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Testing and Determining the Form of Market Efficiency in Dhaka Stock Exchange (DSE)

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Abstract

This paper is focused on the idea of whether Dhaka Stock Market (DSM) is efficient in weak-form of Efficient Market Hypothesis (EMH) or not. As any country's economic condition can be indicated by the efficiency of its stock market, so determining and measuring the different forms of efficiency has always been a well explored topic for researchers. In this paper, attempts have been made to determine and test the market efficiency and randomness of Dhaka Stock Exchange (DSE) in weak form. The entire Dhaka stock exchange has been evaluated by employing daily return from the two indices- DS30 and DSEX. Employing the normality test it is found that both the return series are not normally distributed. Moreover few parametric tests named Augmented Dickey-Fuller test (ADF), Autocorrelation Function (ACF), and Variance Ratio test (Lo & MacKinlay) have been done to examine the historic price dependencies or to examine the random walk hypothesis. The entire test results suggested that DSE is not efficient in weak form which means return from DSE does not follow a random walk.

Keywords: Efficient market hypothesis, EMH, Weak form of efficiency, Random walk hypothesis, DSE

1. Introduction

Dhaka Stock Exchange (DSE) is one of the two stock exchanges currently operating in Bangladesh. Although DSE is a stock exchange, it works as a separate corporate entity under the Companies Act, 1994. At present, DSE is regulated by Articles of Association rules and regulations and by-laws along with the Securities and Exchange Ordinance-1969, Companies Act, 1994 and Securities & Exchange Commission Act, 1993. As of now, DSE does not offer diversified range of financial products, but it has equity, mutual funds, corporate bonds,

treasury bonds, and debentures. At present, DSE has 578 listed companies from different sectors such as, bank, cement, ceramic, financial institutions, jute, IT etc. The main Stock exchange of Bangladesh is not a very a steady market rather it is well known for its volatility. There have been instances where increase in market index resulted in the investors receiving abnormal profit. So, it is important to explore the performance of the Dhaka Stock Exchange by testing the level of efficiency based on the Efficient Market Hypothesis (EMH).

For many people of Bangladesh investment in the DSE is a primary career. So, DSE provides a great source of employment. The process of investment and trading of securities are too much easy. Many people without adequate financial knowledge indulge in the investment of DSE. In recent years, Dhaka Stock exchange and Chittagong Stock Exchange experienced massive crash. So, the question remains is whether are the stock exchanges efficient or not. was the main motivation of this study.

Testing weak form of market efficiency of DSE is not a new concept. But this study is based on the two indices which are DS30 and DSEX. Most of the previous studies have used DSES or DGEN indices. Besides, in this study three parametric approaches have been employed using daily return to test randomness in the market. This paper is conducted to understand and find out if there are any changes in results in the previous findings of existing literature due to the inclusion of two DSEX and DS30. This paper is organized in five sections. Section 2describes the literature review, section 3 presents the data and research methodology, section 4 includes main analysis and findings and section 5 provides conclusion.

1.1 Research Objectives

The primary objective of this paper is to test and determine whether Dhaka stock exchange is efficient in weak-form of efficient market hypothesis or not.

1.2 Research Questions

Is Dhaka stock exchange efficient in weak-form of efficient market hypothesis?

1.3 Research Hypothesis

The main investigation of this research is to test the following hypothesis:

Null Hypothesis, H_0: Return from DSE follow a random walk

Alternate Hypothesis, H_1: Return from DSE does not follow a random walk

2. Literature Review

In 1970, Fama defined an efficient market as the one in which security prices always fully reflect the available information on hand. According to Efficient Market Hypothesis (EMH), the market always knows best. The EMH entails that stock price are traded at fair value and do not let investors use trading strategies and thus does not allow them to earn above average return through arbitrage. Information was categorized into three types which ultimately became three forms of market efficiencies. They are- weak, semi-strong and strong. (Fama, 1965)

Bachelier (1900) first initiated Random walk hypothesis and then it was further modified by Osborne (1959). According to Bachelier and Osborne, traders do not depend on the analysis of past price movement. Instead, they behave rationally and conduct fundamental calculation to measure the price of share based on the performance of the company. It means share prices are set randomly over the periods without any influence of previous price movement.

