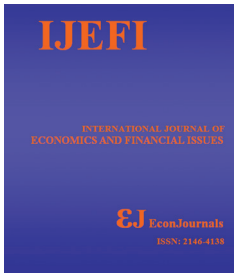

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Predicting the Stock Market Efficiency in Weak Form: A Study on Dhaka Stock Exchange

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ABSTRACT

This study aims to examine the efficiency of Dhaka Stock Exchange (DSE) in the weak form using random walk model of Efficient Market Hypothesis (EMH) based on daily return series. The study applies both non-parametric (Kolmogorov–Smirnov test with Lilliefors coefficient, run test) and parametric test (autocorrelation test, unit root test and variance ratio test) on DSE general index, DSE broad index (DSEX) and DSE30 index ranging from June 1, 2004, to March 18, 2018. The results of the study show that the normality test and unit root test reject the null hypothesis of randomness while the result of the run test shows that only the share prices of DSE30 index follow the random walk out of three indices. Besides, the return series of DSE broad index show some signs in favour of randomness by autocorrelation test and the returns of DSE general index support the efficiency concerning variance ratio test under both homoscedastic and heteroskedastic assumptions. The overall results of the study show inefficiency of DSE in the weak form which means the investor has a chance to make an abnormal profit predicting the historical data. This study also provides valuable insight to the shareholders, investors, the board of directors and regulatory bodies.

Keywords: Stock Market, Weak Form Efficiency, Stock market efficiency, Dhaka Stock Exchange, Efficient Market Hypothesis
JEL Classifications: E44, G2

1. INTRODUCTION

Since the stock market plays a crucial role in mobilising resources with capital formation, it is essential to the financial system of a country (Mamun et al., 2018). To allocate the capital through proper pricing, the efficiency of buying and selling of shares are significant on securities market (Islam and Khaled, 2005). However, the effectiveness in the stock market largely depends on the investment patterns; investor's behaviour has effects on risk appetite and practice, market structure, economy pattern etc. All other factors compared to past stock prices make the stock market more animated. In an efficient capital market, competition leads the market towards the fair value of stocks, debts and securities. Decent value in a market which is efficient implies that investors can receive their just worth for the securities they trade. Movements in the stock prices in an active market are unpredictable and the information is just entering the market is absorbed swiftly by the participants dealing in the market. For these reasons, they cannot make abnormal returns by outguessing the market.

The measurement of stock market efficiency in Bangladesh is crucial for many reasons. First, it has become a burning concern for the entities including individual, market contributors and market regulators dealing in the market. Second, stock market efficiency inclines the investor's strategy and policy of investment criteria. Moreover the information about the effectiveness of capital market verdicts the regulatory measures. Finally, it ensures the systematic development of capital market structure as well as the planning for sustainable financial improvements of a nation.

With growing the market capitalisation rapidly, the trading value of stocks reached at 15% regarding the nations GDP with USD 47 billion which is about 47% of the ratio of the market capitalisation to GDP in 2010. However, the scenario of the rapid growth had been disrupted by the downward phenomenon. At present, the size of market capitalisation stands at US$ 39.29 billion with 28% of

GDP. Dhaka Stock Exchange (DSE) has faced some structural modifications in line with formulating some policies in recent years. Therefore, investigating whether the DSE is efficient is essential to realise the latest amendment in policy formulations. Besides, it has gone through two bubble burst since its foundation. From which the first and second was in 1996 and 2010 respectively. While the market crashed for the second time in later part of 2010, the study observed that the reason for the crash was of the rapid rise in the index value without a fundamental change in company stage. Then the confidence of investors significantly reduced as a result of excessive speculation, apparently amassed by great asymmetrical undertakings. The reason behind the scene of the burst was the market inefficiency. In an inefficient market, some players predict the price of the security and manipulate the cost of the share for exploiting anomalous return. Since all new information demonstrates the market prices in an efficient market, the market participants cannot earn an excess profit. Hence, the knowledge of capital market efficiency is particularly imperative for market participants and market regulators.

