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

Md. Abdus Salam

Lecturer, Department of Accounting, Government, Bangla College, Dhaka, Bangladesh

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 only the tests of weak-form efficiency. By applying Descriptive statistics, Kolmogrov Smirnov goodness of fit test (K-S test) autocorrelation and Technical trading rules tests provides that daily return of Dhaka stock market is not weak form efficient and strongly rejects the null hypothesis. The run test of monthly return of Dhaka Stock market accepts the Null hypothesis significantly and shows efficient at weak form.***

Keywords: Efficient market, Random walk model, Autocorrelation, Run test, Dhaka stock exchange.

1. Introduction

Capital market is now playing a strategic role in a country's economic growth. It facilitates the exchange of funds between company as demander and investor as supplier. 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).

2. Literature review

Efficient-Market Hypothesis (EMH) is a cornerstone of modern financial theory. Eugene Fama [1] divided the empirical tests of the hypothesis into three categories based on the given information set i. weak-form EMH, ii. Semi-strong-form EMH and iii. Strong-form EMH. The Random Walk Model (RWM) is the model which assumes that subsequent price changes are sovereign and homogeneously distributed random variables and concludes that changes in future prices cannot be forecasted through historical price changes and movements. The Random Walk Model is generally used to testify the weak-form Efficient Market Hypothesis. Fama [2], Granger [3], Hawawini [4], Fama [5], Lo [6] comprehensively tested empirically the RWM and the weak form EMH regarding to both developed and emerging economies. They all were in the support of the conclusion that there exists empirical evidence regarding to the support of EMH theory. Ang and Pohlman [7] examined fifty four stocks belonging to 5 far Eastern equity stock markets of Japan, Singapore, Australia, Hong Kong and Philippine. They found that these markets are slightly efficient in the weakest form. The reason is only due to the effect of the greater existence of extreme returns and no concern with price dependencies as explained by serial correlations. Less developed countries (LDC) markets are less efficient than developed countries markets. Urrutia [8] investigated the Random Walk Model for 4 Latin American emerging stock markets. He used the monthly index data for Argentina, Brazil, Chile and Mexico for the period December 1975 to March 1991. Variance ratio test rejects the random walk hypothesis but runs test indicates that there exists weak form of efficiency regarding to these markets. Huang [9] examined the equity markets of 9 Asian countries. He used the variance ratio statistics to test the random walk hypothesis of the Asian stock markets. He found that the RWM hypothesis for Korean and Malaysian equity market is strongly rejected for all changed holding periods. Moreover

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 inefficient. 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 weak 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 Basher [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;

$R\,t = \ln (Pt / Pt-1)$
Pt = Market Price at time't'
Pt-1 = 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 not 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

	N	*Minimum*	*Maximum*	*Mean*	*Std. Deviation*	*Skewness*		*Kurtosis*	
	Statistic	*Statistic*	*Statistic*	*Statistic*	*Statistic*	*Statistic*	*Std. Error*	*Statistic*	*Std. Error*
% return of Sample 1	1099	-7.09	5.93	0.0685	0.99107	-0.259	0.074	8.007	0.147
Valid N (list wise)	1099								

Table 2: Descriptive Statistics of sample-2

	N	Mini-mum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
% return of Sample 2	1189	-6.72	22.61	0.1439	1.36304	3.732	0.071	62.342	0.142
Valid N (listwise)	1189								

Table 3: Descriptive Statistics of monthly return

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
January % return	20	-14.69	42.99	0.4996	12.19224	2.52	0.512	7.749	0.992
February % return	21	-13.24	3.6	-1.5843	3.9786	-1.387	0.501	2.436	0.972
march % return	21	-32.25	38.17	-0.5678	12.27573	0.69	0.501	6.353	0.972
April % return	21	-19.87	14.2	-1.9161	7.92101	-0.563	0.501	0.65	0.972
may % return	21	-8.22	27.07	4.0782	8.28127	1.099	0.501	1.715	0.972
June % return	21	-8.64	28.53	5.1331	8.71234	0.683	0.501	1.248	0.972
July % return	21	-12.45	20.55	-0.2154	8.4299	0.898	0.501	0.573	0.972
August % return	21	-15.34	17.39	1.1976	7.09443	-0.046	0.501	1.448	0.972
September % return	21	-5.71	38.8	4.1068	9.17128	2.901	0.501	10.599	0.972
October % return	21	-10.67	76.68	5.9926	17.22305	3.721	0.501	15.755	0.972
November % return	21	-16.59	30.22	2.4983	11.3969	0.898	0.501	1.031	0.972
December % return	21	-24.95	13.22	0.046	7.10476	-2.015	0.501	7.776	0.972
Valid N (listwise)	20								

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 confirms 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.