The stock indices of Bombay, London and NYSE during the period 1963 to 1973 were evaluated by Sharma and Kennedy (1977). They used spectral analysis and run test. Both of these tests confirmed the random movement of stock indices for the stock indices of Bombay, London and NYSE. Moustafa (2004) employed runs tests and serial correlations in order to examine the behavior of stock prices using data on the daily prices of the 43 stocks included in the UAE market index for e period of 24 months. The results show that the returns of 40 stocks out of the 43 are random at 5% level of significance. This study concluded that the UAE stock market follows weak form of efficiency. (Sharma & Kennedy, 2009)

Botswana stock exchange (BSE) was evaluated by Akinkugbe (2005) to investigate whether it follows weak form of efficient market hypothesis by using 738 weekly observations for the period of 1989 to 2003. Statistical tests like autocorrelation test and unit root tests were used to test whether BSE followed weak form of efficiency. The autocorrelation test did not show serial correlation and the result of both unit root tests indicated a stationary process for stock returns. So, it indicated that stock markets in Botswana were efficient in weak form. (Akinkugbe, 2005)

Omran et al. (2006) analyzed the random walk hypothesis and tested calendar effect in five major Middle-Eastern emerging stock markets. Several tests including the box-pierce test, run test, autocorrelation function and unit root test were used in order to test the random walk and kruskal-wallis test for testing the calendar effect were used in this research. The research showed that stock index of Israel supports the random walk hypotheses (RWH) compared with the other markets in the sample. There were also anomalies found as the week effects do not appear to be related to the pattern of trading days over the week.(Omran & Farrar, 2006)

In a research to examine DSE for the existence of weak form for the period of January, 1990 to September, 2003 Rahman et al. (2004) used monthly index time series. Unit root tests (ADF and PP) were used and the results showed the hypothesis that DSE index time series contains unit root. This indicated DSE follows weak form market efficiency.

Heteroscedasticity robust Box-Pierce test on DSE daily and monthly index was used by Islam and Khaled (2005). Autocorrelation tests typically rejected weak form of market efficiency. This research concluded that, this rejection may be reversed by a heteroscedasticity robust test. (Islam & Sofyani, 2005)

Both nonparametric tests (Kolmogrov-Smirnov goodness of fit test and run test) and parametric-tests (Auto-correlation coefficient test and ARIMA (0, 1,0)) for testing random walk model in the daily return series of DSE were used by Rahman and Hossain (2006). This study found no evidence of weak-form efficiency.

A research was conducted on the stock markets of fourteen Asian countries which included Australia, Malaysia, Pakistan, Philippine, Singapore Hong Kong, India, Indonesia, Japan, Korea, and Thailand using monthly observations by Hamid, Suleman, Shah, and Akash (2010). The research period was from 2004 to 2010. The normality of data using Jarque-Bera statistics test was tested and it was found normal for 11 countries. Serial correlation (Ljung-Box Q-Statistics test) was conducted and it was found that no countries except Pakistan follow a random walk, in stock prices. ADF test was also conducted to check stationarity in data. The study concluded data follow a random walk and 14 of these countries' market do not follow weak form of hypothesis. (Hamid, et al., 2010)

(Hasan, Kamil, & Baten, 2011) conducted a study based on the daily share price of 100 listed companies of DSE. This study showed an interesting outcome. It showed that the market inefficiency was increasing over the time. The study has concluded observing that by the time more historical data have taken place market participants were able to predict more about the stock price movements. (Hasan, et al., 2011)

The efficiency and volatility effect of Dhaka Stock Exchange using three different daily price indices which were DGEN, DSI and DSE20 were analyzed by Hossain and Uddin (2011)examined the. They employed autocorrelation function, ADF and PP tests, ARIMA models, and GARCH (p, q)-M models. This study concludes that DSE returns tend to show fluctuations and investors are rewarded for taking increased risk for the securities of DS20 and DSI. This was not same for DSEG. The study also found out that a massive amount of capital inflow significantly effects the DSE fluctuations during the periods 2007 to 2009. (Hossain & Uddin, 2011)

Khandoker, Siddik and Azam (2011), in their journal employed the random walk hypothesis to test market efficiency in the Dhaka Stock Exchange. They used Runs test, Dickey-Fuller Unit root test while taking total 2403 daily observations of DGEN from the period of 2001-2011, 2614 observations of DSI from 2000-2011, and 2649 daily observations of DSE-20 from 2001-2011. As a proxy of movement of individual stock prices daily closing prices of 30 companies operating in the bank sector were considered. The research results revealed that DSE does not follow the random walk model and thus is not efficient in weak form. (Khandoker, et al., 2011)