This study applies different statistical tools to examine the level of efficiency of the Bangladesh stock market. If the efficiency of stock market exists then to what extent it is? It also is crucial to know the degree of efficiency because it enables the capital market to execute its dynamic role as well as assure investors about the fair value of returns. Therefore, this study tries to find out whether the stock market of Bangladesh is efficient especially in weak form. In the meantime, this present study contributes to the existing literature in several ways. First, the study explores the stock market behaviour and efficiency criteria. Second, the study investigates the efficiency of DSE in the weak form. Third, the study provides a valuable understanding of stakeholders, academics and policymakers about stock market investing criteria. Finally, it may also be helpful for national and international organisations and foreign governments who would like to know the growth of capital markets in emerging countries.

Following introduction with stylized facts of Bangladesh stock market is in the first section, the study deals with the literature review in part two. Data and methodology specified in section three deals with the tools which are used to examine the research. Consequently, resulting in analysis and findings in chapter four, and conclusion in part five have been discussed.

2. LITERATURE REVIEW

Generally, the earlier studies conducted the market efficiency in weak form taking into account the nature of correlations and low transaction cost (Cootner, 1962; Fama, 1965; Kendall and Hill, 1953; Working, 1934). Fama (1970) used the term efficiency at first and stated some conditions which are necessary for the market to be efficient. The conditions included the implication of current information: (1) No transaction costs is to be involved in trading the security, (2) the market participants will be able to access to all information easily at low cost, and (3) all the participants agree with the current price.

However, as in an efficient stock market, information is available; it is unpredictable to determine the future stock price. Such kind of unpredictability is called "random walk." The random walk model is central to efficient market hypothesis (EMH). Thus, the EMH and random walk theory tied together as the price changes occur due to the new information and the information enters randomly, so the random fluctuations in price also occurred similarly. In this case, it is difficult to make an abnormal profit with such details (Fama, 1995). Fama (1970) divided his study into three categories based on the nature of information and how quickly they are observed in prices: (1) "The weak-form EMH" (2) "semi-strong EMH" (3) "strong-form EMH". The market is to be called efficient in the weak form if the prices of security reflect the information which is available following historical data. In this case, investors can make an abnormal profit by using the trading rules based on historical information. Under the semi-strong form of efficiency, stock prices reflect all public information. In consequence, abnormal profits can only be earned by traders with access to nonpublic information. However, in this form, the market does not give the chance of making an excessive return to its participants as it quickly provides all the information. On the other hand, the market will be efficient in strong form, whenever the stock prices adequately reflect the knowledge of all sectors. The sources of information like the private sector, public sector as the well as the historical data is also included where the info especially access to the company insiders. As a result, no single investor can make an excess return.

The previous studies also showed that the prices changes are not predictable at randomness and the forecasting of future price was not possible by past changes particularly when the transactions costs are taken into consideration. Conversely, some other studies found that the possibility of price change is predictable in the developed market, but the studies did not conclude their argument about profitable trading rules (Fama and French, 1988; Poterba and Summers, 1988). Hudson et al. (1996). In U.K market, they found that technical rules of trading have analytical power where they are not able to generate an excess return. Similarly, Groenewold (1997) conducted his study in the Australian market and found that the past returns have command of forecasting, though the power of predictability is not stable regarding the return. The developed market shows no profitability of using the timeline of price based on empirical evidence which indicates the efficiency in the weak form. On the other hand, if we look forward to developing and less developed market, controversial results are observed. The problem of thin trading is one of the necessary sufferings in less developed markets; as well it is easier for the big player to influence a small market. In general, it is alleged that stock markets are less efficient, but the results of the empirical test do not entitle to the assumption. There are two groups of schools from the perspective of findings. The first one found the weak form efficiency in both developing, i.e. the Kuala Lumpur stock exchange, Nairobi Stock Exchange, Latin American economies and less developed economy (Barnes, 1986; Chan et al., 1992; Dickinson and Muragu, 1994; Ojah and Karemera, 1999). Sharma and Kennedy (1977) showed the weak form efficiency in the Bombay Stock Exchange in line with the London Stock Exchange and also the New York Stock Exchange. Conversely, the other school found the markets are not efficient in the weak form of developing and the less developed economy based on Korea and

Taiwan (Cheung et al., 1993). The study of Roux and Gilbertson (1978) showed the result of market inefficiency because of being non-randomness in stock price behaviour in Johannesburg Stock Exchange and Indian Stock Exchange. Several types of research have been conducted on DSE in previous years. Recent studies on market efficiency on DSE provide a definite result. Some results show that security returns of DSE follow a random walk, but the other finds the opposite conclusion. Consequently, some sorts of studies found a mixed effect. Most of the studies were concerned with the market efficiency regarding the weak form as it is the only form of efficiency to qualify in emerging market.

