

Weak form Efficiency of the Sri Lankan Stock Market From 2010 -2014

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Abstract : *With the ending of thirty years civil war, Sri Lankan Colombo Stock Exchange recorded its highest market capitalization and trading volume ever since (Fernando , 2012). Colombo stock market applied new advanced technology for its day to day operation in last decade (www.cse.lk). Resulting, both level of performance and level of investment in Share Market were increased, however the process was further accelerated after post war period (Kenangasl Research Company, 2011). With that improvement, the number of investors who were willing to invest in Colombo Stock Exchange was increased and tried to reap maximum from the market. That cold competition beckon an efficiency problem in share market. Hence the study focused to investigate weak form efficiency of the Colombo Stock Exchange. The study is a quantitative type time series study. The data were collected on All Share Price Index from January 2010 to December 2014. Finally through all the analysis it was found that stock price do not follow random walk, which supports to the conclusion that Colombo Stock Exchange is weak form inefficient.*

Keywords: *Weak Form Efficiency, Colombo Stock Market, Random Walk Model*

I. Introduction

Financial Management mainly concerns the acquisition, financing and management of assets with a concept of creating wealth of organization in which financial market plays vital role in the economy facilitating efficient fund movement from surplus unit to deficit unit through financial instruments .To build a strong financial system in the economy, there should be an efficient financial market in country as it facilitates investors to get correct decision at correct time. Information is very important for investors in decision making process. Accordingly, Information Efficiency in the capital market plays dominant role with in the financial system.

Information Efficiency is the degree to which stock price reflects all available accurate and reliable information to investors, Fama (1965). If the information is accurate enough, none can earn abnormal benefit from the market except luck. The situation progressively encourages investors to engage in market transaction continuously in long run. Based on the natures of information, Fama (1965) classified market efficiency into three categories such as Weak Form Efficient Market, Semi Strong Form Efficient Market and Strong Form Efficient Market. Weak form efficiency is the situation where current stock price reflects all prior movements of stock prices (Syed Tauseef Raza Gilani ,Muhammad Nawaz ,Muhammad Irfan Shakoor and Muhammad Zulqarnain Asab , 2014) When market is weak form efficient share prices follow the random walk model. Consequently, it is impossible to predict profit from the market in long run. The market becomes semi strong from efficient one, when the share price reflects all historical information and publicly available information prices (Syed Tauseef Raza Gilani ,Muhammad Nawaz ,Muhammad Irfan Shakoor and Muhammad Zulqarnain Asab , 2014) .Publicly available information comprises published accounting statements, company articles and investment sensitive data. When market is semi strong, it should reflect the features of weak form as well. Then investors have more information rather than weak form efficient market stage. Therefore investors are in a position to predict future price at a significant level. In a strong form efficiency market, stock price reflects all available historical, publicly available and private insider information. At this level, investors have sufficient information to predict future price resulting investors generate excess profit rather than other two market efficient levels.

Current study highly focus to weak form efficiency level which reflect only historical data. When, past share prices does not correlate with the current stock price, it would very difficult to predict future share prices by sophisticated technical analyses. Consequently, investors not in a position to earn excess profit due to lack. However, the investor who has capability to access other information rather than the historical information they have ability to earn abnormal profits from the market. According to weak form efficiency market is better than the weak form inefficiency market. The concept is widely applicable for investors, companies, regulatory bodies, financial intermediaries and parties who are interesting in this field. The study examined the state of efficiency of Colombo stock exchange during the 2010 to 2014. Colombo Stock Exchange is a place where equity and debt securities are mutually exchanged among licensed parties (P.Samarakoon, 2004). In order to minimize the investor's risk of Colombo Stock Exchange (CSE), investors should be armed with comprehensive, reliable and timely information. Resulting, none get abnormal profit from the market. The weak form efficient market

