Tests of Weak-form Market Efficiency of Dhaka Stock Exchange: 
Evidence from Bank Sector of Bangladesh

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ABSTRACT

This paper uses Random walk hypothesis to test market efficiency in the Dhaka Stock Exchange Ltd (DSE).In this paper; with Runs test, Dickey-Fuller Unit root test processed and analyzed the behavior of daily return of Dhaka Stock Market indices during the past 11 years. The sample includes the daily price indices of all securities listed on the DSE general, DSI (All Share), DSE top 20 indices, and Daily indices listed in the market. As a proxy of movement of individual stock prices, daily closing prices of 30 companies operating in the Bank sector has been analyzed. The results provide evidence that DSE does not follow the random walk model and so the Dhaka stock exchange (DSE) is not efficient even in weak form. To improve the capital market, the timely disclosure and dissemination of information to the shareholders and investors on the performance of the listed companies should be emphasized.

Keywords: Efficient Market Hypothesis (EMH), Random walk model, Dhaka Stock Exchange (DSE).

INTRODUCTION

1.1: Introduction to the topic

Market efficiency and Random walk are two financial conceptions with rather closed relationship. They have been two hot subjects since 60th in the last century. Until now there still exist many different standpoints to the theories. With regard to the market efficiency theory, there are different viewpoints about whether or not a market can be called to be efficient or inefficient and how to test and judge the market efficiency characteristics. Usually this is the so called Efficient Market Hypothesis problems. Though this hypothesis has never been truly certified since the conception comes out, many modern theories and studies are developed based on this conception. Market efficiency has been the central conception of the financial markets. Efficient Market Hypothesis (EMH) is the idea that market prices incorporate all information rationally and instantaneously. The term Efficient Market Hypothesis (EMH) can be explained by a model, namely Fair game model. According to fair game model, in an efficient market, on an average there is no difference between actual price changes and expected price changes. Algebraically, Fair game model is as follows:

\[ e_{j,t+1} = \frac{P_{j,t+1} - P_{j,t}}{P_{j,t}} - \frac{E(P_{j,t+1}/info_{j,t})}{P_{j,t}} \]

Where, \( P_{j,t+1} \) = the actual price of security \( j \) in the next period. \( P_{j,t} \) = the price of security \( j \) this period. \( E(P_{j,t+1}/info_{j,t}) \) =The predicted or expected security
price next period, given a current amount of information, \( \text{info}_{j,t} \). \( e_{j,t+1} = \text{the difference between the actual and predicted returns.} \)

This model can be expressed in return form as follows: \( e_{j,t+1} = r_{j,t+1} - E (r_{j,t+1}/\text{info}_{j,t}) \)

The fair game model says that, on average, across a large number of observations, the expected return on an asset, given an information set, \( \text{info}_t \), will equal its actual return. If we take the expectation of the above model, the price pattern will be a fair game if the expected difference between the actual and predicted returns is equal to zero.

\[ E (e_{j,t+1}) = E [r_{j,t+1} - E (r_{j,t+1}/\text{info}_{j,t})] \] The stock market is a fair game if expected price increases, given available information, are on average, equal to actual price increases.

There are three forms of stock market efficiency - the weak form, the semi strong form and the strong form. The weak form of market efficiency uses information based on historical or past prices. The weak form of market efficiency, the price of a security reflects all the available information about the economy, the market and the specific security, and that prices adjust immediately to new information. Therefore, technical analysis cannot be used to beat the market. Theoretical in nature weak form efficiency advocates assert that fundamental analysis can be used to identify stocks that are undervalued and overvalued, hence keen investors looking for profitable companies can earn profits by researching in financial statements. In the weak form of EMH, past values of the index cannot be used to forecast the current values and it can be tested by unit root test i.e. if the index is I (1) it means that the market is efficient in the weak form. Algebraically Hatemi-j (2002) defined weak form of efficiencies as follows:

\[ \Pr (p_t = \theta | p_{t-1}, p_{t-2}, \ldots) = \Pr (p_t = \theta)(1) \] On the right hand side of the equation there is an unconditional probability that the price today \( p_t \) equals \( \theta \). The left hand side in the above equation defines that the price today is conditional on past prices \( p_{t-1}, p_{t-2}, \ldots \).