Sample-1: Kolmogorov-Smirnov Test

		% return of Sample 1
N		1099
Normal Parameters	Mean	0.0685
	Std. Deviation	0.99107
Most Extreme Differences	Absolute	0.085
	Positive	0.072
	Negative	-0.085
Kolmogorov-Smirnov Z		2.83
Asymp. Sig. (2-tailed)		0

Sample-2: Kolmogorov-Smirnov Test

		% return of Sample 2
N		1189
Normal Parameters	Mean	0.1439
	Std. Deviation	1.36304
Most Extreme Differences	Absolute	0.066
	Positive	0.066
	Negative	-0.059
Kolmogorov-Smirnov Z		2.276
Asymp. Sig. (2-tailed)		0

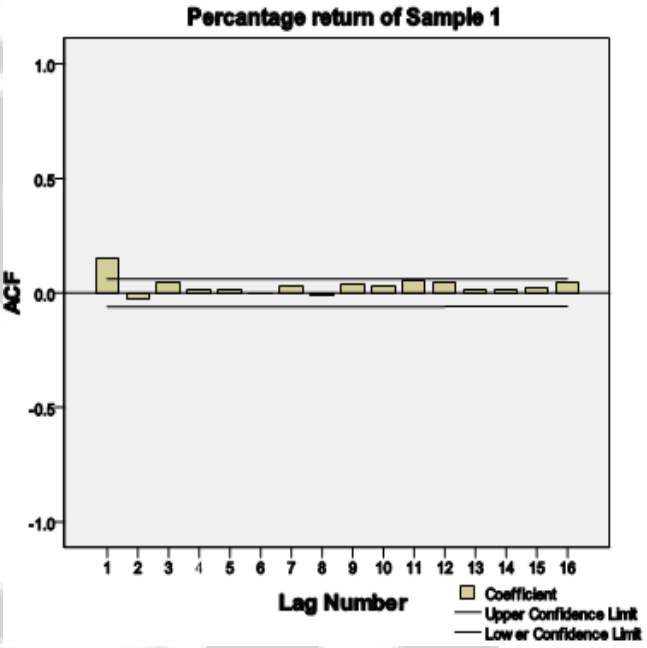
C. Auto Correlation

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 co-efficient significantly different from zero indicates the predictability of share return from the past information. The results presented on the table 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. The null hypothesis that the return series are independent is rejected in both cases and concludes that DSE returns are not efficient at weak form.

Correlations of Sample-1

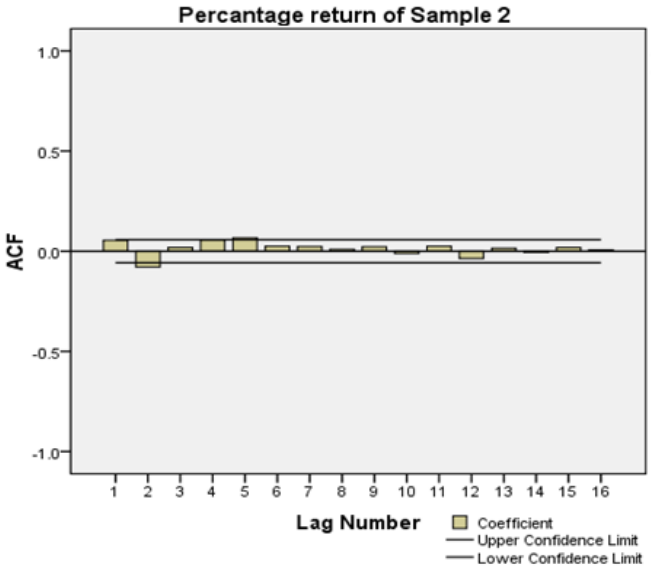
		% return of Sample 1	lag % return of Sample 1
% return of Sample 1	Pearson Correlation	1	.147**
	Sig. (2-tailed)		0
	N	1099	1098
lag % return of Sample 1	Pearson Correlation	.147**	1
	Sig. (2-tailed)	0	
	N	1098	1098

**. Correlation is significant at the 0.01 level (2-tailed).



Correlations of Sample-2

		Percentage return of Sample 2	lag Percentage return of Sample 2
Percentage return of Sample 2	Pearson Correlation	1	0.055
	Sig. (2-tailed)		0.059
	N	1189	1188
lag Percentage return of Sample 2	Pearson Correlation	0.055	1
	Sig. (2-tailed)	0.059	
	N	1188	1188



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.

