Testing on Weak Form Market Efficiency Hypothesis: The Evidence from Dhaka Stock Market Year 2004-2012

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Abstract: The purpose of this study is to test The Weak Form Efficient Market Hypothesis in Dhaka's Stock Market. The study examined the distribution of equity returns by dividing the sample period into two sub periods of daily DSE General Index (DGEN) and sub periods are sample-1(2004-2007), and sample-2 (2008-2012). Also, monthly general index starting from 1990 to 2012 are taken as sample to test the Random walk model (RWM) and market efficiency. The sample included total 1099 daily observations for sample-1, 1189 for sample-2 and 20 for each month return. Return distributions are studied by comparing the descriptive statistics of the Dhaka Stock Exchange Index (DGEN). The five conventional ways: Descriptive statistics, Kolmogrov Smirnov goodness of fit test (K-S test) autocorrelation, run test and Technical trading rules are used to prove the evidences of weak form market efficiency. The result shows the existence of capital market enables company to obtain an alternative source of fund. On the other hands, it gives flexibility for investor to choose investment based on their preference. For both company and investor who are involved in the capital market, understanding about capital market condition becomes matter in order to understand how the market is actually works. One aspect of capital market conditions that might become consideration before deciding to invest is the market efficiency. The term of market efficiency, which is found in the capital market literature, is used to elaborate the relationship between the information and the share price. Fama [1] first defined the term "efficient market" in financial literature in 1965 as one in which security prices fully reflect all available information. The market is efficient if the reaction of market prices to new information should be instantaneous and unbiased. Efficient market hypothesis is the idea that information is quickly and efficiently incorporated into asset prices at any point in time, so that old information cannot be used to foretell future price movements. EMH is one of the well-known methods for measuring the future value of stock prices. Depending on the meaning of “all available information”, the market efficiency is distinguished into three categories, the weak-form, the semi strong-form and the strong form. The testing on Weak Form of Efficient Market Hypothesis focuses on the study to prove the existence of return predictability. The theory states that if the market is efficient in a weak form, future share price will not be able to be predicted by the series of historical share price. For that reason, the use of technical analysis will be violated. The purpose of the study is to test of week form market efficiency hypothesis of Dhaka stock exchange (DSE).

Keywords: Efficient market, Random walk model, Autocorrelation, Run test, Dhaka stock exchange.
the RWM hypothesis is also rejected for the equity markets of Hong Kong, Singapore, and Thailand. Regarding to the scenario of Pakistan, Hasan, Abdullah and Shah [10] examined the weak-form market efficiency of Karachi Stock Exchange (KSE). The results reveal that prices behavior is not supporting random walks and hence these are not weak form efficient. In DSE, there are few studies have been conducted for market efficiency. Hassan et al. [11] studied on time-varying risk return relationship for Bangladesh by utilizing a unique data set of daily stock prices and returns. He found that DSE equity returns held positive skewness, excess kurtosis and deviation from normality and the returns displayed significant serial correlation, implying the stock market is efficient. Mobarek and Keasey [12] investigate that Dhaka Stock Exchange does not follow random walk model and there are significant autocorrelation at different lag causes to DSE is not week form efficient. Kader and Rahman [13] have no evidence that Dhaka Stock Exchange is week form efficient by testing whether any technical trading strategy yielded abnormal profit or not by using technical trading rule. Islam et al [14] analyzed on the predictability of the share price in Dhaka Stock Exchange prior to the boom in 1996 and tests found evidence in favors of short-term predictability of share prices in the Dhaka stock market prior to the 1996 boom, but not during the post-crash period. Uddin and Yasmin [15] seeks evidence supporting the existence of market efficiency in the Dhaka stock exchange (DSE). The sample includes the daily price indices of all securities listed on the DSE for the period from January 01, 1994 to March 22, 2007. Hassan, Islam and Bashar [16] empirically examines the issue of market efficiency and the study utilizes a unique data set of daily stock prices and returns compiled by the authors which was not utilized in any previous study. The Dhaka Stock Exchange (DSE) equity returns show positive skewness, excess kurtosis and deviation from normality. The returns display significant serial correlation, implying stock market inefficiency. No doubt that there are number of studies on the efficient market hypothesis to test the randomness of stock prices but still there are enough gaps in the study regarding to test the random walk of equity market indices regarding emerging markets in present era. Therefore the emerging and less developed market, Dhaka Stock Exchange (DSE) has been selected to test the market efficiency hypothesis.