minimizes investors' risk in a certain level. Accordingly, CSE at least should be weak form efficient one to lower investors' risk. The level of efficiency takes different forms base on time and market conditions (P.Samarakoon, 2004). Sri Lankan government has been taking massive efforts to develop market's ground conditions in time to time applying new technologies like ATS, CDS and amending existing rules and regulations. Sri Lankan share market has been becoming an emerging market in Asia (Nikunj R. Patel, Nitesh Radadia and Juhi Dhawan, 2012). It shows significant fluctuations in share prices time to time. This manipulation blinds investors and increases the risk of investments, hence identification of CSE market efficiency type is mandatory for a country. Efficient stock market creates fair environment for all investors hence a country should try to increase information market efficiency as much as possible to attract more investment to the stock market. Currently, authoritative dealers apply different strategies to augment stock market efficiency time to time such as increasing market activities while reducing transaction cost, increasing membership investors in the stock market, increasing regulatory capacities, establishing a stock exchange news service, and minimize institutional restrictions.

II. Literature Review

Market efficiency is the degree to which stock price reflects all available and relevant information that was developed (Fama, 1965). He never concluded that the market should be hundred percent efficient in all the time when the new information released to the market, authoritative parties cannot reflect information through price immediately it takes some period because of that every stock market is impossible to attain full efficiency at all the time. The market efficiency is a requirement of all parties "when the asset price fully reflects all available information, instantaneously adjusts to stock price and fully incorporated with new information such a market can be categorized as efficient market" (Fama, 1965).

2.1 Empirical Findings

The studies related to developed country as same as emerging country provide evidences to support for both weak form efficiency and inefficient market. There are several comprehensive reviews in the developed stock market. Some literature supports to the weak form efficiency but some literature reject the weak form efficiency. Posta (2008) in Prague stock market he used GARCH model, autocorrelation, Jarque Bera statistic and twelve years daily returns according to the findings he identified there are no statistically significant serial auto correlation, have a larger impact on the volatility of the returns and high difference logarithms in daily returns, therefore he concluded that Prague stock market is weak form efficiency. Shiller and Radikoko (2014) examined Canadian stock market using unit root test, ADF, PP, KPSS test. The tests' findings were that two indices show strong degree of autocorrelation and five indices show weak degree of autocorrelation. Accordingly, the researcher concluded that market was weak form inefficient. Tutu, Ekow and Naaidar (2013) applied run test, JB test, descriptive statistic and seven year weekly market return. The findings indicated that weekly return series show evidence of negative skewness in its distribution and financial return not follow the normal distribution therefore they concluded Ghana Stock market is weak form inefficiency. Shaker (2013) utilized nine years daily returns, autocorrelation, unit root test, run test. He identified unit root test is absent from all the return series and return series are stationary. Because of that he decided Finnish and Swedish Stock Market stock market is weak form inefficiency. The few scholars analyzed emerging market also to identify the market efficiency level. Moberak and Keasey (2000) found that Market Share return series do not follow random walk model and show significant autocorrelation coefficient at different lags. As a result they conclude market is weak form inefficiency. Gupta (2013) revealed that stock market of India does not move randomly due to the dependency of current security prices on the past in formation. Nwosa and Oseni (2011) used autocorrelation, regression analysis, unit root test and twenty four years daily index to test the level of market efficiency. The result indicated that coefficient of the lag variables were possible and significant, ADF test times series was non-stationary at level they concluded, according the researcher conclude that Nigirian market is weak form inefficient. Abeyrathnam and power (1995) identify negative coefficient, statistically significant and positive in share price according to sixteen months daily index, result of run test and serial correlation. The study concludes that Colombo Stock market is weak form inefficiency. Smarakoon (2004) applied descriptive statistic and regression equation the test were based on monthly and daily return from 1985 to 2003 the result of study is Positive autocorrelation in short holding period, Negative autocorrelation in long period it revealed Colombo Stock market is not weak form efficiency. Some scholars analysed developed market and emerging market efficiency levels across many countries. Evidently, Jayaraman and Ramarathnam (2011) analysed USA, Japan, China and South Korea stock markets. Sarmat and Dima (2011) analyzed USA, Japan and UK stock markets and Patel, Radadia and Dhawan (2012) analyzed Hong Kong, Japan, China and India. All scholars identified markets are weak form inefficient according to analysis result. According to the above empirical analyze study identified country development did not affect to the country stock market efficiency level as same as same methodologies can be apply to the every country to measure efficiency level.