To the random walk theory, The Random Walk (RW) model, one of the earliest models proposed for stock price behavior, which states that future stock prices cannot be predicted based on past price movements. The model implies that investment strategies based on past information will not necessarily yield higher returns than a portfolio consisting of randomly picked stocks. The more efficient a market is the more random and unpredictable the market returns would be. In the most efficient market the future prices will be random and the prices formation can be assumed to be a stochastic process with mean in price change equal to zero. The discussions are usually related to the market efficiency problems. The two are usually tied together in the studies such as on the following points: whether or not the random walk characteristic is the own property of an efficient market or else the random walk characteristic exists in none kinds of markets which include efficient market, less efficient and not efficient markets. If random walk characteristic exists in anyone kind of markets, then it will be very contradictory for the actions done by the investors on the security markets which has the following interesting phenomenon: On the one side all the investors in security markets hope to forecast the future well in order to get more and more profit while on the other side, random walk theory said it is impossible for one to forecast future security price correctly because the price movements of the securities are changing randomly in one day and the next day. Obviously we can say this contradiction exists in all the markets that once the markets conform to random walk characteristics.

1.2: Introduction to the Dhaka Stock Exchange (DSE)

Dhaka Stock Exchange has been the subject of significant changes in recent periods. DSE has also taken significant steps towards the development of its capital market. The stock market is one of the most important sources for companies to raise money. This allows businesses to be publicly traded, or raise additional capital for expansion by selling shares of ownership of the company in a public market. The liquidity that an exchange provides affords investors the ability to quickly and easily sell securities. This is an attractive feature of investing in stocks, compared to other less liquid investments. History has shown that the price of shares and
other assets is an important part of the dynamics of economic activity, and can influence or be an indicator of social mood. Rising share prices, for instance, tend to be associated with increased business investment and vice versa. Measures have taken for privatization, Economic liberalization, and relaxation of foreign exchange controls and easing of regulations on profit repatriations.

The capital market plays various roles in an economy. It acts as an intermediary between surplus units and deficit units of the economy and facilitates savings into investments. By also providing liquidity of these investments, the capital market ensures optimum allocation of resources. The term efficiency is used to explain a market in which relevant information is impounded into the price of financial assets.

2. LITERATURE REVIEW

During the past half a century, there are many articles and papers examined the random walk characteristics in all kinds of markets. The results of the enormous studies and what the viewpoints they hold after the tests are very different and various. In 2002, Robert T. Kleiman, James E. Payne and Anandi P. Sahu published their article named Random walk and market efficiency: Evidence from International Real Estate Markets. In their paper, they used the Augmented Dickey-Fuller Unit root test to test the Real estate stock market indices and got the conclusion which demonstrates that both in real estate and broader stock markets in Europe, Asia and North America exhibit random walk behavior. They said that even in the less or not efficient markets like China, it also may perform to be random walk characteristic. That is random walk exit in all kinds of markets—at least in real estate stock markets and the stock markets in Europe, Asia and America are co-integrated in the long run. However many recent studies provided through the ability of computers show that certain predictions are possible. This word means even in efficient markets, it is not the completely random walk characteristic, not even less and not efficient markets. So random walk characteristic does not exist in any kinds of market efficiency.

A fundamental question concerning capital markets is their efficiency. The term efficiency is important in the area of finance and economics. The findings from the empirical testing of the efficient market hypothesis (i.e., random walk) with stock prices have been mixed. According to Samuelson (1965) and Fama (1970), under the ‘efficient market hypothesis’ (EMH), stock market prices must always show a full reflection of all available and relevant information and should follow a random walk process. Fama (1965), the most comprehensive study on the issue, claims to have found strong and voluminous evidence in support of the Random Walk hypothesis.

