teknis sektor asuransi NSE mungkin tidak membuahkan hasil.*

***Kata kunci**: Hipotesis Pasar Efisien; Tingkat Pengembalian Saham; Efisiensi Bentuk Lemah*

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Efficient Market Hypothesis (EMH) has attracted a considerable number of research resources and effort in empirical finance, particularly in determining the market efficiency of an emerging financial market (Islam, Watanapalachaikul, & Clark, 2007). EMH asserts that prices of financial assets, at all times, fully reflect all available information required to forecast assets prices. This assertion suggests that stock picking techniques, such as technical analysis, are not likely to yield abnormal returns. EMH, according to (Malkiel & Fama, 1970), is divided into three categories according to the information item reflected in the prices: weak-form, semi-strong form, and strong form efficiency. The weak-form version of EMH holds that prices of financial assets already reflect all information contained in the historical prices, trading volume, and short interest. This level of market efficiency indicates that history of past prices and volume of assets traded does not have predictive capacity on future asset price movements. The semi-strong version of EMH asserts that assets prices already contain all information that can be obtained publicly regarding the prospects of a firm. This implies that financial market players cannot consistently make abnormal profit through analysis of published information, because such information is incorporated into assets prices as soon as they are released. The strong-form EMH postulates that assets prices reflect, in addition to information on history of past prices and information available to the public, information only available to company's insiders. This study is restricted to weak-form version of EMH.

Although weak-form version of EMH has been extensively investigated in financial economics literature for over four decades (Fama, 1965; Samuels & Yacout, 1981; Appiah-Kusi & Menya, 2003; Emenike, 2009; Saramat & Dima, 2011; Alkhatib & Harasheh, 2014), very few studies have concentrated on the insurance industry despite its import in economic development (Wang & Corbett, 2008; Chis, 2012; Stojakoviæ, 2017). Insurance is a risk transfer mechanism whereby individuals and firms can transfer their risks and uncertainties to the insurer. Insurance thus provides protection and stability to trade and industry, which ultimately contributes towards economic, social, technological, and human development. Stojakoviæ (2017), for example, identified two major purpose of insurance: the provision of a specific type of protection of the property and persons by enhancing confidence and security when damage occurs, and the capacity to mobilize an extremely high level of funds that have the characteristics of a specific capital. The insurance industry thus has an important role in social and economic advancement of both developed and developing economies. A well-functioning and efficient insurance industry is therefore very important in mobilizing savings and channeling the savings to productive investments. It equally encourages trade, innovation, and domestic productivity through reduction in investment risk and uncertainties.

Despite the importance of efficient insurance industry to development of productive capacity, very few empirical studies have considered this area of study in developed, emerging and developing economies. No empirical study, to the authors' knowledge, has examined the weak-form efficiency of the insurance industry using Nigeria data.

Majority of the financial economics studies conducted to evaluate the validity of financial market efficiency in both developed and developing economies were carried out for stock markets (Samuels & Yacout, 1981; Emenike, 2009; Appiah-Kusi & Menya, 2003; Saramat & Dima, 2011; Alkhatib & Harasheh, 2014). Emenike (2009), for instance, analyzed weak-form efficient market hypothesis across time for the Nigerian Stock Exchange (NSE) by investigating normal distribution and random walk in monthly stock return series. The study divided the all share indices of the NSE into three periods including January 1985 to December 1992, January 1993 to December 1999, and January 2000 to December 2007. The results indicate that NSE returns do not follow normal distribution in all the periods. Runs test results reject the randomness of the NSE monthly return series in the periods studied. He concludes that the NSE is not weak-form efficient across the time periods of this study.

Saramat & Dima (2011) evaluated the weak-form informational efficiency of United Kingdom, United States of America and Japan's capital markets using variance ratio and unit root tests. They interpret their results as rejecting the weak-form efficient market hypothesis for DJI, FTSE 100 and NIKEI 225 indexes.