III. Methodology

The study of testing the weak form of efficiency of Colombo Stock Exchange in Sri Lanka was a basic, quantitative type, time series study. Efficiency of Colombo Stock Exchange was measured through All Share Price Index of the market. Accordingly, dependent variable of the study was Market efficiency and independent variable of the study was All Share Price Index. The data were collected from officially published document by Colombo Stock Exchange. All Share Price indexes which were calculated from 1985 to date were the population of this study from which the researcher selected data on All Share Price Index from 1st January 2010 to 31st December 2014 as sample of the study based on the convenience sampling techniques. To address the research question present, the study following hypothesis was developed;

H0:- The Colombo stock exchange is not efficient in weak form.

H1:- The Colombo stock exchange is efficient in weak form

IV. Data Analysis

Collected data went through rigorous analysis process with the support of E-views statistical software. The unit root test (ADF model and PP model), descriptive statistic, serial correlation and variance ratio test were run on collected data to find efficiency of Colombo stock market. The analytical process followed a number of tests to validate the study result and remove methodological biasness. Based on the methodologies applied in previous studies, the researcher also applied different analysis to remove methodological biasness.

4.1 Descriptive Test

Descriptive statistic is used to test the normality of stock price movement in the time period in which study calculated mean, median, standard deviation, variance, kurtosis, skewness and range and Jarque – Bera test based on collected data. The Jarque – Bera value, Kurtosis and skewness supported researcher to identify normal distribution pattern of stock price movement during the time period. Market could be categorized as efficiency when the result of skewness and kurtosis value equal to the 0 and 3 respectively and P value should be less than 0.01. If test result do not equal to above condition at that time market can be categorized as weak form inefficiency (Patel, Raddia and Dhawan 2012).

4.2 Unit root Test

Based on the Random Walk Model, Unit root test was calculated to identify level of unit root stationary of All Share Price Index (ASPI). When unit root test regression ($P = 1$), it reflect non-stationary series. Which is a necessary condition for a random walk model (Ahmet Buyuksalvari and Hasan Abdioglu, 28 December, 2011). If unit root test is stationary then it can be concluded that market is weak form efficiency. Unit Root Test can be conducted by two different tests such as Augmented Dickey Fuller and The Phillip Perron (PP) Test. Both tests mainly focus “t” statistic, significant value and critical value. If significant value is more negative than critical value it will helps to conclude market as weak form efficiency, (Shiller and Radikko, 2014).

4.3 Serial Correlation

Serial correlation test was applied to identify whether Sri Lanka All Share Price Index follows random walk model or not. The light of the test indicated negative and positive changes in the Lags through the period. That implies that there is no any basement for investors to predict the future share prices during the period considered. Nwosa and Oseni (2011) and Abeyratna (1995).

4.4 Variance Ratio Test

Variance ratio test is a kind of test which can be used to measure market efficiency. The basic assumption of this test is that variance of increments in the random walk series is linear with the sample interval. According to the variance ratio test result, when every lag “Z value” greater than 1 and “P value” equal to zero, the data set does not support to the random walk model (Patel, Radadia and Dhawan 2012). Current study clearly derived hypothesis of the study to achieve study objective. Hence study had to analyze data under selected methodology and identify whether result in line with previous studies result.

V. Result And Discussion

5.1 Descriptive Statistic

Descriptive statistics were used to explain the basic information and test the normality of the data set.

Table 1: Descriptive Statistics of Five Year All Share Price Index (ASPI)

| | | | |
|---------|---------|-------------|-------|
| Minimum | 3478.56 | Skewness | -0.54 |
| Maximum | 7811.80 | Kurtosis | 2.95 |
| Mean | 5971.62 | Jarque-Bera | 58.56 |
| Median | 5968.70 | Probability | 0.00 |