From previous research, some researchers support that DSE is efficient in the weak form (Hassan and Chowdhury, 2008; Uddin and Yasmin, 2008). On the other hand, some others studies concluded the weak form inefficiency of DSE (Alam et al., 2007; Basher et al., 2007; Mobarek et al., 2008; Uddin and Alam, 2010). For example, Mobarek et al. (2008) examined daily price indices of DSE from 1988 to 2000 find the index don't follow the randomness. Another study based on DSE returns over the period 2001–2013 applying the non-parametric test resulting in the existence of positive serial correlation that means it does not follow the random walk model as the well as not holding the weak form efficiency (Raquib and Alom, 2015). Results of the capital market efficiency are mixed in nature. Some researchers support the weak form efficiency (Abrosimova et al., 2002; Cheung and Andrew, 2001) while others are in favor of price predictability (Lee et al., 2001; Mollah et al., 2000; Nisar and Hanif, 2012; Smith et al., 2002).

The existing literature on market efficiency are more extensive and undoubtedly beyond the range of this study to survey carefully. This study focuses on the research regarding random walk theory with efficiency in the weak form in Bangladeshi economy. The researchers were also keen to justify the random walk hypothesis in the developing economy regarding measuring the weak form efficiency. To measure the efficiency, they consider either DSE general index (DSEG) or DSE broad index (DSEX), but none of them consider DSE30 index. Therefore, this study finds these three indices to measure the weak form efficiency of the stock market. The research is also concerned with the examination of random walk hypothesis or measuring the weak form efficiency in Bangladeshi economies, especially on the DSE.

3. METHODOLOGY, DATA SELECTION PROCEDURES AND SAMPLE SIZE

There are two stock markets in Bangladesh - one is DSE and another is "Chittagong Stock Exchange" (CSE). The study selects DSE to examine capital market efficiency since DSE is more significant than CSE in size and older from the establishment history. Initially, the sample comprised of DSEG, DSEX and DSE30 index from 1 June 2004 to 24 January 2013, 27 January 2013–31 December 2015 and 3 January 2016–29 March 2018 correspondingly. The number of the sample included is 2089 of DSEG, 702 of DSEX and 551of DSE30 index where all the data series are collected on the daily basis from the website of DSE (Basher et al., 2007). As the study covers the bearish and bullish period, it anticipates that it would provide the result in the more realistic degree of the efficiency of DSE.

3.1. Measurement Instruments

The study conducts both the parametric and non-parametric test to measure the efficiency of the stock market. According to EMH theory, a market can be efficient in three forms, but in an emerging market, the weak form is frequent and reliable to check the extent of efficiency. Therefore, the study emphasises on analysing the weak form efficiency of DSE.

3.2. Data Analysis Techniques

The study conducted the run test, autocorrelation test and also multiple variance ratio tests to check the weak form efficiency of DSE based on stock returns series of three different indices.

3.3. Kolmogorov-Smirnov (K-S) Goodness of Fit Test with Lilliefors Coefficient

This study applies K-S with Lilliefors coefficient test to check the normality of return series and randomness. The Shapiro-Wilk (S-W) statistic has also been considered to be more appropriate for testing normality over K-S test.

The hypothesis for normality test:

H_0: Follow normal distribution

H_1: Do not follow the normal distribution.

3.4. Unit Root Test

Unit root rest has been applied to check whether the data of stock market are stationary or non-stationary. Bouri et al. (2017) suggested that the unit root can be used to test any market efficiency, as it is inevitable to measure the market efficiency due to randomness in the security prices. Thus, unit root test is used to gauge whether the time series is stationary or not. The decision of rejecting the hypothesis and the data being non-stationary is based on test statistic and critical value (Mackinnon tabulated value). In this study, the study use Augmented Dickey-fuller test to test the unit root.

$$\Delta\rho it=a0+a1t+\rho0\rho it-1+\Sigma i=1\rho i\rho it-1+\in it$$

Where pit denotes the price for the i-the market at time t, $\Delta\rho it=\rho it+\rho it=1$ are coefficients to be estimated, t is the trend term, 1 is the estimated coefficient for the trend, 0 is the constant and $\in$ is white noise and ρ0 is used to determine the significance of the test with MacKinnon's critical values.