The early studies on testing weak form efficiency started on the developed market, generally agree with the support of weak-form efficiency of the market considering a low degree of serial correlation and transaction cost (Working, 1934; Kendall, 1943, 1953; Cootner, 1962; Osborne, 1962; Fama, 1965). All of the studies support the proposition that price changes are random and past changes were not useful in forecasting future price changes particularly after transaction costs were taken into account. However, there are some studies which found the predictability of share price changes (for example, Fama and French, 1988; Poterba and Summers, 1988) in developed markets but they did not reach to a conclusion about profitable trading rules. Poterba and Summers (1988) suggest that noise trading, trading by investors whose demand for shares is determined by factors other than their expected returns provides a plausible explanation for the transitory component in stock prices. And they suggest constructing and testing theories of noise trading as well as theories of changing risk factors could account for the characteristics of stock returns auto-correlogram they found. Fama and French (1988) conclude that auto-correlation’s may reflect market inefficiency or time-varying equilibrium expected returns generated by rational investor behaviour and neither view suggests, however, the patterns of auto-correlation should be stable for a long sample period. Hudson, Dempsey and Keasey (1994) found that the technical trading rules have predictive power but not sufficient to enable excess return in U.K market. Similarly, Nicolaas, (1997) also conclude that past returns have predictive power in Australian market but the degree of predictability of return is not so high. Overall, the empirical studies on developed market show no profitability from using past records of price series supports the weak-form efficiency of the EMH in general.
On the other hand, the research findings of weak-form efficiency on the market of developing and less developed markets are controversial. Most of the less developed market suffers with the problem of thin trading. In addition, in smaller markets, it is easier for large traders to manipulate the market. Though it is generally believe that the emerging markets are less efficient, the empirical evidence does not always support the thought. There are two groups of findings; the first group find weak-form efficiency in developing and less developed markets are Branes, 1986, (on the Kuala Lumpur Stock Exchange); Chan, Gup and Pan, 1992, (in major Asian markets); Dickinson and Muragu, 1994 (on the Nairobi Stock Exchange) and Ojah and Karemera 1999, (on the four Latin American countries market) despite the problems of thin trading. On the other hand, the latter group, who evidence that the market of developing and less developed markets are not efficient in weak-sense are Cheung, Wong and Ho, (1993), on the stock market of Korea and Taiwan; in a world bank study by Claessens, Dasgupta and Glen (1995), report significant serial correlation in equity returns from 19 emerging markets and suggest that stock prices in emerging markets violates weak form EMH; similar findings are reported by Harvey (1994) for most emerging markets. Nourrenrindle Kababa (1998) has examined the behaviour of stock price in the Saudi Financial market seeking evidence that for weak-form efficiency and find that the market is not weak-form efficient. He explained that the inefficiency might be due to delay in operations and high transaction cost, thinness of trading and illiquidity in the market. Roux and Gilberson (1978) and Poshakwale S. (1996) find the evidence of non-randomness stock price behaviour and the market inefficiency (not weak-form efficient) on the Johannesbourg stock Exchange and on the Indian market.

In DSE, there are few studies have been conducted for market efficiency. Hassan (1999) 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 inefficient. Mobarec (2000) investigate that Dhaka Stock Exchange does not follow random walk model and there are significant autocorrelation at different lag causes to DSE is not weak form efficient. Kader (2005) has no evidence that Dhaka Stock Exchange is weak form efficient by testingwhether any technical trading strategy yielded abnormal profit or not by using technical trading rule (K% filter rule). Islam (2005) analyzed on the predictability of the share price in Dhaka Stock Exchange prior to the boom in 1996 and by using heteroscedasticity-robust tests found evidence in favour 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 Alam (2007) examines the linear relationship between share price and interest rate, share price and growth of interest rate, growth of share price and interest rate, and growth of share price and growth of interest rate were determined through ordinary least- square (OLS) regression. For all of the cases, included and excluded outlier, they found that Interest Rate has significant negative relationship with Share Price and Growth of Interest Rate has significant negative relationship with Growth of Share Price in Dhaka Stock Market so that DSE is not weak form efficient. Alam, Alam and Uddin (2007) also shows that Dhaka Stock Exchange (DSE) is not weak form efficient through analyzing the randomness of market return, market risk-return relationships and the frequency of the market depth or liquidity. Uddin and Yasmin (2008) 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.Again as a proxy of the of the movement of individual stock prices, daily closing prices of 18 companies operating in the Banks and Financial Institutions sector has been analyzed. This industry is chosen as this sector is rapidly growing in Bangladesh stock markets. The results from the unit root test, the ADF test on DSE price indices and also on individual stock prices of the proxy companies provide evidence that the Dhaka stock exchange (DSE) is not efficient even in weak form and DSE does not follow the random walk model.

In short, review of previous studies state that the developed markets are generally weak-form efficient. But the dynamics of emerging market equities requires clarification. So it is an interesting empirical question whether and to what extent, this is also the case with less developed market stock exchanges. And the review of previous empirical evidences addressed some research questions: Is the Dhaka Stock market as a less developed emerging market, weak form efficient or not? How far it deviates from idealized EMH? What return generating
process drives emerging equity market series? Conflicting result is a function of the research methodology employed? Is it possible to build up a predictive model? What are the implications of the findings?