According to the Table 1, the Maximum and Minimum value of ASPI were 7811.80, and 3478.56 respectively. It indicates that data on ASPI spreads between 7811.80 and 3478.56 during the period concerned. As indicated by the table the mean, skewness and kurtosis were 5971.62, -0.54 and 2.95 respectively. The data set on ASPI is normal when Skewness of the test become zero and Kurtosis is equal or greater than 3 (Syed Tauseef Raza Gilani ,Muhammad Nawaz ,Muhammad Irfan Shakoor and Muhammad Zulqarnain Asab , 2014) According to the descriptive statistic Table 1, Skewness was minus (-) 0.54 recording a little deviation from the mean. On the other hand, Kurtosis also were less than the three (Kurtosis 2.95). Hence, there is no evidence to prove that data set is normally distributed. Alternatively, the normality of the data set was further tested through Jarque- Bera value. Jarque- Bera value of the test was 58.56 which exceeded the respective critical Jarque –Bera values at (0.1 = 4.61), (0.05= 5.99) and (0.01= 9.21) confidence levels and significant. The findings further accentuated non normality of the data set. Accordingly the ASPI from 1st January 2010 to 31st December 2014 was not symmetric and bell shape. It skewed to the left side a little. Based on above all evidences it could be said that data set was not normally distributed. The result is very much similar to the findings of Patel, Raddia and Dhawan (2012). That study reflects negative skewness and high kurtosis value in the Asian Stock Market, but market does not follow normal distribution. Mobarek and Keasey (2000) in Dhaka Stock Market revealed a positive skewness of 0.04 and 0.09 kurtosis which implies non-normal distribution.

5.2 Unit Root Test

Unit Root Test is used to find out stationarity of the data set. When there is a trend or pattern in the data set, it should be removed before analyzing, as such patterns manipulate the actual behavior of data set. The study applied both Argumented Dickey Fuller (ADF) and Phillips Perron (PP) models to test the stationary of data set. ADF model helped to find out trends associate in the data set and makes the data free from such kind of trends. Identified trends were removed selecting both “Trend & Intercept” and “1st difference” option of the test. Following tables clearly indicates the findings of the test.

Table 2: Augmented Dickey Fuller Test Statistic

| | | t-Statistic | Prob. |
|--|-----------|-------------|-------|
| Augmented Dickey-Fuller test statistic | | -28.34 | 0.00 |
| Test critical values: | 1% level | -3.96 | |
| | 5% level | -3.41 | |
| | 10% level | -3.12 | |

According to Table 2, ADF test statistic was -28.34 and probability was less than the threshold 0.05. The result indicates that data set is stationary. Alternatively the stationary of the data set was further checked by t- statistics. As per the table, t- statistic of ADF test at 1%, 5% and 10% significance levels were greater than the respective critical values. Hence it can be concluded that Unit root test is statistically stationary. How long share price reflects the valuable information about the market is a critical information source for a rational investor, is tested by Lag differences of All Share Price Index in the study.

Table 3: ADF Test Lag Differences of Five Year ASPI

| Variable | t-Statistic | Prob. |
|---------------------|-------------|--------|
| ASPI - Constant | 2.44 | 0.0148 |
| - First Difference | 41.18 | 0.0000 |
| - Second Difference | -4.01 | 0.0001 |
| - Third Difference | -0.51 | 0.6036 |

According to the Table 3, first and second differences of ASPI were statistically significant however the third difference of ASPI was statistically insignificant at 0.05 percent level. It accentuate that share price information spreads over period of two days only.

Phillips Perron (PP) test is used to measure stationary of the data when distribution is not normal. According to the descriptive statistic it found that data set is not normal distributed during the period concerned, hence in order to come to a robust conclusion researcher conducted PP test also to explain the stationary of data set.

Table 4: Phillips Perron Test Statistic for Five Year ASPI

| | | Adj.t-Stat | Prob. |
|--------------------------------|-----------|------------|-------|
| Phillips-Perron test statistic | | -29.16 | 0.00 |
| Test critical values: | 1% level | -3.43 | |
| | 5% level | -2.86 | |
| | 10% level | -2.56 | |

As mention in the Table 4, the PP test statistic is -29.16 and probability is less than the threshold 0.05. The test also assured that data set is stationary during the period. Not only the test but also T- statistic conformed the result. As per the table, T- Statistic of the test at 1%, 5% and 10% significance levels were - 3.43, -2.86 and -2.56 respectively and those significant values were more negative than the critical level of the t-table, therefore it could be concluded that unit root is stationary. The above results indicated random walk model not presence in Colombo Stock Exchange during the selected sample period.