Runs Test of Sample-1

	% return of Sample 1
Test Value[a]	0.0685
Cases < Test Value	574
Cases >= Test Value	525
Total Cases	1099
Number of Runs	441
Z	-6.556
	0

a. Mean

Runs Test of Sample-2

	% return of Sample 2
Test Value[a]	0.1439
Cases < Test Value	601
Cases >= Test	588
Value	1189
Total Cases	509
Number of Runs	-5.016
Z Asymp. Sig. (2-tailed)	0

a. Mean

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.

Runs Test of monthly return

	January % return	February % return	March % return	April % return	May % return	June % return	July % return	August % return	September % return	October % return	November % return	December % return
Test Value[a]	-1.71	-0.75	0.39	0.05	2.59	5.27	-2.32	1.09	2.07	1.82	0.32	0.4
Cases< Test Value	10	10	10	10	10	10	10	10	10	10	10	10
Cases>= Test Value	10	11	11	11	11	11	11	11	11	11	11	11
Total Cases	20	21	21	21	21	21	21	21	21	21	21	21
Number of Runs	10	16	14	9	8	11	15	13	8	10	12	9
Z	-0.23	1.806	0.908	-0.89	-1.336	0	1.357	0.46	-1.336	-0.438	0.011	-0.887
Asymp. Sig. (2-tailed)	0.818	0.071	0.364	0.375	0.182	1	0.175	0.646	0.182	0.661	0.991	0.375

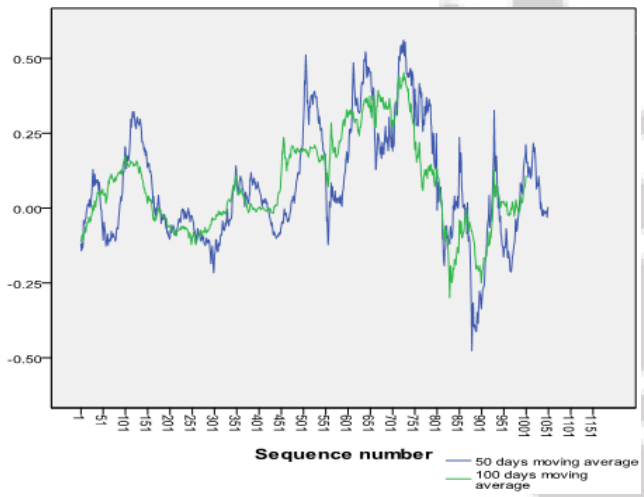
a. Median

A popular technique used to predict stock prices called technical analysis, is to study past stock price data and search for patterns such as trends and regular cycles. Rules for when to buy and sell stocks are then established on the basis of the patterns that emerge. The efficient market hypothesis suggests that technical analysis is a waste of time. The simplest way to understand why is to use the random-walk result derived from the efficient market hypothesis that holds that past stock price data cannot help predict changes. Therefore, technical analysis, which relies on such data to produce its forecasts, cannot successfully predict changes in stock prices. Technical analysis can be useful where market is not efficient at weak form. In general, buy signal shown when current price of security is above the moving average. Another buying signal has shown when the shorter moving average crosses the longer moving average from below. And if the sorter moving average crosses the longer moving average from the above sell signal

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

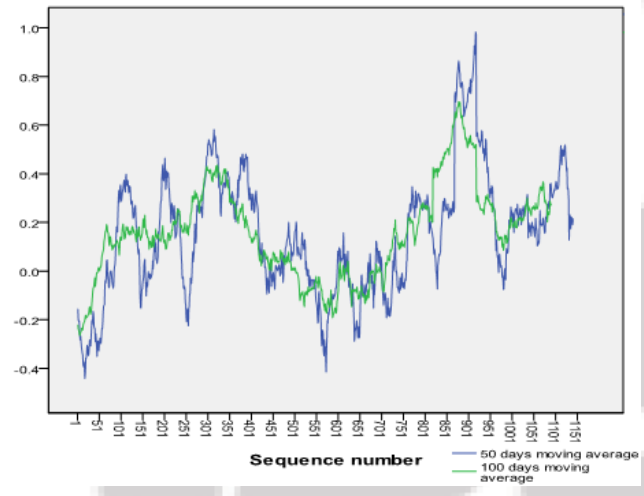
Sample-1

	50 days moving average	100 days moving average
Series or Sequence Length	1181	1181
Number of Missing in User-Missing	0	0
Values in the Plot System-Missing	131	181