3. DATA SOURCES AND DESCRIPTION

Usually the employed data should comply with the following character and only this they can be called to be efficient and can represent the whole market. First is accuracy: the data should from prestige institute or sections, only this they can conform to the reality and reflect the real conditions. Statistical data is the basis for people to study the society, economy, management condition so if the data are inaccurate it can mislead person to make great loss to the development of the country and entrepreneur. The second is timely: if the statistic data cannot be supplied in time, for example we use the stock market indices in 50th of last century then people will not realize the current facing conditions and cannot do proper analysis and decision to do their works that they should do to improve the work itself. The last is completely: non-completed data is very harm to the suitable and corrected decision because they are lack of representative. For example, a time series sample only includes data for two years or just some data from very special time and this cannot lead to accurate results and further a wrong decision. Following is the description to the data employed in this paper:

The sample includes total 2403 daily observations of DSE daily general price index for the total sample period from November 27, 2001 to May 19, 2011, For DSI (ALL SHARE) price index the sample includes 2614 observations from January 01, 2000 to May 19, 2011 and the sample includes total 2649 daily observations of DSE Top 20 price index for the total sample period from January 01, 2001 to May 19, 2011. The general price index covers all the stocks listed on the exchange and, therefore, provide a complete representation of the market. The study examines the behavior of stock prices in the DSE 20 index. The behavior of stock prices in the Banking sector (Bank, Cement, Ceramics Sector, Corporate Bond, Debenture, Engineering, Food & Allied, Fuel & Power, Insurance, Investment, IT Sector, Jute, Miscellaneous, Mutual funds, Paper & Printing, Pharmaceuticals & Chemicals, Services & Real Estate, Tannery Industries telecommunication, Textile, Travel & leisure and Treasury bond) has been examined as a proxy of the individual stock price movement in Dhaka Stock Exchange. However, in case of individual company’s stock price, as we know that recently many of the company’s face value of share has been converted from taka 100 per share to taka 10 per share, for simplicity and accuracy of the test, I have excluded after conversion price.

All data are taken from Dhaka Stock Exchange. For the statistical analysis, the software Minitab 15, and Eviews 5 version have been used.

4. METHODOLOGY DESCRIPTION

The purpose of this paper is to find out whether or not the Dhaka Stock Exchange(DSE) indices conform to the characteristic of random walk and further judge if it is efficient or not. We must find proper methodology for the test so following I will talk about how to process the data with methods. The data that conform to random walk was said to be the simplest time series for that in a random walk data model. Many previous studies and methods are based on this important point. Such as the Run tests are based on the point: if the data tested was certified to deterministic trend upwards or downwards or the variance is variable (non-stationary) for different samples of the whole data then it cannot be called to be random walk. Another we can find the patterns of the data. If the data have a pattern or deterministic trend then it should not be random. Besides Runs test method, there is still the Unit root test which is the classical test method of randomness. Further I will respectively elaborate the two methods which I have used in the paper.

4.1 Runs test

This method was thought to be the least restrictive method for the test of the random walk and market efficiency and also it was one of the earliest methods used for the randomness tests by scholars. However it is still just a necessary condition for the certification of random walk characteristic and it is not sufficient. So all the results
got only according to this test cannot be sufficient and convincible. During the last more than 20 years during
the undeveloped markets such as Latin America, China, India there are a lot of scholars who used only this one
method to do the test for the random walk. This is not scientific. Runs test is to judge whether or not the
successive increasing or decreasing of the indices returns is random that is if the positive and negative value
comes out with equal or lies within an efficient scope then the market can be called to be efficient.
Then following I will introduce the runs test in detail. Above mentioned that the runs test is to determine
whether successive price changes are independent or not. If they are not independent then it must not conform to
random walk characteristic. Following is the definition of Runs: Lots of sequences of successive price changes
with the same sign in a sequence of price changes. Successive price changes should be random and not
dependent other price changes if the series is random. In another words the positive and negative value of the
returns should equal.

According to this state we can construct a null hypothesis of randomness. Specific procession is this: Each
return (the difference between two neighboring days'indices) or each price is classified to be a category
according to its sign with the respect to the mean value of the return or the price. That is, a positive change is
when the return or price is larger than the mean value while a negative change is when the return or price is less
than the mean value. Of course the zero change is those values when the return or price equals the mean value
and it can be classified to be both of the kinds.

To the real test we can denote: The letter n₁ to be each return or price that equals or more than the mean value
and let the letter n₂ to be the returns or prices that are below the mean. The test statistic is TS and N is the total
number of the data. For large sample sizes, where both n₁ and n₂ are greater than twenty, the test statistic is
approximately normally distributed: n₁ is the number of return equal or more than the mean value of the indices
in the stock market, n₂ is the number of return less than the mean value of the indices in the stock market. And N
is the total number of the data. TS is the statistical test of the runs in the indices which should be approximately
normally distributed. Let G be the number of runs then the probability P(R) can be established as following.
Equation:

\[ \mu_G = \frac{2n_1 n_2}{n_1 + n_2} + 1; \quad \sigma_G = \frac{\sqrt{(2n_1 n_2)(2n_1 n_2 - n_1 - n_2)}}{(n_1 + n_2)^2 (n_1 + n_2 - 1)} \]

\[ TS = \frac{G - \mu_G}{\sigma_G} \]

The critical value is from z table. Where, N = total number of returns; n₁ = total number of returns equal and more than the
mean value; n₂ = total number of returns less than the mean value.