Nikita and Soekarn (2012) analyzed the weak form efficient market hypothesis in Indonesian Stock Market using daily closing prices of IHSG and LQ45 composite index for the period of 2008-2011. Run test, autocorrelation, and a regression analysis are used to prove the signs of weak form market efficiency. The result of the study shows that the existence of non-randomness and significant autocorrelation on IHSG and LQ45 index. The study concludes that Indonesian Stock Market is does not follow weak form of hypothesis during the sample period. (Nikita & Soekarno, 2012)

A normality test along with Serial correlation were conducted by Chaity and Sharmin (2012), Auto regressive Integrated Moving Average approach (ARIMA) of stock daily return from All Share Price Indices (ASPI) and DSE General Indices (DSEGI) were analyzed respectively for the period of 1993-2011 and the data of 2002-2011. 4363 daily stock price

returns from ASPI and 2433 daily stock price returns from DSEGI were taken as sample. The result indicated that the DSE does not follow random walk model and thereby does not have weak form of efficiency. (Chaity & Sharmin, 2012)

Bose, Uddin, and Islam (2014) in their journal "Measuring and Comparing the Efficiency of Dhaka Stock Exchange and Chittagong Stock Exchange" used ARIMA test to measure the efficiency level of DSE and CSE. In their research the relation between the past information and the share price is investigated or in other words whether share prices follow random walk or not. They calculated distance of securities for DSE and CSE to make assumption of whether stock exchanges belong to strong form of efficiency or not along with which stock exchange is more efficient. This research concluded that DSE and CSE are not in the form of 'weak efficiency' and 'strong efficiency', they rather belong to the 'semi strong' form of efficiency and CSE is more efficient than DSE. (Bose, et al., 2014)

Abu Hasan (2015) investigated the weak form efficiency using the random walk hypothesis for the DSE, using both non-Parametric tests (Runs test and Phillips-Perron test) and Parametric tests (Autocorrelation test, Augmented Dickey-fuller test, and Variance Ratio test). 4823 daily return observations from DSI, a total of 2903 daily return observations from DGEN, and a total of 3047 daily return observations from DSE20 were used for this study. The study concluded that all the return series do not follow the random walk model and DSE is inefficient in weak form. (Hasan, 2015)

Ahmed, Kawser in his paper "Determining the Efficiency of Dhaka Stock Exchange (DSE)" analyzed the efficiency of DSE, by determine whether the index return series are normal or not. Skewness, Kurtosis and Jarque-Bera statistics, Quantile-Quantile (Q-Q) plot and Kolmogrov-Smirnov goodness of fit tests are used in this study. Later, Ljung-Box Test and Correlogram were used to measure the serial dependency of return series but insignificant non-zero autocorrelations indicate the non-randomness of data series. Then the Random Walk Model hypothesis was tested by Run test, Augmented Dickey-Fuller (ADF) test and the most modern Variance- Ratio test. The study concluded the investors can easily use the past security market information to predict the future price. (Shiblu & Ahmed, 2015)

A study done by Raquib, Alom (2015) shows a paradigm of non-parametric tests of market efficiency for an emerging stock market. To establish a more definitive conclusion about EMH in emerging financial markets, autocorrelation function tests (ACF) were used. The result of this research shows that a positive autocorrelation on DSE returns exists particularly in the period of 2001-2013. (Raquib & Alom, 2015)

Shaheen, Rehman, & Haq, 2015 conducted a study considering the stock exchanges of Hong Kong, Korea, India, Taiwan and Pakistan. The study used daily data from the period of 2000-2012. Jarque-Bera test was applied to measure the nature of data. In order to test the randomness of data or efficiency in stock market ADF, serial correlation tests were used. In the findings, Korean stock exchange was found to be efficient. And the rest of the studied exchanges were found inefficient. (Shaheen, et al., 2015)

As stated already in the thorough literature that the selected topic has gained the attention of researchers all through the world with regular addition of testing the different forms of market efficiency. This study particularly aims at including the database after being hugely faced by the pandemic phenomena COVID-19. This entirely creates a new addition to the established review to justify whether such a significant and world-changing phenomena has changed or impacted the financial market of Bangladesh in any different way than previously found.