Arora (2013) assessed the daily indices of S&P CNX Nifty (Index of National Stock Exchange India) for evidence of weak-form of efficient market hypothesis and random walk hypothesis using a battery of econometric tests. His results show that the S&P CNX Nifty returns are characterized by linear as well as nonlinear dependences and a high persistence of volatility clustering over the sample period. He therefore rejects null hypothesis of random walk for the series and concludes that Indian stock market do not show evidence of weak-form efficiency.

Alkhatib & Harasheh (2014) applied random walk model to empirically examine the weak-form market efficiency of Palestine Exchange (PEX). The results of their regression analysis, serial correlation, ADF, and runs tests reveal that the stock market is inefficient at the weak-form. They therefore conclude that their findings do not support the random walk model.

The few studies that examine efficiency of the insurance sector include Wang & Corbett (2008), Chiº (2012), and Gaganis, Hasan, & Pasiouras (2013).

Wang & Corbett (2008) explore stock market reactions of insurance industry shocks to the September 11, 2001 event in the USA. The apriori expectation is that property and liability insurers should have significant underwriting losses in many lines as a result of the event. Empirical evidence from the market model methodology on 86 sample insurers stock shows however that after the first week of trading subsequent to the market's reopening on September 17, the abnormal returns were not significantly different from zero. They conclude that the market is consistent with the efficient market hypothesis.

Chiº (2012) investigates a sample of selected insurance firms for evidence of weak-form efficiency. Specifically, the study examined eight insurance company ING unit-linked funds. He adopted the martingale difference hypothesis (MDH) in the analysis for the period ranging from July 21, 1999 to June 1, 2012. The MDH postulates that current stock market returns are not correlated with their past returns. The results of the study rejected MDH for almost all unit-linked fund markets, except for ING Poland Bonds Sub-Fund and ING Poland Balanced Sub-Fund. The study concludes that most of the markets are not weak-form efficient.

In a similar study, Gaganis, Hasan, & Pasiouras (2013) employed data from the insurance industry to evaluate the relation between stock returns and firm efficiency. The sample consists of 399 insurance companies stocks listed in the stock markets of 52 countries, for the 2002 to 2008 period. Results of the study indicate evidence of significant positive relationship between profit efficiency and stock returns. The results, however, did not show evidence of linkage between cost efficiency and stock returns.

In a very recent study, Stojakoviæ (2017) analysed correlation between the insurance and economic growth of selected countries undergoing transition in Western Balkans and some member states of the European Union in Southeast Europe. Specifically, the study evaluated whether the invested funds in the insurance industry had an impact on economic growth in Serbia, Montenegro Macedonia, Slovenia, Croatia, Hungary and Romania; using relevant economic indicators in the period 2010-2014. The study concludes that the life and non-life insurance, individually and collectively, contribute to economic growth in the selected EU member states and selected non-EU countries, in the study period.

The objective of this study therefore is to evaluate the weak-form efficient market hypothesis of insurance sector of the Nigerian Stock Exchange by evaluating serial dependence and randomness in stock returns in the framework of random walk model.

The hypotheses of this study, based on the research objective, are: the insurance sector returns are independent, and the insurance sector returns are random. Existence of independence and/or randomness in the return series of the insurance industry is evidence in support of weak-form efficiency.

This study is useful to the investors and participants of the insurance industry as well as to regulators of the developing capital markets and future researchers. To the investors for example, the study illuminates the extent to which historical prices would enhance pricing of insurance sector stocks. The study also provides basis for the formulation of market efficiency enhancing policies in the Nigerian stock market. The regulators can therefore formulate policies that can boost investors' confidence in the market. The study is also useful to academics as it provides premier evidence on the weak-form efficiency of the insurance sector stock returns in Nigeria. It will also serve as reference material to future scholars in similar study field. The remainder of the paper is organized as follows: the next section presents literature review. Section three contains research methods and data, while section four provides results and discussions. Finally, section five provides the conclusion.

METHODS

To evaluate weak-form efficiency of the Insurance industry in Nigeria stock market, in accordance with Emenike (2017), we apply parametric and non-parametric tests. The non-parametric test was executed using Runs test, whereas the parametric test was conducted using autocorrelation test.