The hypothesis for stationary checking;

H_0: Non-stationary (having unit root) and support a random walk

H_1: Stationary (having no unit root) and do not support a random walk.

3.5. Runs Test

The run test, as a statistical tool, has been used in this study to check whether the return series runs randomly or not. Being a non-parametric test, it only considers the movements regarding signs as like positive and negative in a time series while ignoring the value in the absolute form. The analysis examines the changes of track in an entitled time series.

In the test, the number of observed runs is compared with the number of expected runs. If the observations are distributed randomly, and the null hypothesis is true, the calculation of the expected number of runs will be as follows:

$$\text{Expected runs } \left[E(R)\right] = \frac{2n1n2}{n1+n2}+1$$

The formula for calculating the standard error of expected runs SE(R) as follows:

$$\text{Standarderror[SE(R)]}=\sqrt{\frac{(2n1n2)(2n1n2\text{-}n)}{(n^2(n\text{-}1)}}$$

$$\text{Standard error [SE(R)]} = \frac{\sqrt{(2n1n2)(2n1n2-n}}{n^2(n-1)}$$

Z statistics is used to testing the randomness of a time series and the formula for calculation is as:

$$Z = \frac{R-E(R)}{SE(R)} \sim N(0,\ 1)$$

Where, E(R) = Number of expected runs;
n = Total observations;
n1 = Positive run;
n2 = Negative run;
R = Actual number of runs;
Z = Standard normal variate;
SE(R) = Standard error of the number of runs.

Hypotheses for testing the randomness by the run test are as follows:

H_0: The index series of stock follow the random walk
H_1: The index series of stock do not follow the random walk.

3.6. Serial Correlation Test

To identify the correlation in the time series of return and to check the independence of the return series of indexes, this study applies the serial correlation test. Furthermore, to test the series whether there is any joint autocorrelation between them, this study applies Box-L Jung Q statistics up to 20 lags. The corresponding coefficient value of autocorrelation up to a certain lag is consequently equal to zero which means the existence of joint autocorrelation. BL statistics is calculated as follows:

$$BL = n(n+2)\sum_{k=1}^{m}\frac{\hat{p}k^2}{n-k} \sim x^{2m}$$

Where, BL = Indicates the Chi-square distribution, n = Size of the sample, m = Degree of freedom and length of lag, *p*k = Serial correlation coefficient at lag k.

The hypothesis for serial correlation test as follows:

H_0: *p*k=0 (Efficient market)
H_1: *p*k≠0 (Inefficient market).

3.7. Variance Ratio Test

Variance ratio test has been used as a sophisticated method called in this study to analyse the EMH (Lo and MacKinlay, 1988). Considering a time series where its natural log is Yt which is entitled to the pure random walk, any movement in q differences leads to the variance of its q differences to grow correspondingly. The study further applies variance ratio test to test the existence of random walk considering two different criteria as homoscedastic and heteroskedastic with asymptotic distribution (Chow and Denning, 1993).

The hypothesis for variance ratio test:
VR=1 (Follow random walk)
VR 1 (Not follow a random trail).

4. RESULT ANALYSIS AND DISCUSSION

4.1. Test of Normality

The study conducted the normality test with the help of descriptive statistics and K-S Goodness of fit test. Table 1 represents the result of normality test.

From Table 1, since the result of mean, median and mode are not similar, the indices are generally not distributed as per symmetrical distribution. Therefore, the market return series follow a positively skewed distribution because of greater the value of mean that mode. The kurtosis value of 19.613 for DSEG exhibits extreme leptokurtic distribution, 1.825 and 1.476 for DSEX and DSE30 presents extreme platykurtic distribution while the perfect normal distribution demands zero for skewness value and three for kurtosis. So, skewness, leptokurtic and platykurtic frequency distribution of stock return series on the DSE rejects the null hypothesis. The study further justifies the normality by K-S Goodness of fit test with Lilliefors coefficient.