3. Research Methodology

3.1 Data Collection

Data type is secondary in nature and is collected entirely from DSE website. Two of the four indices DS30 and DSEX have been considered. All the daily closing values were taken for the period of 01/09/2015 to 01/09/2021, almost 5 years. In total the study has approximately 1417 daily observations to run different tests. Attempts have been made to show the historical price dependency of DSE. Both Microsoft Excel and Stata 13 have been used to conduct the various statistical tests. The return series of DSEX and DS30 is calculated in order to do so.

Following formula has been used to calculate the return (R_t) for two indices:

$$R_t = \left(\frac{Pr_t - Pr_{t-1}}{Pr_{t-1}}\right) * 100$$

Here,

Pr_t = Closing Price of the index at time "t"

Pr_{t-1} = Closing Price of the index at time "t-1"

3.2 Research Design

After calculating the return series for DSEX and DS30, normality test is conducted employing Jarque-Bera test of normality. Under this test of normality, the null hypothesis is stated as the variable is normally distributed while the alternative hypothesis states that the variable is not normally distributed. To test descriptive statistics using the following formula:

$$JB = n * \left(\frac{S^2}{6} + \frac{EK^2}{24}\right)$$

Where, S= skewness of data;

EK = Excess kurtosis of the data;

n = sample size

Descriptive statistics will test the following hypothesis:

Null Hypothesis, H_0: Data of return series is randomly or normally distributed

Alternate Hypothesis, H_1: Data of return series is not randomly or normally distributed

After the evaluation of the descriptive statistics following parametric tests such as, Unit root (ADF) test, variance ratio test (Lo and MacKinlay), and autocorrelation (ACF) test have been employed in order to test the primary hypothesis of the research.

3.3 Unit Root Test or Augmented Dicky Fuller Test (ADF)

In order to check market efficiency, it is fore mostly needed to be checked if stock market return series follow a random walk. For this reason unit root test has been used to test the random walk hypothesis model on time series data. In this paper, unit root test is used to check if return series has a pattern or trend. If a pattern is found, the return series has a constant mean, variance, and covariance; in other words, there is no unit root, so, data is stationary. If data has unit root, it means, investors cannot predict future by employing trading strategies. To test the unit root, Augmented Dicky Fuller Test (ADF) is one of the widely used tests. It is used to see the presence of stationary properties in data series. The null hypotheses of all tests concerning the status of being stationary are stated as the return series is non-stationary.

Null Hypothesis, H_0: There is presence of unit root in the series (non-stationary)

Alternate Hypothesis, H_1: There is no presence of unit root in the series (stationary).

3.4 Autocorrelation Function Test (ACF)

ACF test is used to see the randomness in data series. This test primarily measures the degree of correlation between the current stock returns and lagged observations or degree of independence. In this study ACF test has been done to justify if the correlation in between prices is significantly different from zero. In other words, results close to plus or minus one refer to strong correlation between return series. It measures the level of serial correlation coefficient.

3.5 Variance Ratio Test

This test is used particularly in situations where the return series of stock prices are not normally distributed. This test examines the return series by comparing the variances among the data. It helps to determine whether previous data has influence over the current and coming share prices. This test can calculate and measure both homoskedastic and heteroskedastic random walks, using the asymptotic normal distribution. Following two hypothesis will be tested using variance ratio test:

Null Hypothesis, H_0: Return series follows a random walk

Alternate Hypothesis, H_1: Return series does not follow a random walk

4. Analysis

4.1 Descriptive Statistics

For the analysis purpose two of the four indices of Dhaka Stock exchange named DS30 and DSEX or DSX have been considered. All the daily closing values were taken for the period

of 5 years from 01/09/2015 to 01/09/2021. In total the study has 1416 daily observations to run different tests.

	DSX	DS30
Observations	1416	1416
Mean	0.0304	0.0262
Median	0.034997	0.0182
Maximum	10.2945	10.1693
Minimum	-6.5152	-6.1944
Skewness	1.1215	1.1105
Kurtosis	25.2714	21.5448
Standard Deviation	0.8388	0.8881

(Appendix Tables 1 and 2)

In the descriptive statistics, the mean, median, standard deviation, kurtosis, skewness of the both return series-DSX and DS30 have been calculated. Mean value of DSX is 0.0304 and mean for DS30 is 0.0262. Return of DS30 has higher standard deviation than that of DSX. Both the return series are positively skewed. Moreover normality test has also been performed in order to check whether the variables are normally distributed or not. Normality test reveals that both variables are not normally distributed.