3. Methodology

The study examined the distribution of equity returns by dividing the sample period into two sub periods of daily DSE General Index (DGEN) and sub periods are sample-1(2004-2007), and sample-2 (2008-2012). Also, monthly general index starting from 1990 to 2012 are taken as sample to test the Random walk model (RWM) and market efficiency. The sample included total 1099 daily observations for sample-1, 1189 for sample-2 and 20 for each month return. Return distributions are studied by comparing the descriptive statistics of the Dhaka Stock Exchange Index (DGEN). Market efficiency is examined with reference to the structure of autocorrelation. Moving average and run test of returns. Market returns are computed as follows;

\[ R_t = \ln \left( \frac{P_t}{P_{t-1}} \right) \]

\[ P_t = \text{Market Price at time} \ t \]

\[ P_{t-1} = \text{Market Price at time} \ t-1 \]

4. Empirical Result

The hypothesis of the study and the empirical results of individual tests on weak form efficiency are described in following two parts:

5. Hypothesis

The study seeks evidence whether the Dhaka Stock market follows random walk model and market is weak form efficient or inefficient.

H0: The Dhaka stock market follows random walk model and efficient in week form.

H1: The Dhaka stock market is inefficient in weak form.

6. Empirical Result and Discussion

The empirical results are classified in accordance with the different statistical techniques used. The findings of individual statistical techniques are discussed in each subsection below:

6.1 Descriptive Statistics

One of the basic assumptions of random walk model is that the distribution of the return series should be normal. In order to test the distribution of the return series, the descriptive statistics of the daily market returns for the two sub samples and monthly return are calculated and presented on the table I, II and III.

Tables present a summary of descriptive statistics of the daily returns for the DSE general indices of two subsamples. Sample means, maximums, minimums, standard deviations, skewness, kurtosis of two subsamples are shown on table-I and II. From the table I and II it can be seen that the frequency distribution of the return series is normal. Generally, values for skewness zero and kurtosis value 3 represents that the observed distribution is perfectly normally distributed. Where, both two subsamples have nonzero skewness and more than kurtosis of three. So skewness and leptokurtic frequency distribution of stock return series on the DSE indicates that the distribution is not normal. In other words, the non-normal frequency distributions of the stock return series deviate from the prior condition of random walk model and reject the Null hypothesis. So, the DSE return is not efficient even though at weak form.
Table 1: Descriptive Statistics of sample-1

<table>
<thead>
<tr>
<th>Statistic</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>% return of</td>
<td>1099</td>
<td>5.93</td>
<td>0.0685</td>
<td>0.99107</td>
<td>-0.259</td>
<td>0.074</td>
<td>8.007</td>
</tr>
<tr>
<td>Sample 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valid N (listwise)</td>
<td>1099</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Descriptive Statistics of sample-2

<table>
<thead>
<tr>
<th>Statistic</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>% return of</td>
<td>1189</td>
<td>-6.72</td>
<td>0.1439</td>
<td>1.36304</td>
<td>3.732</td>
<td>0.071</td>
<td>62.342</td>
</tr>
<tr>
<td>Sample 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valid N (listwise)</td>
<td>1189</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Descriptive Statistics of monthly return