The study findings were matched with results of many studies which were based on emerging and developed countries stock market. A study conducted by Shaker (2013), in Finnish and Swedish Stock Market, found stationary market. According to the findings the ADF t-statistical values were -3.43, -2.86 and -2.56 at confidence level of 1%, 5% and 10% respectively. Further, Patel, Radadia and Dhawan (2012) conducted a study on Asian Stock Market, it found that market was stationary during the period, because ADF t-statistic values were -3.42, -2.86 and -2.56 at 1%, 5% and 10% confidence level as well as P value was 0.00. Shiller and Radikko (2014) found the stationary of Canadian Stock Market using ADF and PP tests.

5.3 Serial Correlation

Serial correlation is used to test whether there is an interrelationship between time cerise data or not (Nwosa and Oseni 2011). According to the test result presented in nd negative serial correlation. it found that ASPI lags were both positive and negative resulting investors not in a position to identify the direction of prices change. The result implied that there is no any autocorrelation among the data of the data set. It means that stock prices is independent and is not influenced by the prices of past. The result further accentuated that CSE does not follow the Random Walk Model. The findings were positively aligned with the result of many studies conducted by Abeyratna and Power (1995), Nwosa and Oseni (2011). According to the Abeyratna and Power (1995), CSE is not weak form efficient according to their serial correlation test result. Nwosa and Oseni (2011) also conclude that Nigerian Stock Market does not follow random walk model due to due to presence of positive and negative serial correlation.

Table 5: Serial Correlation

| Lag | AC | PAC | Q-Stat | Prob | Lag | AC | PAC | Q-Stat | Prob |
|-----|-------|--------|--------|------|-----|-------|--------|--------|------|
| 1 | 0.995 | 0.995 | 1193.0 | 0.00 | 19 | 0.879 | 0.008 | 20357. | 0.00 |
| 2 | 0.990 | -0.049 | 2373.9 | 0.00 | 20 | 0.872 | -0.023 | 21288. | 0.00 |
| 3 | 0.984 | -0.019 | 3542.3 | 0.00 | 21 | 0.865 | 0.008 | 22204. | 0.00 |
| 4 | 0.978 | -0.029 | 4697.6 | 0.00 | 22 | 0.858 | 0.003 | 23108. | 0.00 |
| 5 | 0.972 | -0.009 | 5839.8 | 0.00 | 23 | 0.852 | -0.007 | 23999. | 0.00 |
| 6 | 0.966 | -0.011 | 6968.6 | 0.00 | 24 | 0.845 | -0.017 | 24875. | 0.00 |
| 7 | 0.960 | -0.018 | 8083.8 | 0.00 | 25 | 0.838 | -0.030 | 25739. | 0.00 |
| 8 | 0.953 | 0.001 | 9185.4 | 0.00 | 26 | 0.831 | -0.010 | 26588. | 0.00 |
| 9 | 0.947 | -0.016 | 10273. | 0.00 | 27 | 0.823 | -0.005 | 27423. | 0.00 |
| 10 | 0.940 | -0.027 | 11347. | 0.00 | 28 | 0.816 | -0.033 | 28243. | 0.00 |
| 11 | 0.934 | -0.006 | 12406. | 0.00 | 29 | 0.808 | -0.007 | 29050. | 0.00 |
| 12 | 0.927 | -0.010 | 13451. | 0.00 | 30 | 0.801 | 0.004 | 29842. | 0.00 |
| 13 | 0.920 | -0.017 | 14481. | 0.00 | 31 | 0.793 | 0.003 | 30620. | 0.00 |
| 14 | 0.913 | -0.007 | 15496. | 0.00 | 32 | 0.786 | 0.003 | 31384. | 0.00 |
| 15 | 0.906 | -0.008 | 16497. | 0.00 | 33 | 0.779 | 0.008 | 32135. | 0.00 |
| 16 | 0.899 | 0.001 | 17483. | 0.00 | 34 | 0.772 | -0.004 | 32873. | 0.00 |
| 17 | 0.892 | 0.003 | 18455. | 0.00 | 35 | 0.764 | 0.003 | 33597. | 0.00 |
| 18 | 0.885 | 0.013 | 19413. | 0.00 | 36 | 0.757 | 0.014 | 34309. | 0.00 |