From this test we can have a preliminary idea to a market’s randomness characteristics. That is if the market can
not conform to this test, then it must not be called to be even weak-form efficiency. However, the markets
conforming to this test may be still not efficient because of its looseness and not strict enough. So in order to test
a market’s efficiency we must test the market price indices using the following method.

4.2 Dickey-Fuller Unit root test

There has been a vivid metaphor to describe autoregressive model that is there is memory or affection in the
system in which it can generate internal dynamics. I think it is a good description to the model because the
model is used to analyze the previous inner affections on the current conditions. Usually the data used in the
scientific experiments are demanded to be stationary only with this characteristic the studies are meaningful. So
if the studied data are non-stationary then the results has been deviated from original directions. Unit root test is
the methods to inspect this kind of stationary characteristic. First let us have a look at the formal definition to the
Unit root test: A unit root test tests whether a time series variable is non-stationary using an autoregressive model.
Unit root test can be seemed to be autocorrelation that the order is larger than 1. Another definition: a
unit root test is a statistical test for the proposition that in an autoregressive statistical model of a time series, the
autoregressive parameter is one. Conceptually the unit root tests are straightforward. In practice however there
are a number of difficulties. The first is unit root tests generally have nonstandard and non-normal asymptotic
distributions. The second is there distributions are functions of standard Brownian motions and do not have
convenient closed form expressions. Consequently critical values must be calculated. The third is the distributions are affected by the inclusion of deterministic terms for example the constant term, time trend. To test the EMH (Efficient Market Hypothesis) of DSE, the tools of stationarity of share prices are tested by using daily market returns. DSE prepares daily price index from daily weighted-average price of daily transaction of each stock. Daily market returns ($R_t$) are calculated from the daily price indices such as follows: $R_t = \ln (P_t / P_{t-1})$ Where, $R_t = market return at period t$; $P_t = price index at period t$; $P_{t-1}= the price index at period t-1$ and $\ln = natural log. This calculation of market return is used in the efficiency test. The reasons to take logarithm returns are justified by both theoretically and empirically. Theoretically, logarithmic returns are analytically more tractable when linking returns over longer intervals. Empirically, logarithmic returns are more likely to be normally distributed which is a prior condition of standard statistical techniques (Strong 1992).

The equation of unit root test is, $(3) Y_t = \alpha + Y_{t-1} + \mu_t$. Where $\mu_t$, is the error term with zero mean, constant variance and $\alpha$ is the intercept. Now run a regression based on equation, $(4) Y_t = \alpha + \rho Y_{t-1} + \mu_t$. In this regression it is assumed that, $\rho = 1$ means unit root is present and the series are random walk implying non-stationarity. If $Y$ has a unit root, then $\Delta Y$ will be stationary for this reason $(5) \Delta Y_t = \alpha + (\rho - 1)Y_{t-1} + \mu_t$ For simplicity, $(6) \Delta Y_t = \alpha + \delta Y_{t-1} + \mu_t; \Delta Y_t = Y_{t-1} - Y_{t-2}$ etc, $\rho =1$ and $\delta = 0$. Then proceed to add enough lagged difference terms until the error term, $\epsilon_t$, becomes serially independent. This modification is the Augmented Dickey-Fuller test,

**Ho:** Stock returns follow random walk (Non-stationary);

**H1:** Stock returns do not follow random return (stationary);

The critical values of the tests are simulated under the null that yt is a drift-less random walk. Moreover, the critical value will change depending on (1) if both $\alpha$ and $t$ is included, (2) if only $\alpha$ is included, and (3) no constant or time trend is included. This test is very sensitive to deviations from yt being a random walk. If Ho is rejected, it would be simple to conclude that yt does not contain a unit root.

5. RESULTS AND ANALYSIS

5.1 Results and Analysis from Runs test

In this section I will display the results got from Runs test using Minitab 15 software and then we will do the analysis. First let us have a look at Runs test. We have known that the Runs Test (Table 1) is the least restricted rules for judging the random walk and judge market efficiency because runs test is neither necessary nor sufficient. In another words, even if a market conforms to the run test this can denote nothing but only that the market may be character of random walk. So in my opinion, this test have nothing mean in the usage of the academic but just a kind of early method in use. In the above table, I have conducted run tests to three index values of Dhaka Stock Exchange: DSE General Index, DSI (All Share) Index, and DS 20 index and get the results as above listed. From the results it can easily find that: All the three indices have much more than 20 cases so the results are dependable. I compute for TS statistics and we make the confidence interval is 95%. The critical number is 1.732. Since the absolute value of TS statistics of all three indices is larger than 1.732 and p-value is zero which is smaller than significance level of 5% then on the basis of runs test, we can reject that there existed Random walk characteristic theoretically and vice versa. That is Stock returns of DSE do not follow Random walk hypothesis.