4.2 Normality Test

Skewness/Kurtosis tests for Normality

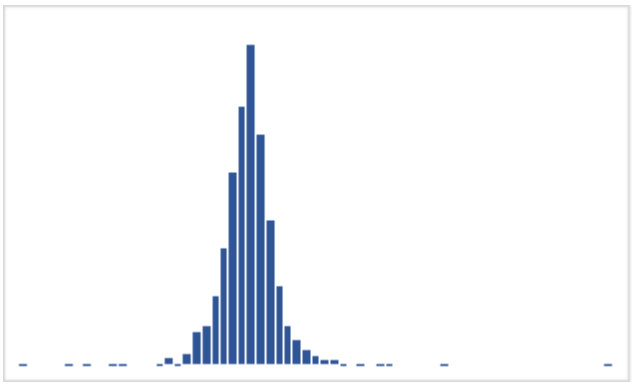
				joint	
Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	adj chi2(2)	Prob>chi2
RX	1.4e+03	0.0000	0.0000	.	0.0000

From the above calculation, it can be seen that the p-value is below 0.05. So, the null hypothesis has been rejected and alternate hypothesis has been accepted justifying that the return series of DSX is not randomly or normally distributed.

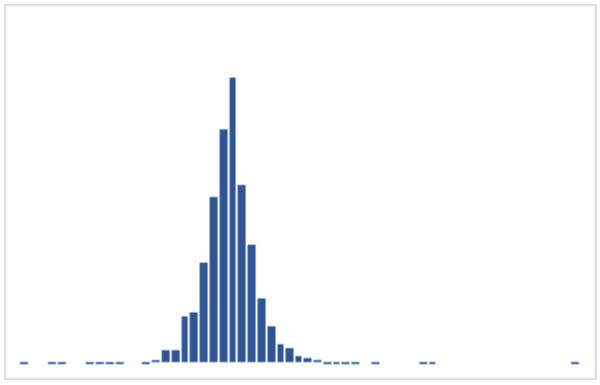
Skewness/Kurtosis tests for Normality

				joint	
Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	adj chi2(2)	Prob>chi2
R30	1.4e+03	0.0000	0.0000	.	0.0000

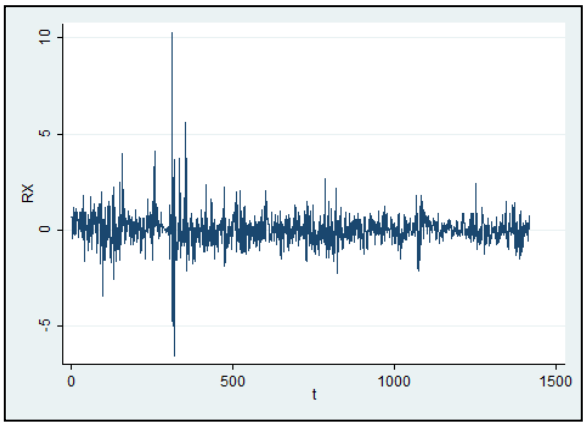
From the above calculation, it can be seen that the p-value is below 0.05. So, again the null hypothesis can be rejected and alternate hypothesis can be accepted justifying that the return series of DS30 is also not randomly or normally distributed.

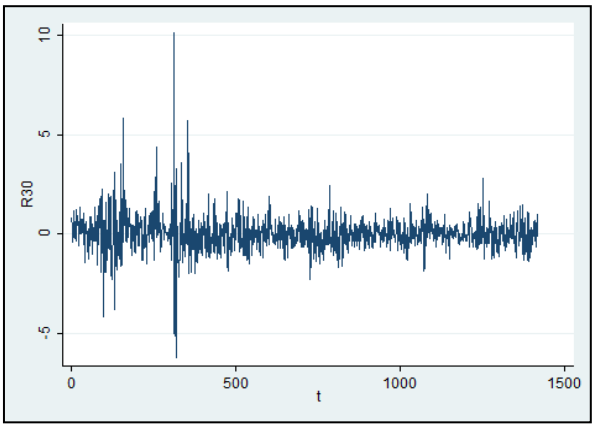


Histogram of DSX



Histogram of DS30





Two-way Line Graph (DSX)

Two-way Line Graph (DS30)

From the above graphs it can be seen that both the series are not upward trending, instead they are mean reverting which indicates that the dataset is stationary..