5.4 Variance Ratio

Variance ratio is one of widely applied test to identify the random walk model of a stock market exchange, Sarmat and Dima (2011), Patel, Radadia and Dhawan (2012). Resulting the study also applied the model to verify the findings of previous tests. When $VR > 1$ and returns are positively serial correlated or $VR < 1$ and returns are negatively serially correlated, at that time study can conclude market is inefficiency.

Table 6: Variance Ratio Test Result of Five Year ASPI

| Joint Tests | | Value | df | Probability |
|-------------------------|------------|------------|-------------|-------------|
| Max z (at period 16)* | | 6.40 | 1201 | 0.00 |
| Individual Tests | | | | |
| Period | Var. Ratio | Std. Error | z-Statistic | Probability |
| 2 | 1.20 | 0.04 | 4.60 | 0.00 |
| 4 | 1.41 | 0.08 | 5.10 | 0.00 |
| 8 | 1.72 | 0.12 | 5.77 | 0.00 |
| 16 | 2.13 | 0.17 | 6.40 | 0.00 |

According to the Table 6, every period variance ratios are greater than one and p values equal to zero and z statistic value also greater than one. If variance ratio and z-statistic value equal to one which will support to categorized market under weak form efficiency Patel, Radadia and Dhawan (2012). The result of Variance ratio and Z –statistic value greater than one and the values increase in all period which implies the chance of rejection become stronger. All findings support to conclude CSE market do not follow random walk model and CSE is not weak form efficient during the selected sample period.

The results of many previous studies aligned with the current findings of present research. According to Sarmat and Dima (2011), UK, USA and Japan stock market also were weak form inefficient as p value of VR test was equal to zero and Z value of the test was greater than 3. Patel, Radadia and Dhawan (2012) also used variance ratio test in Asian stock markets to test the weak form efficiency. The study found negative Z values for all selected Asian markets and it was statistically significant as p values less than 0.05 in considered period. Accordingly the study concluded that Asian market was weak form inefficient.

VI. Conclusion And Recommendation

Sri Lankan Stock market is the back bone of the Sri Lankan economy which facilitates to move fund from surplus unit to deficit unit through financial instruments. Stock market investors need necessary information to circulate funds efficiently and effectively among the sectors. Resulting, market efficiency is more valued by investors who are directly or indirectly involve to the stock market. If financial market is efficient, it provide accurate, timely information to investors, then none can earn abnormal profit through market. The main problem of the study is whether Sri Lankan share market is weak form efficient or not? Based on the research question, study sat main objective as to examine whether the Colombo Stock Exchange is an efficient in weak form sense. The study is significant for investors, intermediaries, company and regulatory bodies. The study mainly investigated the random walk model of CSE using Descriptive Statistic, Unit Root Test (ADF and PP model), Serial Correlation and Variance Ratio Test. The findings of the study accentuate that CSE does not follow Random Walk Model and is not Weak Form Efficient. The findings were supported by many previous studies (Samarakoon 2004, G.Abeyrathna, D. Power. 1995 and Fernando, P. N. 2012) According to the previous studies most of emerging countries are not efficient in weak form due to inefficient market characteristics such as thin and infrequent trading, lack of experience and low liquidity. Therefore responsible authorities should take necessary actions to increase the market performance.

Based on the study finding, it is recommended that government policy makers should take necessary steps to improve corporate disclosures in a timely manner. When government implement such kind of regulation company have a bond to disclose their information timely basis, resulting investors would be able to predict future price efficiently. On the other hand, government should impose new standards and regulations to improve the quality of financial reports disclosed by the listed companies. Further, government can reduce transaction cost of CSE to increase the level of efficiency. High transaction cost may lower investor's interest in large volume of transactions. Along with above recommendation the study highly recommends that CSE should apply new technology to improve the market efficiency in line with global market changers.

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