<table>
<thead>
<tr>
<th>Statistic</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>January % return</td>
<td>20</td>
<td>-14.69</td>
<td>42.99</td>
<td>0.4996</td>
<td>12.19224</td>
<td>2.52</td>
<td>7.749</td>
</tr>
<tr>
<td>February %</td>
<td>21</td>
<td>-13.24</td>
<td>3.6</td>
<td>-1.5843</td>
<td>3.9786</td>
<td>-1.387</td>
<td>2.436</td>
</tr>
<tr>
<td>March % return</td>
<td>21</td>
<td>-32.25</td>
<td>38.17</td>
<td>-0.5678</td>
<td>12.27573</td>
<td>0.69</td>
<td>6.353</td>
</tr>
<tr>
<td>April % return</td>
<td>21</td>
<td>-19.87</td>
<td>14.2</td>
<td>-1.9161</td>
<td>7.92101</td>
<td>-0.563</td>
<td>0.65</td>
</tr>
<tr>
<td>May % return</td>
<td>21</td>
<td>-8.22</td>
<td>27.07</td>
<td>4.0782</td>
<td>8.28127</td>
<td>1.099</td>
<td>1.715</td>
</tr>
<tr>
<td>June % return</td>
<td>21</td>
<td>-8.64</td>
<td>28.53</td>
<td>5.1331</td>
<td>8.71234</td>
<td>0.683</td>
<td>1.248</td>
</tr>
<tr>
<td>July % return</td>
<td>21</td>
<td>-12.45</td>
<td>20.55</td>
<td>-0.2154</td>
<td>8.4299</td>
<td>0.898</td>
<td>0.573</td>
</tr>
<tr>
<td>August % return</td>
<td>21</td>
<td>-15.34</td>
<td>17.39</td>
<td>1.1976</td>
<td>7.09443</td>
<td>-0.046</td>
<td>1.448</td>
</tr>
<tr>
<td>September %</td>
<td>21</td>
<td>-5.71</td>
<td>38.8</td>
<td>4.1068</td>
<td>9.17128</td>
<td>2.901</td>
<td>10.599</td>
</tr>
<tr>
<td>October % return</td>
<td>21</td>
<td>-10.67</td>
<td>76.68</td>
<td>5.9926</td>
<td>17.22305</td>
<td>3.721</td>
<td>15.755</td>
</tr>
<tr>
<td>November %</td>
<td>21</td>
<td>-16.59</td>
<td>30.22</td>
<td>2.4983</td>
<td>11.3969</td>
<td>0.898</td>
<td>1.031</td>
</tr>
<tr>
<td>December %</td>
<td>21</td>
<td>-24.95</td>
<td>13.22</td>
<td>0.046</td>
<td>7.10476</td>
<td>-2.015</td>
<td>7.776</td>
</tr>
</tbody>
</table>
Table III, presents the descriptive statistics for the entire period of 1990 to 2012 and each month. Returns for the months of February, March, April and July are negative and the rest of the months have positive mean returns. The maximum average return occurs in the month of October and minimum average returns result in the month of March. Returns show negative skewness for four months and positive skewness for eight months and none of this has zero skewness. Five months have kurtosis >3, meaning leptokurtic distribution. That means flatter tails than the normal distribution. The return series for the entire period show high dispersion, and it is leptokurtic and skewness is positive. In April, June, July, August and November have very low skewness and kurtoses are also less than 3. So, these four month have a normally distribution which is less significant in terms of others month. So, overall statistics implies that returns are not normally distributed and do not follow the random walk model.

B. Kolmogrov Smirnov goodness of fit test (K-S test)

Kolmogrov Smirnov Goodness of fit test (K-S test) is a non-parametric test and is used to determine how well a random sample of data fits a particular distribution. Smirnov Goodness of Fitness Kolmogrov test (K-S test) provides evidence whether the distribution conforms to a normal distribution or not. Results from the table (K-S test), shows a 0.000 significance for the both sample-1 and sample-2 of the Z, clearly indicates that the frequency distribution of the daily price indices of Dhaka Stock Exchange does not fit by normal distribution. So, it rejects the Null hypothesis and does not follow random walk model according to the K-S tests.