4.3 Augmented Dickey Fuller Test (ADF)

In order to check market efficiency, it is needed to check if stock market return series follow a random walk. Unit root test is used to test the random walk hypothesis model on time series data to clarify if return series has a pattern or trend. If a pattern is found, the return series has a constant mean, variance, and covariance; in other words, there is no unit root, so, data is stationary. If data has unit root, it means, investors cannot predict future by employing trading strategies. To test the unit root, Augmented Dickey Fuller Test (ADF) is one of the widely used tests. ADF test is used to see the presence of stationary properties in data series. In the test, augmented dickey-fuller (ADF) statistic is a negative number and thus it indicates that the more negative value of the test statistics is, the stronger will be the rejection of the null hypothesis. If there is no unit root, it is stationary.

Null Hypothesis, H_0: There is a unit root in the series (non-stationary)

Alternate Hypothesis, H_1: There is not any unit root in the series (stationary).

(i) ADF Test on DSEX Return

```
. dfuller RX, regress

Dickey-Fuller test for unit root                    Number of obs   =      1415

                                 ---------- Interpolated Dickey-Fuller ----------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)           -31.978           -3.430            -2.860           -2.570
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

------------------------------------------------------------------------------
        D.RX |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          RX |
         L1. |  -.8398081   .0262623   -31.98   0.000    -.8913253   -.7882909
             |
       _cons |   .0251697   .0220345     1.14   0.254    -.0180541    .0683935
------------------------------------------------------------------------------
```

In the above calculation, it can be seen that the absolute value of test statistic is then the critical value at 1%, 5% and 10% significance. Also, the p value is significant at 5% level. Thus the null hypothesis can be rejected recognizing the existence of unit root (random walk characteristic) in the model.

(ii) ADF Test on DS30 Return

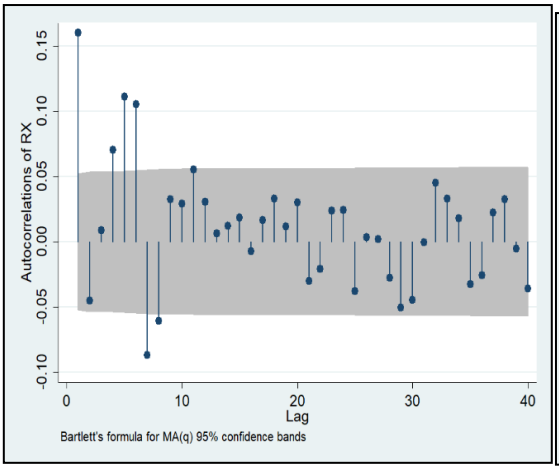
```
. dfuller R30, regress

Dickey-Fuller test for unit root                    Number of obs   =      1415

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical         5% Critical        10% Critical
               Statistic           Value               Value              Value
------------------------------------------------------------------------------
 Z(t)          -31.818             -3.430              -2.860             -2.570
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

------------------------------------------------------------------------------
       D.R30 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         R30 |
         L1. |  -.8349672   .0262423   -31.82   0.000    -.8864453   -.7834892
             |
       _cons |   .0213764   .0233044     0.92   0.359    -.0243385    .0670914
------------------------------------------------------------------------------
```

In the above calculation, it can also be seen that the absolute value of test statistic is then the critical value at 1%, 5% and 10% significance. Also, the p value is significant at 5% level. In this case also the null hypothesis can be rejected justifying the existence of unit root (random walk characteristic) in the model.