The runs test procedure was adopted to evaluate weak-form efficiency of the insurance sector returns. It is a non-parametric test that examines whether or not an observed sequence is random. Numerous earlier studies employed the runs test to evaluate weak-form efficiency in stock markets across the globe (Emenike, 2009; Rahman & Hossain, 2006; Simon & Laryea 2004). Runs test is based on the premise that if a time series follows random process, the observed number of runs in the time series should be close to expected number of runs. If there is too many runs in an observed sequence, it indicates that the residuals change sign frequently, thus evidencing negative serial correlation. Conversely, if there is too few runs, it suggests evidence of positive serial correlation (Gujarati, 2003). Hence, too many runs or few runs indicate evidence against randomness in the observed series (Emenike, 2009). Under the null hypothesis of randomness in the insurance sector returns, the expected number of runs can be estimated as:

$$M = \frac{2N_1N_2}{N} + 1 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where N is the total number of time series observations (N_1+N_2), N_1 is the number of positive residuals, N_2 is the number of negative residuals, and M is the expected number of runs. For a large number of observations (i.e., $N > 30$ observations), the sampling distribution of M is approximately normal and the variance is given by:

$$\sigma_M^2 = \frac{2N_1N_2(2N_1N_2 - N)}{(N)^2(N-1)} \quad \ldots\ldots\ldots (2)$$

The standard normal Z statistic which is applied to test whether the actual number of runs is consistent with the hypothesis of randomness is given as follow:

$$Z = \frac{R - M}{\sigma_M} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Where R is the actual number of runs. To test the null hypothesis of randomness (weak-form efficiency) of the Insurance sector returns, the runs test was computed for the study period. The decision rule is to accept randomness at 5% significance if the Z coefficient is equal to ±1.96, and to reject it otherwise.

The parametric test for serial dependence was conducted using autocorrelation function (ACF). The ACF evaluates the serial dependence between observed time series at a current period and past periods. The lag-i sample autocorrelation of $\mathrm{r_t}$ is:

$$\rho\ell = \frac{\sum_{t=\ell+1}^{T}(r_t - \bar{r})(r_{t-\ell} - \bar{r})}{\sum_{t=1}^{T}(r_t - \bar{r})^2}, 0 \le \ell < T - 1. \ \ldots\ldots (4)$$

Where, $\rho\ell$ is the serial correlation coefficient of the insurance sector returns of lag ℓ, T is the number of observations, $\mathrm{r_t}$ is the insurance sector return for period t specified in equation (6), $\bar{r}$ is the sample mean of the insurance sector return, and ℓ is lag of the period. The ACF is used to detect whether the serial correlation coefficients are significantly different from zero under the null hypothesis $\rho_l = 0$ versus the alternative hypothesis $\rho_l \neq 0$. The decision rule is to reject the null hypothesis of independence in insurance sector returns if the p-value is less the significance level (0.05)**.** Implicitly, weak-form efficiency should be rejected if is serially correlated (Emenike, 2017).

To test jointly, that several autocorrelations of are zero, the Ljung-Box (1978) modification of Box and Pierce (1970) portmanteau (Q) test was applied. Ljung-Box Q entails testing the squared error series for serial correlation using portmanteau tests as follows:

$$Q_{LB}(m) = T(T+2)\sum_{\ell=1}^{m}\frac{\hat{\rho}_{\ell}^{2}}{T-\ell} \ \ldots\ldots\ldots\ldots (5)$$

Where T is the sample size, m is the number of autocorrelation used in the test. Under the null hypothesis that the insurance sector returns are serially uncorrelated sequence, the Q-statistic is asymptotically a chi-square random variable with degrees of freedom equal to the number of autocorrelation (m). The null hypothesis is that the first m lags of ACF of are zero (Tsay, 2005). The decision rule is therefore to reject null hypothesis if the marginal significance level is less than or equal to the significance level (i.e., 0.05).