![Correlations of Sample-1](image)

![Correlations of Sample-2](image)

C. Auto Correlation

The study use exact maximum likelihood auto- correlation techniques in time series analysis to examine if there is non-zero significant relationship exist between current return series with the first and second lag values of itself. The coefficient significantly different from zero indicates the predictability of share return from the past information. The

![Correlations of Sample-1](image)

![Correlations of Sample-2](image)
D. Run test

Runs test is defined as the series of consecutive price changes with the identical sign. The Ho, (Null hypothesis) elucidates that the succeeding price changes are not dependent and moves randomly. The number of runs is computed as a sequence of the price changes of the same sign (such as; +++, --, 0 0). When the expected number of run is significantly different from the observed number of runs, the test reject the null hypothesis that the daily returns are random. The run test converts the total number of runs into a Z statistic. For large samples the Z statistics gives the probability of difference between the actual and expected number of runs. The Z value is greater than or equal to -1.96, reject the null hypothesis at 5% level of significance.

As it can be seen from the table that the Z statistics of daily market return is greater than -1.96 and negative for both the subsamples, which means that the observed number of runs is fewer than the expected number of runs with observed significance level. So, for the both sub samples run test reject the Null hypothesis. However the run tests of monthly return are within 1.96 for all cases and significantly accept the null hypothesis and follow random walk model.

E. Technical Trading Rules:

Technical trading rules are the technical analysis, by which investors can beat the market if the market is inefficient in weak form. Moving average is one of the widely used indicators of this technical analysis.
has shown. In this study, all tests significantly show DSE daily market returns do not follow random walk model and inefficient at weak form. So technical analysis including moving average technique can be useful to earn extra money and beat the DSE

<table>
<thead>
<tr>
<th>Sample-1</th>
<th>50 days moving average</th>
<th>100 days moving average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Series or Sequence Length</td>
<td>1181</td>
<td>1181</td>
</tr>
<tr>
<td>Number of Missing in User-Missing</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Values in the Plot System-Missing</td>
<td>131</td>
<td>181</td>
</tr>
</tbody>
</table>

A.2 Kolmogrov Smirnog goodness of fit test (K-S test)
Kolmogrov Smirnov Goodness of fit test (K-S test) is a non-parametric test and provides evidence whether the distribution confirms to a normal distribution or not. Results from the (K-S test), shows a 0.000 significance for the both sample-1 and sample-2 of the Z, clearly indicates that the frequency distribution of the daily price indices of Dhaka Stock Exchange does not fit by normal distribution. So, it rejects the Null hypothesis and market is not efficient at weak form.

A.3 Auto Correlation
The result shows a significant coefficient of correlation (.147) different from zero during the sample period 2004 to 2007. The coefficient of correlation is significant at 1% level of significance prove that the series are not independent and the market is not weak form efficient. The result does not differ significantly when we assess sub sample-2 of 2008 to 2012 which coefficient (.055) also, different from zero. Positive autocorrelation of both sub samples refers that the current returns has some dependence over past return and reject null hypothesis. So, there is no evidence that market is efficient at weak form according to this autocorrelation.

A.4 Run test
The run test converts the total number of runs into a Z statistic. The Z value is greater than or equal to -1.96, reject the null hypothesis at 5% level of significance. As it can be seen from the run test that the Z statistics of daily market return is greater than -1.96 and negative for both the sub samples, which means that the observed number of runs is fewer than the expected number of runs with observed significance level. So, for the both sub samples run test reject the Null hypothesis. However the run tests of monthly return are within 1.96 for all cases and significantly accept the null hypothesis and refers monthly return are efficient at weak form.

8. Conclusion
The overall findings in this study suggest that during the observation period provide evidences to reject the research’s hypothesis. Studies from this field of economy have made an important contribution to the understanding of the stock market, although the present state of understanding of the issue especially in the emerging financial markets is far from being conclusive. This study focuses only the tests of weak-form efficiency. By applying descriptive statistics, K-S test, Auto Correlation and Technical trading rules tests provides that daily return of Dhaka stock market is not weak form efficient and strongly rejects the null hypothesis. Dhaka stock market analysis shows that this market is rather...
inefficient. Hence it is concluded that the investors may get the stream of arbitrage benefits due to market inefficiency belonging to this capital market. However, the run test of monthly return of Dhaka Stock market accept the Null hypothesis significantly and shows efficient at weak form. So, it is generally assume that the emerging markets are less efficient than the developed market and Dhaka Stock market also, inefficient but not conclusive and further research need to be conducted to find out the underlying reason.

References


Author Profile

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