4.2. K-S Goodness of Fit Test with Lilliefors Coefficient

Table 2 shows the result of K-S statistic with a Lilliefors significance level for testing normality. Regarding K-S goodness

Table 1: Descriptive statistics

	DSE general index	DSEX	DSE30 index
n	2063	691	549
Mean	0.0000	0.0000	0.0000
Median	–0.1440	1.6785	0.4059
Mode	–849.23[a]	–154.93[a]	–45.83[a]
Standard deviation	78.07771	41.64528	10.68093
Variance	6096.129	1734.329	114.082
Skewness	–0.530	0.049	–0.033
Kurtosis	19.613	1.825	1.476
Minimum	–849.23	–154.93	–45.83
Maximum	630.93	213.87	37.05

[a]Multiple modes exist. DSEX:

Table 2: Tests of normality

	K-S[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
DSE general index	0.070	525	0.000	0.953	525	0.000
DSEX	0.039	525	0.053	0.991	525	0.003
DSE30 index	0.055	525	0.001	0.981	525	0.000

[a]Lilliefors significance correction. K-S: Kolmogorov-Smirnov

of fit test, the study perceives that the DSEX follows the normal distribution at 5% level of significance, but the other two indices do not follow the normal distribution. As the study mentioned earlier that the Shapiro-Wilk (S-W) statistic of normality is more appropriate over K-S statistic, the result shows the probability value of three indices is significant at 5% level which means the market returns series do not follow a normal distribution.

4.3. Unit Root Test

The study applies Augmented Dickey-Fuller test statistic to check the unit root of return series. In Table 3, the result shows that there is no unit root in return series. For DSE general index, as the value of ADF statistics is too smaller compared to the tabularized value of MacKinnon meaning the existence of no unit root. From Table 3, the study also shows that ADF test value is way too negative from the MacKinnon formulated value as the estimated value of ADF statistics is −34.4995 where the MacKinnon expressed amount is −2.86272. Besides, considering the p-value, it is also significant at 5% level of significance. Thus it can be concluded that the unit root test rejects the null hypothesis and data is stationary.

For DSEX, here as like the previous result the study also see that the value of ADF t-statistics is negative to exceed the formulated value of MacKinnon. The amount represented in the table is as follows: ADF test result is −24.0319 and the MacKinnon tabularized result is −2.86545 where the former is much smaller than the later one. As the p-value is significant at 5% level, the study rejects the null hypothesis; the data are stationary.

Finally, if the study gazes at the result of DSE30 Index, it also contains the similar result. For DSE30 Index the value of the ADF test statistic result is way too negative compared to the formulated value of MacKinnon. The value of ADF is −19.1049 and MacKinnon tabularized value is −2.86659. Likewise, significant p-value concluded that the data is stationary as there is unit root in return series by rejecting the null hypothesis.

4.4. Run Test

Table 4 representing the Z statistic as negative for each index indicates the actual number of runs is smaller significantly than the expected number of runs. However, in case of the DSE30 index, the Z value lies in ± 1.96 which means the actual number of runs is almost equal to the expected number of runs. Hence, a sign of randomness exists in the DSE30 index. The negative Z value also indicates the returns are positively auto-correlated. Besides, since the p-value of DSE general index and DSEX is <0.05, this significant result rejects the null hypothesis of randomness. On the other hand, the study perceives a different scenario regarding DSE30 index where the p-value is more significant than 0.05 which indicates the null hypothesis of randomness is accepted. As the randomness is rejected regarding DSE General and Broad index meaning that the prediction can be possible to make abnormal returns inversely the DSE30 index indicates the prediction is invalid.

Thus, the results are mixed from the Table 4. The study shows significance in the weak form in DSE general index and DSEX which means they do not follow a random walk and vice versa in case of the DSE30 index.

4.5. Autocorrelation Tests

The autocorrelation test has been applied to assess the efficiency of DSE in the weak form DSEG, DSEX and DSE30 Indices up to 20 lags. The result of these tests highlighted in table 5 found that return of DSE general index is correlated. Therefore, the returns of the index are not the independent and null hypothesis of the random walk is rejected in this studies. The non-zero nature of correlation also indicates the returns are correlated over the period that means the existence of autocorrelation in return series. In the case of DSEX Index, there are some indications of independence of return series that is the study cannot reject the null hypothesis for the lags l5, 16, 19 and 20 but most of the lags indicating the existence of autocorrelation that means the time series is not independent over the period. However, in case of