Daily observations on the insurance index of the Nigerian Stock Exchange (NSE) were obtained from the NSE statistics databank for the period ranging from 02 January 2009 to 02 February 2016, totaling 1776 observations. This time period was chosen based on availability of data. Although the NSE started the compilation of the Insurance index on January 2008, the period corresponds with the global financial crisis era. The insurance index series were transformed to sector returns series by taking the first difference of log series as follows:

$$Ir_t = Ln(P_t - P_{t-1}) * 100 \ \ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Where is the daily returns of the insurance industry specified in equation (1), is closing value of insurance index in day t, is the previous day closing value, and is natural logarithm.

RESULTS

Descriptive Statistics

Figure 1 displays time series graph of log-level and returns series of the Insurance sector stock index for the 02 January 2009 to 02 February 2016 period. A close look at the graph shows that the log-level series appear non-stationary. This suggests that the first two moments, of the distribution from which the series is drawn, may change with time. The second panel of Figure 1 indicates that the insurance sector stock return is a stationary series. Implicitly therefore, the mean of the insurance sector return series may not change with time, and the covariance with any k lag is independent of t.

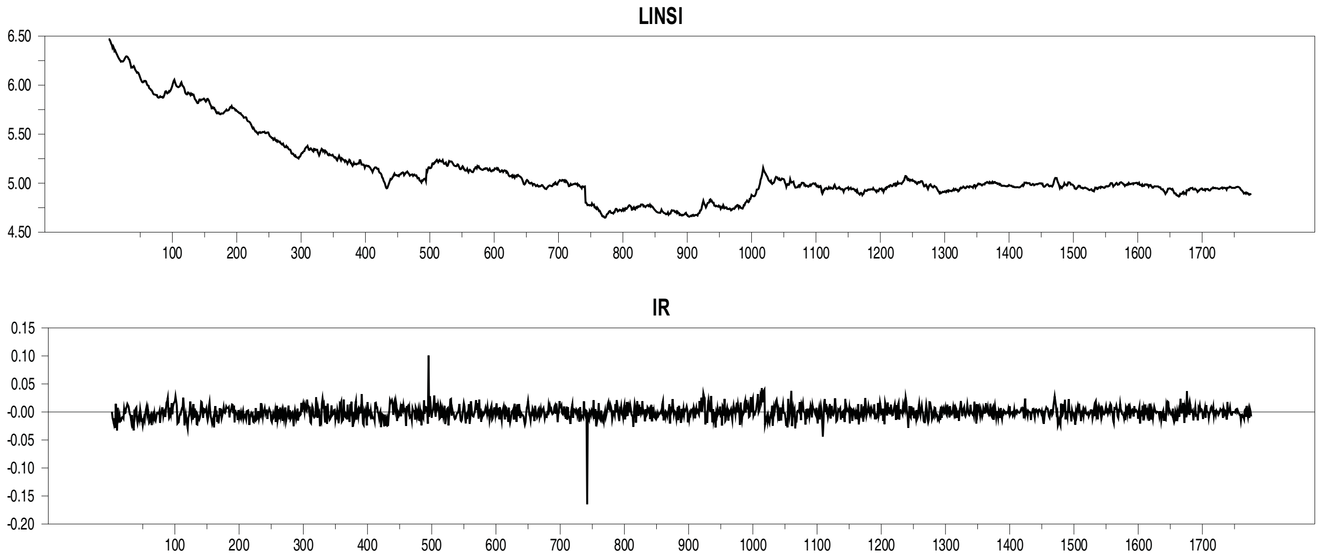

Figure 1. Time Graph of Level and Returns of Insurance Sector Stock Index in Nigeria 02 January 2009 to 02 February 2016

Table 1. Univariate Statistics for Insurance Sector Returns

Variable	Mean	Min. rtn.	Max. rtn.	Std. Dev.	Skewness	Kurtosis	J-B Stat.
Stock	-0.0893	-16.4653	10.0921	1.1656	-1.0771	24.8293	45938.386
	(0.001)				(0.000)	(0.000)	(0.000)

Note: *P*-values are displayed as (.). Min. and max rtns are the minimum and maximum insurance sector returns during the study period. Std. Dev. and J-B Stat are the standard deviation and Jarque-Bera statistics for the insurance sector returns.