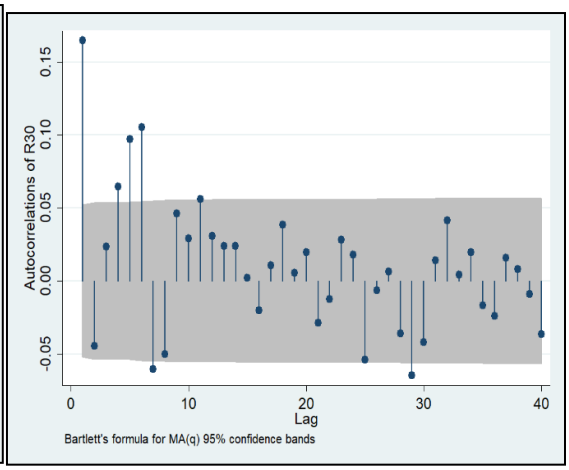
4.4 Auto-Correlation Function (ACF)

Seasonal patterns of time series can be examined via correlograms. ACF plot is a bar chart of the coefficients which depicts the correlation between the time series and lags of itself. At various lags ACF summarizes the correlation of a time series. For instance, the ACF for a time series X_t is given by: Corr(X_t, X_t−k).

Here, k is the time gap being considered, which is called the lag. A lag 1 auto-correlation is the correlation between values that are one time period apart meaning a lag k auto correlation is the correlation between values that are k time periods apart.



Autocorrelation of return of DSX

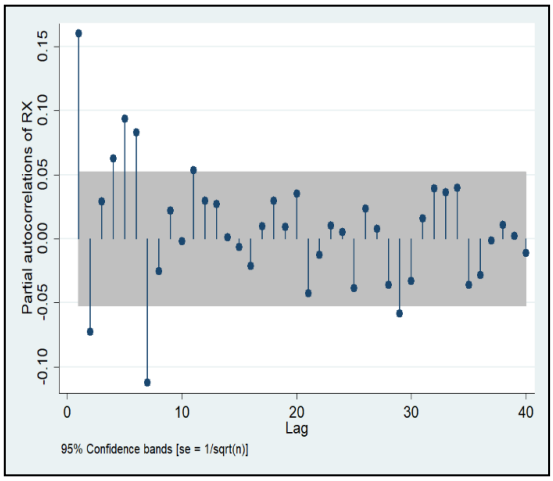


Autocorrelation of return of DSX

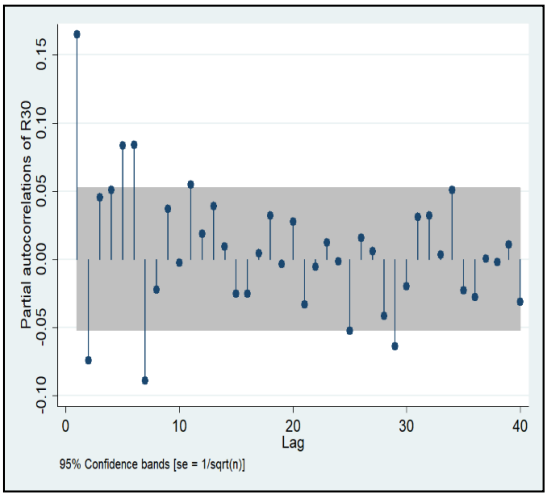
From the above plots, it can be seen that the variables – return of DS30 and return of DSEX are stationary since the ACF plot represents random pattern for different lags.

4.5 Partial Auto-Correlation Function (PACF)

Another useful method to examine serial dependencies is to examine the partial autocorrelation function (PACF). PACF is a method that works as an extension of autocorrelation function, where the dependence on the intermediate elements (those within the lag) is removed.



Partial Autocorrelation of return of DSX



Partial Autocorrelation of return of DS30

4.6 Variance Ratio Test

This test is used particularly in situations where the return series of stock prices are not normally distributed. This test examines the return series by comparing the variances among the data. It helps to determine whether previous data has influence over the current and coming share prices. Variance ratio test can calculate both homo-skedastic and heteroskedastic random walks, using the asymptotic normal distribution. Following hypothesis can be tested in variance ratio test:

Null Hypothesis, H_0: Return series follows a random walk

Alternate Hypothesis, H_1: Return series does not follow a random walk

	DSX		**DS30**	
	z-statistic	P value	z-statistic	P value
Lag 2	-18.8097	0.00	-18.8129	0.00
Lag 4	-15.08	0.00	-15.0794	0.00
Lag 8	-11.1254	0.00	-11.1249	0.00
Lag 16	-8.01157	0.00	-8.0111	0.00

(Appendix Tables 3 and 4)

Return series of both indices, DS30 and DSEX, are used to estimate both joint and individual variance ratio test statistics for different lags (2, 4, 8, and 16). The paper includes test for homo-skedastic random walks, using the asymptotic normal distribution (Lo & MacKinlay, 1988). In all the test output the significance value is less than 0.05, therefore, the null hypothesis can be rejected and alternative hypothesis can be accepted, which justifies that return series of indices DS30 and DSEX do not follow random walk.