Sample-2

	50 days moving average	100 days moving average
Series or Sequence Length	1190	1191
Number of Missing in User-	0	0
Values in the Plot System-	50	100



7. Findings

7.1 Decision criteria

A.1 Descriptive statistics

Generally values for skewness zero and kurtosis value 3 represents that the observed distribution is perfectly normally distributed and the normally distributed refers that market in accepting null hypothesis and efficient at weak form. Where, both two sub samples of daily observation i.e. sample-1 (2002-2005) and sample-2 (2006-2010) have nonzero skewness and more than kurtosis of three. On the other hand, sample of monthly Returns show negative skewness for four months and positive skewness for eight months and none of this has zero skewness. But 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 and two daily sub samples. So, overall statistics shows that the null hypothesis is rejected and market is not efficient at weak form except few months.

A.2 Kolmogrov smirnov 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

[1] Fama, E. "The behavior of Stock Market Prices", *Journal of Business*, vol. 38, Pp.34-105, 1965.
[2] Fama, E. "Efficient Capital Markets: A Review of Theory and Empirical Work" *Journal of Finance*, 25, Pp. 383 – 417, 1970.
[3] Granger, C. "A Survey of Empirical Studies on Capital Markets", in: E. Elton and M. Gruber. eds, *International Capital Markets* (North–Holland, Amsterdam) Pp. 3 – 36,1975.
[4] Hawawini, G. "European Equity Markets: Price Behavior and Efficiency" *Monograph Series in Finance and Economics* (Saloman Center, New York University), 1984.
[5] Fama, E. "Efficient Capital Markets: II. "*Journal of Finance*, vol. 46, pp. 1575 – 1617, 1991.
[6] Lo, A. W. **"***Market Efficiency: Stock Market Behaviour in Theory and Practice*" Volume I and II, Chethenham, UK. An Elgar Reference Collection, 1997.
[7] Ang, J. S. and Pohlman, R.A. "A Note on the Price Behavior of Far Eastern Stocks," *Journal of International Business Studies*, Spring, 1978.
[8] Urrutia, J. L. "Tests of Random Walk and Market Efficiency for Latin American Emerging Equity Markets" *Journal of Financial Research* 18, pp. 299-309, 1995.
[9] Huang, B. N. "Do Asian stock market prices follow random walks? Evidence from the variance ratio test", *Applied Financial Economics*, vol. 5, pp. 251-256, 1995.
[10] Hassan, A., Abdullah, S., and Shah, Z. A., "Testing of Random Walks and Efficiency in an Emerging Market", The Business Cambridge Review. 9.1, 2007.
[11] Hassan, M. Kabir, M. A. Islam and S. A. Basher, "Market Efficiency, Time-Varying Volatility and Equity Returns in Bangladesh Stock Market", Working Papers 2002-06, York University, Department of Economics, revised Jun 2002. *International Research Journal of Finance and Economics* - Issue 33 (2009) 100.1999.
[12] Mubarak, A., Keasey, K., "Weak-form market efficiency of an emerging market: Evidence from Dhaka Stock market of Bangladesh", ENBS Conference paper, Oslo, Norway, 2000.
[13] Kader, A. A., and, A. F. M A. Rahman, "Testing the Weak-Form Efficiency of an Emerging Market: Evidence from the Dhaka Stock Exchange of Bangladesh", AIUB Journal, vol.4 (2), August, 2005.
[14] Islam, Ainul and Mohammed Khaled, "Tests Of Weak-Form Efficiency of the Dhaka Stock Exchange", *Journal of Business Finance & Accounting*, vol. 32 (7-8), pp. 1613-1624, September/October, 2005.
[15] Uddin, Md Gazi Salah and Yasmin, Shakila "Random Walk Model in the Dhaka Stock Exchange: An Empirical Evidence of Daily Return" *Journal of Business Administration*, IBA, Dhaka University. Bangladesh, 2008.
[16] M. Kabir Hassan, M. Anisul Islam and Syed Abul Basher. "Market Efficiency, Time-Varying Volatility and Equity Returns in Bangladesh Stock Market," UNO Working Paper #13-2000.

Author Profile

Md. Abdus Salam is currently a lecturer, Dept. of Accounting, Govt. Bangla College, Dhaka, Bangladesh. He holds MBA and BBA in Accounting and Information Systems from Dhaka University, Bangladesh. He has published two articles in a reputable journal.