Table 2. Augmented Dickey-Fuller (ADF) Unit Root Tests Results

	Log-level series		Return series	
Variables	critical value 5%	computed value	critical value 5%	computed value
Insurance	-3.414	-3.330	-3.414	-14.935**

Note: ** indicates significance at the 1% level.

Univariate statistics for the insurance sector return series are reported in Table 1. Notice that the average daily percentage return for the insurance sector of the Nigeria stock market over the study period is negative. This is evidenced in the statistical significance (0.001) of the *p*-value for the zero mean hypothesis. The minimum and maximum insurance sector returns show wide dispersion from the mean return. This is also supported by the very high excess kurtosis coefficient (24.8). The return distribution is negatively skewed, as the *p*-value (0.000) rejects the null hypothesis of zero skewness. This implies that there are more negative insurance sector returns than predicted by normal distribution. Table 1 also shows that the empirical distribution of the insurance sector returns is leptokurtic, and not normally distributed as indicated by the high excess kurtosis and significant Jarque-Bera coefficient.

Results of Unit Root Tests for the Insurance Sector Returns

Given that a rule of thumb in any time series modeling is to work with only stationary time series, Table 2 contains the results of the augmented Dickey-Fuller (ADF) unit root tests estimated to evaluate the insurance sector log-level and return series for unit root. The null hypothesis of the ADF test is that a time series contains a unit root. As shown in Table 2, the computed values of the ADF test statistics indicate that the log-level insurance sector series contain a unit root at the 1% significance level. This implies that the insurance sector level series are non-stationary.

The ADF statistics of the return series, on the other hand, reject the null hypothesis of unit root at the 1% significance level. This suggests that the insurance sector returns series are stationary.

Autocorrelation Function for Insurance Sector Returns

Figure 2 displays the correlograms of the autocorrelation and partial correlation function of stock returns series of the insurance sector for the 02 January 2009 to 02 February 2016 period. According to the graph, there are indications of positive autocorrelation at lags 1 and 2 of the daily returns of the insurance sector stock. The correlograms does not exhibit any other significant autocorrelation up to lags 84, which was selected using Akaike Information Criterion (AIC).

In order to investigate whether the ACF is significant, we computed the *Q* statistics for lags 1 to 100 and the results are displayed in Table 3. The *p*-value of the Ljung-Box *Q* coefficients for the lags 1 to 100 are all less than 5% the significance level. Therefore, we cannot accept the null hypothesis of independence in the returns series of the insurance sector in Nigeria at the 5% level of significance.

The existence of serial dependence in the insurance sector stock returns is an indication of stock returns predictability, which is evidence against weak-form EMH.