5. Findings

From descriptive statistics of the two indices, it is initially inferred in this paper that DS30 has higher standard deviation compared to DSEX. According to the test results both the index return series, DS30 and DSEX, are found not normally distributed. Hence, the null hypothesis can be rejected, that is, data series is not normally distributed. The primary objective of this paper is to test the hypothesis, which is whether DSE follow a random walk or not. For this reason, both stationarity and randomness of the return series of both indices are examined. Initially, stationarity check is made by using two techniques Augmented Dickey Fuller (ADF) and Auto-correlation Function (ACF). In the results from the augmented dickey fuller test, it can be seen that both the return series are stationary, which suggest non-randomness in data. Autocorrelation Function test suggests, shown by correlogram, DS30 and DSEX are stationary. This paper also uses variance ratio test because this test is used when data series are not normally distributed. From the results of the variance ratio test, it can be justified that both the indices do not follow a random walk. This means, investors can predict the stock prices using trading strategies. So, it can be said that null hypothesis of the research paper is rejected and the alternate hypothesis is accepted that return from DSE does not follow a random walk.

6. Conclusion

From all the tests that have been conducted in this research paper, it can be said that according to the results found from both the indices, DS30 and DSEX representing DSE is not efficient in weak form. It means historical price of shares can influence the market participants. In weak form, the future market index movements are determined entirely by unexpected information and are random. But, market efficiency changes over time and capital market are subject to be tested continuously. Future researches in this area should investigate if the market inefficiencies of Dhaka Stock Exchange lead to profitable investment strategy for prudent investors. Recommendation for the government and regulatory body would be to induce more investment literacy programs for general investors. So that, investors do not rely on past movements of stock prices and rumors, rather, conduct investments based on new and market generated facts and information resulting from company performance and fundamental calculation. This will prevent market crashes from happening and it will also stabilize the market by preventing few investors earning above average return from investments.

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Appendix

Table 1. Summary of Descriptive Statistics (DSX)

RX

	Percentiles	Smallest		
1%	-1.889609	-6.515168		
5%	-1.166218	-4.957033		
10%	-.8312065	-4.469126	Obs	1416
25%	-.3746916	-3.889868	Sum of Wgt.	1416
50%	.034997		Mean	.0304144
		Largest	Std. Dev.	.8387579
75%	.4268548	4.01495		
90%	.8348508	4.131203	Variance	.7035148
95%	1.197014	5.596387	Skewness	1.121522
99%	2.213079	10.29454	Kurtosis	25.27137

Table 2. Summary of Descriptive Statistics (DSX)

R30

	Percentiles	Smallest		
1%	-1.935976	-6.194425		
5%	-1.236996	-5.115243		
10%	-.8713503	-4.872458	Obs	1416
25%	-.4057444	-4.143599	Sum of Wgt.	1416
50%	.018222		Mean	.0261547
		Largest	Std. Dev.	.8880879
75%	.4125872	4.367593		
90%	.8752331	5.734436	Variance	.7887001
95%	1.328902	5.855007	Skewness	1.110486
99%	2.464775	10.16927	Kurtosis	21.54481

Table 3. Variance Ratio Test on DSX

K	Lag 1	Lag 2	Lag 4	Lag 8	Lag 16
Varience	0.703515	0.703708	0.704282	0.706031	0.707511
VR		-0.49986	-0.74973	-0.87455	-0.93715
Varience of VR		0.000706	0.002472	0.006179	0.013683
std		0.026575	0.049717	0.078609	0.116974
z-stat		-18.8097	-15.08	-11.1254	-8.01157
p-value		0.00	0.00	0.00	0.00

Table 4. Variance Ratio Test on DS30

k	Lag 1	Lag 2	Lag 4	Lag 8	Lag 16
Varience	0.7887	0.7888	0.7897	0.7917	0.7939
VR		-0.4999	-0.7497	-0.8745	-0.9371
Varience of VR		0.0007	0.0025	0.0062	0.0137
std		0.0266	0.0497	0.0786	0.1170
z-stat		-18.8129	-15.0794	-11.1249	-8.0111
p value		0.00	0.00	0.00	0.00