In the Table 2, we have conducted Runs test on all companies of Bank Sector which are listed and traded at DSE, as a proxy of all companies. In case of individual company’s stock price (Table 2), as we know that recently many of the company’s face value of share has been converted from taka 100 per share to taka 10 per share, so for simplicity and accuracy of the test, I have excluded after conversion prices.
From the results it can easily find that: All the banks have much more than 20 cases so the results are dependable. I compute for TS statistics and make the confidence interval 95%. The critical number is 1.732. Since the absolute value of the TS statistics of all banks is larger than 1.732 and also p-value is lower than the significance level of 5% then we can conclude, on the basis of runs test, that DSE does not follow Random walk characteristic theoretically and vice versa. That is Stock returns of DSE do not follow Random walk hypothesis.

5.2 Results and Analysis from Augmented Dickey-Fuller Unit root test

In order to obtain a better understanding of the behavior of stock process, a preliminary analysis of the data carried out in this section. The daily data set consists of Dhaka Stock Exchange General Indices, DSI (All share) Indices and DS 20 indices for Bangladesh. The statistical output (Table-3) presents the summary of the logarithms of the first differences of the stock price indices. Result shows that the standard deviation of the General stock price indices and DSI (all share) indices closely move together while standard deviation of DS 20 is more than that of the both.

Table 3 presents a summary of descriptive statistics of the daily returns for the DSE General, DSI (all share) and DS 20 indices. Sample means, maximum, minimum, standard deviation, skewness, kurtosis are calculated. The lowest mean returns are in DSI (ALL SHARE) indices (-0.2252) while it has also highest mean return (0.599033) and logically it has the highest standard deviation (0.020159).

Table 4 Presents A Summary Of Descriptive Statistics Of The Daily Returns For The AB Bank Ltd, ALARABANK (Al-Arafah Islami Bank), BANKASIA, BRACBANK, CITYBANK, DHAKABANK, DUTCHBANGL, EBL, EXIMBANK, FIRSTSBANK, ICBIBANK, IFIC, ISLAMIBANK, JAMUNABANK, MERCANBANK, MTBL, NBL, NCCBANK, ONEBANKLTD, PREMIERBAN, PRIMEBANK, PUBALIBANK, RUPALIBANK, SHAHJABANK, SIBL, SOUTHEASTB, STANDBANK, TRUSTBANK, UCBL, UTTARABANK. Sample Means, Maximum, Minimum, Standard Deviation, Skewness, Kurtosis Are Calculated. The Lowest Mean (-0.81450) return is with Rupali Bank Limited while BRAC BANK has the highest return (0.83022). However, in case of individual company’s stock price, as we know that recently many of the company’s face value of share has been converted from taka 100 per share to taka 10 per share, for simplicity and accuracy of the test, I have excluded after conversion prices.

In the following section I examine daily stock returns of DSE General, DSI (all share) and DS 20 stock price indices for Dhaka Stock Exchange using Eviews 5 software. The result of analysis is compared for the significant 5% and 1 % with Augmented Dickey-Fuller (ADF) Test statistics table values. A common problem arises in determine the optimal number of lags of the dependent variables. The analysis of the ADF result are using by 10 lags. The ADF test is carried out by both trend and without trend, (which is represented in table 5 and table 6). ADF (t-value) of DSE General, DSI (all share) and DS 20 stock price indices are comparing with the MacKinnon Critical values at the 1% and 5% level of significance. ADF calculated values are significant at 1% and 5% significance levels for all 10 degrees of freedom (lags) suggests that the return series does not follow random walk hypothesis (table-5 and table-6) which means DSE is not efficient in weak form.