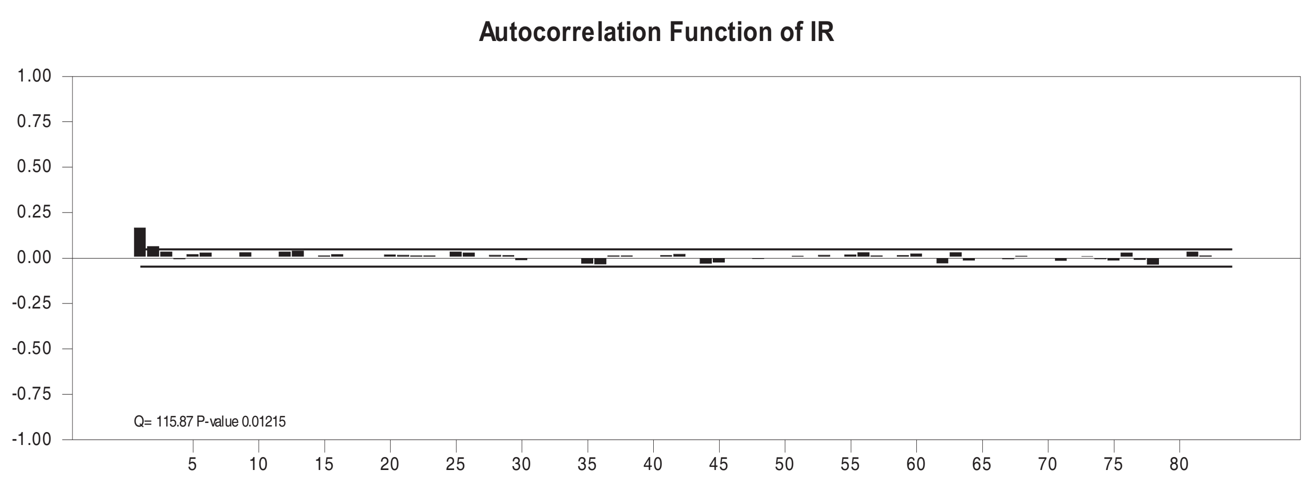

Figure 2. Autocorrelation Function for Insurance Sector Stock Returns in Nigeria 02 January 2009 to 02 February 2016

Table 3. Autocorrelation Function and Ljung-Box Q Statistics for Insurance Stock Returns

Lags	ACF	Ljung-BOX Q
1	0.167	49.610 (0.000)
2	0.096	66.188 (0.000)
3	0.055	71.707 (0.000)
4	-0.011	71.963 (0.000)
5	0.015	72.367 (0.000)
6	0.037	74.831 (0.000)
7	0.005	74.887 (0.000)
8	-0.007	74.887 (0.000)
9	0.030	65.993 (0.000)
10	0.005	76.691 (0.000)
20	0.010	84.995 (0.000)
30	-0.012	96.224 (0.000)
40	-0.004	105.53 (0.000)
50	-0.001	112.94 (0.000)
60	0.015	119.48 (0.000)
70	-0.009	125.15 (0.000)
80	-0.011	133.19 (0.000)
90	0.057	150.97 (0.000)
100	0.022	157.62 (0.000)

Note: The *p*-values of Ljung-Box Q statistic for the autocorrelation functions are displayed in bracket.

Measuring Weak-Form Efficiency of the Insurance Sector Stock Returns using Runs Test

Table 4 displays results of the Runs test estimated to test the null hypothesis of randomness of the insurance sector returns in Nigeria. Notice from *Table 4* that the Z statistics (-5.417), is less than -1.96 and negative. This indicates that the actual number of runs fall below the expected number of runs at the 5% significance level. Notice also from *Table 4* that the actual runs is 87% of the expected runs. Negative Z coefficient and few observed runs is evidence that the residuals change sign frequently, thus indicating a strong positive serial correlation. This evidence of positive serial correlation is similar to the result provided by the ACF in Figure 2 and Table 3. Positive autocorrelation, according to Emenike (2009), infers predictability of returns in the short horizon. In the same vein, the negative annualized mean return of -23.2% contradict the random walk model which postulates zero mean. In a weak-form efficient stock market, the positive returns cancel out the negative returns so that their average effect on investment returns is zero. The negative mean return value indicate insurance sector return series may not be random. More so, the asymptotic significance (2-tailed), which is the *p*-value corresponding to the Z coefficient, show a probability of (0.000). Under the null hypothesis of randomness in return series, asymptotic significance corresponding to the Z coefficient should be greater than or equal to significance level, in this case 5%. Consequently, we can reject the null hypothesis of randomness *i.e.* weak-form efficiency in insurance sector stock returns, with 95% confidence, since Z coefficient is less than the significance level (0.05).

Table 4. Runs Test Results

	IR
Test Value[a]	-.0009
Cases < Test Value	867
Cases >= Test Value	908
Total Cases	1775
Number of Runs	774
Z	-5.417
Asymp. Sig. (2-tailed)	.000

Note: A is the mean. RIR is the residual of the insurance market returns

CONCLUSIONS AND SUGGESTIONS

Conclusions

Majority of the empirical studies conducted to examine the validity of the efficient market hypothesis, hence financial market efficiency in both developed and developing economies are conducted for stock markets. This paper evaluated the weak-from efficiency by hypothesizing independence and randomness in the stock return series of insurance industry. The data for the study ranged from 02 January 2009 to 02 February 2016. The results obtained from autocorrelation function and Ljung-Box Q Statistic show evidence of serial dependence in insurance industry stock returns in Nigeria at the