Table 3: Result of unit root test

	DSE general index	Probability*	DSE broad index	Probability*	DSE30 index	Probability*
	t-statistic		t-statistic		t-statistic	
Augmented Dickey–Fuller test statistic	−34.49953	0.000	−24.03194	0.000	−19.1049	0.000
Test critical values						
5% level	−2.862724		−2.865452		−2.866585	

*MacKinnon (1996) one-sided P values. DESX: Dhaka Stock exchange broad index

Table 4: Results of the run test

	DSE general index (DSEG)	DSEX	DSE30 Index (DS30)
Value of the test[a]	0.0000	0.0000	0.0000
Cases < test value	1034	337	265
Cases ≥ test value	1029	354	284
Total cases	2063	691	549
Number of runs	900	315	273
Expected number of runs	1031	345	274
Z	−5.836	−2.384	−0.186
Asymp. Sig. (2-tailed)	0.000	0.017	0.853
a. Mean value			

Table 5: Results of serial correlation test

	DSE general index			DSEX (broad) index			DSE30 index		
Lag	AC	Q-Stat	Prob	AC	Q-Stat	Prob	AC	Q-Stat	Prob
1	0.025	1.2753	0.259	0.094	6.2376	0.013	0.218	26.334	0.000
2	–0.078	14.135	0.001	0.038	7.2432	0.027	0.045	27.475	0.000
3	–0.035	16.7	0.001	0.062	9.9394	0.019	0.096	32.608	0.000
4	0.02	17.568	0.001	0.097	16.604	0.002	0.016	32.755	0.000
5	–0.016	18.124	0.003	0.068	19.912	0.001	0.004	32.766	0.000
6	–0.009	18.294	0.006	–0.011	19.998	0.003	–0.049	34.122	0.000
7	–0.014	18.712	0.009	–0.01	20.07	0.005	–0.093	38.972	0.000
8	0.054	24.851	0.002	0.006	20.093	0.01	–0.117	46.602	0.000
9	0.083	39.317	0.000	0.008	20.14	0.017	0.038	47.432	0.000
10	0.013	39.69	0.000	0.073	23.984	0.008	0.023	47.74	0.000
11	–0.043	43.577	0.000	0.002	23.988	0.013	–0.007	47.765	0.000
12	0.024	44.835	0.000	0.019	24.239	0.019	–0.003	47.769	0.000
13	–0.087	60.7	0.000	0.006	24.261	0.029	–0.023	48.062	0.000
14	0.014	61.114	0.000	–0.005	24.279	0.042	0.02	48.29	0.000
15	0.054	67.249	0.000	–0.011	24.371	0.059	0.068	50.891	0.000
16	0.041	70.718	0.000	–0.037	25.334	0.064	0.065	53.281	0.000
17	–0.025	72.065	0.000	–0.073	29.217	0.033	0.026	53.666	0.000
18	0.053	78.056	0.000	–0.004	29.226	0.046	–0.004	53.674	0.000
19	0	78.057	0.000	–0.009	29.288	0.062	0.052	55.239	0.000
20	–0.044	82.084	0.000	–0.023	29.679	0.075	0.015	55.365	0.000

Table 6: Result of variance test

Multiple variance ratio tests		
Indices	***Under the assumption of homoskedastic***	***Under the assumption of heteroscedastic***
DSE General Index		
z-statistic value	1.734806	0.566278
joint probability value	0.292	0.966
DSEX (Broad) Index		
z-statistic value	4.132009	3.403712
joint probability value	0.0001	0.0027
DSE30 Index		
z-statistic value	5.200098	4.617893
joint probability value	0.0000	0.0000

	DSE general index (DSEG)					
Period	Var. Ratio	Z (q)	Probability	Var. Ratio	Z (q*)	Probability
2	1.025673	1.173118	0.2407	1.025673	0.316807	0.7514
4	0.943768	−1.37347	0.1696	0.943768	−0.39523	0.6927
8	0.887697	−1.73481	0.0828	0.887697	−0.56628	0.5712
16	0.946133	−0.5592	0.576	0.946133	−0.19642	0.8443
	DSE broad index (DSEX)					
2	1.096567	2.55675	0.0106	1.096567	1.922695	0.0545
4	1.216627	3.065751	0.0022	1.216627	2.344534	0.0191
8	1.461418	4.129998	0.000	1.461418	3.268721	0.0011
16	1.686947	4.132009	0.000	1.686947	3.403712	0.0007
	DSE30 index (DSE30)					
2	1.204184	4.788551	0.000	1.204184	4.522015	0.000
4	1.414824	5.200098	0.000	1.414824	4.617893	0.000
8	1.569086	4.511854	0.000	1.569086	3.849162	0.0001
16	1.511405	2.724741	0.0064	1.511405	2.309228	0.0209

DSE 30 index rejects the null hypothesis of randomness for all lags at 5% significant level.