Table – 5 and Table – 6 shows individual stock price movement in DSE is analyzed by taking a proxy of the daily closing prices of the following companies: The behavior of stock prices in the Banking industry [AB Bank Ltd, ALARABANK, BANKASIA, BRACBANK, CITYBANK, DHAKABANK, DUTCHBANGL, EBL, EXIMBANK, FIRSTSBANK, ICBIBANK, IFIC, ISLAMIBANK JAMUNABANK, MERCANBANK, MTBL, NBL, NCCBANK, ONEBANKLTD, PREMIERBAN, PRIMEBANK, PUBALIBANK, RUPALIBANK, SHAHJABANK, SIBL, SOUTHEASTB, STANDBANK, TRUSTBANK, UCBL, UTTARABANK] has been examined as a proxy of the individual stock price movement in Dhaka Stock Exchange. The data consists of price of 30 stocks covering the period commencing from November 27, 2001 to May 19, 2011. However, in case of individual company’s stock price, as we know that recently many of the
company’s face value of share has been converted from taka 100 per share to taka 10 per share, for simplicity and accuracy of the test, I have excluded after conversion prices. The daily data set consists of Bank stock price indices for Bangladesh. In order to obtain a better understanding of the behavior of stock prices, a preliminary analysis of the data carried out in this section. The statistical output (table-4) presents the summary for the logarithms of the first differences of the stock price indices or continuously compounding returns. The result of Augmented Dickey-Fuller test used for trend (table-8) and no trend (table-7) respectively. DSE day wise (ADF t-value) value is comparing with the MacKinnon Critical values at the 1 % and 5 % level of significance. It is observed that ADF calculated values are significant at 1% and 5% significance levels for all 10 degrees of freedom (lags) suggests that the return series does not follow random walk hypothesis (table-7 and table-8) which means even the individual stock prices in the banking industry of DSE does not follow the random walk model. (See Table-7 & Table-8)

6. CONCLUSION

Overall results from the empirical analysis suggest that the Dhaka Stock Market of Bangladesh is not efficient in weak-form. The primary objective of this paper was to analyze the weak form efficiency of DSE General, DSI (all share) and DS 20 index and individual stock prices of the proxy companies (30 companies operating in the Banking industry). The result of this study shows that the hypothesis of randomness of the stock returns are rejected for stock price index changes by using Runs test and at all lags using Augmented Dickey –Fuller test which means Dhaka Stock Exchange is not efficient even in the weak form.

The reason for the market inefficiency is the weak regulatory framework, poor corporate governance, lack of accountability, poor institutional infrastructure, lack of transparency of market transactions and low level of capacity of major market players. The processing of new information in Bangladesh is rather weak, and may result from large number of non-actively traded shares, and the limited role of mutual funds. As an institutional policy to improve the capital market, the timely disclosure and dissemination of information to the shareholders and investors on the performance of the listed companies should be emphasized. The traders make their living by analyzing historical returns of the stock. Using this information to project future returns the traders may able to earn abnormal profits. The implication of the rejection of Randomness (which means weak form efficiency) for the investors is that they cannot adopt a fair return strategy by holding a well-diversified portfolio in the Dhaka stock market.

REFERENCES

2. Andrew C. Worthington and Helenhiggs, Tests of random walk and market efficiency in Latin American stock markets: An empirical note, School of Economics and Finance, Queensland University of Technology, Brisbane, Australia
44. Zibil Song, Fanglei Niu, Test of the weak-form market efficiency for Shanghai Stock Market, Business School, Hehai University, Nanjing210098
### LIST OF TABLES

**Table 1:** Results of Runs test for DSE General, DSI (All Share) and DS 20 Indices

<table>
<thead>
<tr>
<th>Item</th>
<th>DSE General</th>
<th>DSI (All Share)</th>
<th>DS 20</th>
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<td>0.000814</td>
<td>0.000871</td>
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<tr>
<td>Cases&gt; Mean Value</td>
<td>1186</td>
<td>1083</td>
<td>1282</td>
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<tr>
<td>Cases&lt; Mean Value</td>
<td>1215</td>
<td>1529</td>
<td>1365</td>
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<tr>
<td>Total cases</td>
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<tr>
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<td>1067</td>
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<tr>
<td>P-value</td>
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</table>

| 95% confidence | Randomness rejected | Randomness rejected | Randomness rejected |

**Table 2:** Results of Runs test for the Bank sector stock price indices return

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<tr>
<th>BANK NAME</th>
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<th>Cases&gt; Mean Value</th>
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<th>Total cases</th>
<th>Number of Runs</th>
<th>TS-Statistics</th>
<th>P-value</th>
<th>95% confidence</th>
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Table-3: Statistical output for DSE General, DSI (all share) and DS 20 stock price indices return:

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<th></th>
<th>Mean</th>
<th>Standard dev.</th>
<th>Skewness</th>
<th>Kurtosis</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Observation</th>
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Table 4: Statistical output for the Bank sector stock price indices return:

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<th>Mean</th>
<th>Standard deviation</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
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<td>-2.28</td>
<td>28.42</td>
</tr>
<tr>
<td>STANDBANK</td>
<td>1810</td>
<td>0.000358</td>
<td>0.029117</td>
<td>-0.30286</td>
<td>0.201640</td>
<td>-1.31</td>
<td>17.86</td>
</tr>
<tr>
<td>TRUSTBANK</td>
<td>796</td>
<td>-0.001070</td>
<td>0.034390</td>
<td>-0.24604</td>
<td>0.159550</td>
<td>-0.19</td>
<td>6.98</td>
</tr>
<tr>
<td>UCBL</td>
<td>2087</td>
<td>0.001668</td>
<td>0.044909</td>
<td>-0.79520</td>
<td>0.199170</td>
<td>-7.05</td>
<td>123.20</td>
</tr>
<tr>
<td>UTTARABANK</td>
<td>2722</td>
<td>0.001134</td>
<td>0.038033</td>
<td>-0.61352</td>
<td>0.548270</td>
<td>-4.86</td>
<td>110.10</td>
</tr>
</tbody>
</table>

Table 5: Output for Unit Root test on DSE General, DSI (all share) and DS 20 stock price indices return:
Augmented Dickey Fuller (Constant) Null Hypothesis: The variable contains a Unit root

<table>
<thead>
<tr>
<th>Lag Year</th>
<th>ADF (General Price Indices) calculated value</th>
<th>ADF (ALL Share Price Indices) calculated value</th>
<th>ADF (DS 20 Price Indices) calculated value</th>
<th>ADF Critical value at 1%</th>
<th>ADF Critical value at 5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-36.44457</td>
<td>-37.31031</td>
<td>-37.07975</td>
<td>-3.432639</td>
<td>-2.862437</td>
</tr>
<tr>
<td>2</td>
<td>-29.04612</td>
<td>-29.86442</td>
<td>-28.91030</td>
<td>-3.432639</td>
<td>-2.862437</td>
</tr>
</tbody>
</table>
Table-6: Output for Unit Root test on DSE General, DSI (all share) and DS 20 stock price indices return: Augmented Dickey Fuller (Constant and Trend) Null Hypothesis: The variable contains a Unit root

<table>
<thead>
<tr>
<th>Lag Year</th>
<th>ADF(General Price Indices) calculated value</th>
<th>ADF (ALL Share Price Indices) calculated value</th>
<th>ADF(DS 20 Price Indices) calculated value</th>
<th>ADF Critical value at 1%</th>
<th>ADF Critical value at 5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-36.44890</td>
<td>-37.30673</td>
<td>-37.10936</td>
<td>-3.961885</td>
<td>-3.411688</td>
</tr>
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<td>7</td>
<td>-16.65155</td>
<td>-17.92396</td>
<td>-17.76967</td>
<td>-3.961885</td>
<td>-3.411688</td>
</tr>
</tbody>
</table>

Table-7: Output for Unit Root test on DSE Bank stock price indices return: Augmented Dickey Fuller (Constant) Null Hypothesis: The variable contains a Unit root

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Lag 1</th>
<th>Lag 2</th>
<th>Lag 3</th>
<th>Lag 4</th>
<th>Lag 5</th>
<th>Lag 6</th>
<th>Lag 7</th>
<th>Lag 8</th>
<th>Lag 9</th>
<th>Lag 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company Name</td>
<td>Lag 1</td>
<td>Lag 2</td>
<td>Lag 3</td>
<td>Lag 4</td>
<td>Lag 5</td>
<td>Lag 6</td>
<td>Lag 7</td>
<td>Lag 8</td>
<td>Lag 9</td>
<td>Lag 10</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
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</tr>
<tr>
<td>EXIMBANK</td>
<td>-33.80</td>
<td>-20.84</td>
<td>-17.73</td>
<td>-16.21</td>
<td>-14.59</td>
<td>-13.53</td>
<td>-13.16</td>
<td>-12.71</td>
<td>-12.57</td>
<td>-11.60</td>
</tr>
<tr>
<td>NBL</td>
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<td>-25.51</td>
<td>-22.38</td>
<td>-20.33</td>
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<td>-17.89</td>
<td>-16.49</td>
<td>-16.16</td>
<td>-16.01</td>
</tr>
<tr>
<td>RUPALIBANK</td>
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<td>-29.57</td>
<td>-25.15</td>
<td>-22.82</td>
<td>-20.45</td>
<td>-18.61</td>
<td>-17.18</td>
<td>-16.51</td>
<td>-15.74</td>
<td>-14.74</td>
</tr>
</tbody>
</table>

Table 8: Output for Unit Root test on DSE Bank stock price indices return: Augmented Dickey Fuller (Constant and Trend)

Null Hypothesis: The variable contains a Unit root