5% significance. Thus reject the null hypothesis of independence in the stock return series of insurance industry. The result from the runs test also shows evidence of positive serial correlation, and therefore rejects the null hypothesis of randomness in the returns of insurance industry at the 5% significance level. Positive serial correlation infers predictability of returns in the short horizon. From the results obtained from this study, we conclude that the Nigerian insurance industry stock return is not weak-form efficient. The existence of serial dependence in the insurance sector stock returns is an indication of stock returns predictability, in the short-term, which disputes weak-form efficient market hypothesis.

Suggestions

The major stock trading implication of this finding is that investors in the insurance sector of the Nigerian Stock Exchange can predict future price movements from history of prices. In this way, investors can systematically earn abnormal returns from the insurance sector of the NSE. Consequently, technical analysis on the insurance sector of the NSE may not be fruitless.

REFERENCES

Alkhatib, A., & Harasheh, M. (2014). Market efficiency: The case of Palestine Exchange (PEX). *World Journal of Social Sciences, 4*(1), 196–206.

Appiah-Kusi, J., & Menya, K. (2003). Return predictability in African Stock Markets. *Review of Financial Economics*, *12*(3), 247-270.

Arora, H. (2013). Testing weak-form of efficiency of Indian Stock Market. *Pacific Business Review International, 5*(12), 16-22.

Chiº, D. M. (2012).Testing the martingale difference hypothesis in the European emerging unit-linked insurance markets. *Procedia Economics and Finance*, *3*, 49-54.

Emenike, K. O. (2009). Efficiency across time: Evidence from the Nigerian Stock Exchange. *International Journal of Management Sciences*, *1*(2), 60-78.

Emenike, K. O. (2017). Weak-form efficiency after the global financial crises: Emerging stock market evidence. *Journal of Emerging Market Finance*, *16*(1), 99-113.

Fama, E. F. (1965). The behaviour of stock market prices. *Journal of Business*, *38*(1), 34-105.

Gaganis, C., Hasan, I., & Pasiouras, F. (2013). Efficiency and stock returns: Evidence from the insurance industry. *Journal of Productivity Analysis, 40*(3), 429-442.

Gujarati, D. N. (2003). *Basic econometrics* (4th ed), New York: McGraw Hill Inc.

Islam, S. M. N., Watanapalachaikul, S., & Clark, C. (2007) Some tests of the efficiency of the emerging financial markets an analysis of the Thai Stock Market. *Journal of Emerging Market Finance*, *6*(3), 291–302.

Ljung, G. M., & Box, G. E. P. (1978). On a measure of lack of fit in time series models. *Biometrical, 65*(2), 279-303.

Malkiel, B. G., & Fama, E. (1970). Efficient capital market: A review of theory and empirical work. *Journal of Finance*, *25*(2), 385-417.

Rahman, S., & Hossain M.F. (2006). Weak-form efficiency: Testimony of Dhaka Stock Exchange. *Journal of Business Research, 8*, 1-12.

Samuels, J. M., & Yacout, M. (1981). Stock exchange in developing countries. *Savings and Development, 5*(4), 217-232.

Saramat, O., & Dima, B. (2011). Testing the weak-form informational efficiency of United Kingdom, United States of America and Japan's Capital Market. *Timisoara Journal of Economics*, *4*(2), 111-122.

Spiegel, M. R., & Stephens, L. J. (2008). *Schaum's outline of theory and problems of statistics.* 4th Edition. USA: McGraw Hill Inc.

Stojakoviæ, A. (2017). Insurance industry in selected transition countries. *The European Journal of Applied Economics*, 14(1): 32-47.

Tsay, R. S. (2005). *Analysis of financial time series.* 2nd Edition. Hoboken, New Jersey: John Wiley & Sons Inc.

Wang, Y. & Corbett, R. B. (2008). Market efficiency: Evidence from market reactions of insurance industry stocks to the September 11, 2001 event. *Journal of Insurance Issues*, *31*(2), 153-167