The study further applies Q-statistics to conduct autocorrelation coefficient tests up to 20 lags. This Q-statistics test the joint hypothesis of correlation and show DSEG, and DSE30 indices are jointly correlated up to all 20 lags. However, the p-value of DSEX is partly significant and partly insignificant which means the returns of DESX have not correlated up to 20 lags.

4.6. Variance Ratio Test

The study further applies the variance ratio test considering the intervals of (q) 2, 4, 8, 16 observations to examine the null hypothesis of random walk under homoskedastic and heteroskedastic. The results shown in Table 6 examine both the multiple variance ratio and individual tests.

Here, the study mainly focused on the result of multiple variance ratio tests as it provides the common probability value which is

considered as more reliable. The effect of variance ratio test of DSE general index based on daily return shows insignificant for all q's of individual analysis which indicates the stocks follows the random walk under both homoskedastic and heteroskedastic assumption. The study also suggests that the value of the joint hypothesis of both homoskedastic and heteroskedastic conjecture is more extensive than 0.05 and the value of variance ratio is significantly close to one which is consistent with the individual test. Thus the study cannot reject the null hypothesis. On the contrary to the results of DSEX Index shows significant for all the values of q except q=2 under both the homoskedastic and heteroskedastic assumption. Therefore, the index does not follow the random walk. Besides, the study also rejects the result of joint hypothesis, as the values of random walk lie between 1.96. The DSE30 index also shows the similar results alike DSEX.

5. CONCLUSION

From the findings of the study, it can be said that the stock market of Bangladesh is not efficient in the weak form which means the investors have the chance to make an abnormal profit using the historical data. Since the result of normality test implies that return series of DSE are not normally distributed and stationary shown in ADF statistics, the DSE does not follow the random walk. Though the return of DSE30 index covering the data ranging from 3 January 2016 to 29 March 2018 shows that the returns series follow the random walk by run test, the other tests do not support the result. Nevertheless, some sign of efficiency is observed in DSEX index regarding autocorrelation test with some specific lags and DSEG index by variance ratio test. Since all the test results are not associated with each other, the study can conclude that the DSE is not efficient in the weak form. Accordingly, the study concludes that the stock market is not functioning well as it does not respond to new information that means it delays to captivate the available public information.

The main reason behind the market not functioning well is the failure to discharge the latest information by the partakers of the stock market in due time. Since the result shows the DSE inefficient in the weak form, the investors would be benefited predicting the historical prices. Therefore, the large investors have the chance to make the abnormal profit by manipulating their trade in a systematic way. From the findings, however, the study recommends that a possibility of technical analysis extends the latitude of pledging the process for safeguarding the market efficiency by the market regulators. Because of advanced technology, improved and controlled system and publication of regular business journals, the absorption of information of price forming or any other good or bad news make a late effect on stock prices. Therefore, the above factors should be highlighted before denouncing in a market which is not efficient. The study has some limitations. First, the study conducts with limited coverage of data due to time constraint. Second, the study considers only secondary data, primary data including the opinion stakeholders, practitioners and researchers can be used. Then, the study should have used more statistical techniques to measure stock market efficiency more accurately. Despite these limitations, this study provides valuable insight to the shareholders, investors, the board of directors and regulatory bodies. This study also provides a useful insight to the shareholders, investors, the board of directors and regulatory agencies. The authority should formulate proper policies and make the plan to emphasise on timely disclosure of financial data for developing the operations of Bangladesh stock market. Furthermore, the policymakers should have policies and guidelines to conduct and control the Bangladeshi and multinational companies effectively who buy shares and bonds in the stock market. Although the DSE diverges from the weak form efficiency, it will not be wise decisions to label the stock market as an inefficient because the market efficiency is randomly changed from time. Therefore, the stock market efficiency should be tested continuously.

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