EVALUATION OF HIGHER MOMENT CAPITAL ASSET PRICING MODEL AND STOCK MARKET TECHNICAL EFFICIENCY WITH STOCHASTIC FRONTIER APPROACH

by

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(Md. Zobaer Hasan)

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LIST OF ABBREVIATIONS

ADF	Augmented Dickey-Fuller
AGM	Annual General Meetings
APT	Arbitrage Pricing Theory
BB	Bangladesh Bank
BO	Beneficiary Owner's
CAPM	Capital Asset Pricing Model
CBS	Circuit Breaker System
CCAPM	Consumption Based CAPM
CPD	Centre for Policy Dialogue
DEA	Data Envelopment Analysis
DFA	Distribution Free Approach
DGEN	DSE General Index
DSE	Dhaka Stock Exchange
DSE20	DSE20 Index
DS30	DSE30 Index
DSEX	DSE Broad Index
DSI	All Share Price Index
EFA	Econometric Frontier Approach
EPS	Earnings Per Share
FOK	Full Fill or Kill
GMM	Generalized Method of Moment
H-CAPM	Higher Moment CAPM
HML	High Minus Low

ICAPM	Intertemporal CAPM
ICB	Investment Corporation of Bangladesh
ICT	Information and Communication Technology
IFC	International Finance Corporation
IMF	International Monetary Fund
ICT	Information Technology
JB	Jarque-Bera
LR	Likelihood Ratio
MA	Moving Average
MDGs	Millennium Development Goals
MIC	Middle Income Country
MLE	Maximum Likelihood Estimates
MSA	Member's Server Application
OLS	Ordinary Least Squares
OTC	Over The Counter
P/E	Price/Earnings
PF	Partial Fill
PFAK	Partial Fill and Kill
S & P	Standard and Poor's
SEC	Securities and Exchange Commission
SFA	Stochastic Frontier Analysis
SMB	Small Minus Big
SML	Security Market Line
TESA	The Electronics Securities Architecture
TFA	Thick Frontier Approach

VR	Variance-Ratio
WB	World Bank
WEO	World Economic Outlook
WOSK	Without Coskewness and Cokurtosis
WSK	With Coskewness and Cokurtosis

LIST OF SYMBOLS

e_i	Random disturbance term
e_{it}	Random disturbance term at time *t*
e_p	Random disturbance term in the portfolio
e_{pt}	Random disturbance term in the portfolio at time *t*
k	Number of companies included in each portfolio
K	Kurtosis
$L(H_0)$	Value of the log-likelihood function under the null hypothesis
$L(H_1)$	Value of the log-likelihood function under the alternative hypothesis
n	Number of companies
p	Number of portfolios
P_i	Closing price of the individual company in the current month
P_{i-1}	Closing price of the individual company in the previous month
P_m	Closing price of the market index in the current month
P_{m-1}	Closing price of the market index in the previous month
$\bar{r}_i$	Average excess return of the individual company
R_i	Return of the individual company
$\bar{R}_i$	Average return of the individual company
$\hat{R}_i^{model}$	CAPM or H-CAPM forecast of return
$E(R_i)$	Expected return of the individual company
R_{it}	Return of the individual company at time *t*
R_f	Return of the risk free asset

R_{ft}	Return of the risk free asset at time *t*
R_m	Market return
R_{mt}	Market return at time *t*
$\bar{r}_p$	Average excess return of the portfolio
R_{pt}	Return of the portfolio at time *t*
$\overline{R}$	Average return for all companies
S	Skewness
TE_{it}	Technical efficiency level of the company at time *t*
U^2	Theil's measure
UR_i	Unique risk of the company
$\hat{UR}_i$	Estimated unique risk of the company
$\hat{UR}_p$	Estimated unique risk of the portfolio
U_{it}s	Inefficiency effects
V_{it}s	Random errors
X_{1it}	Market return of the individual company at time *t*
X_{2it}	Market capitalisation of the individual company at time *t*
X_{3it}	Book-to-market ratio of the individual company at time *t*
X_{4it}	Market value of the individual company at time *t*
X_{5it}	Coskewness of the individual company at time *t*
X_{6it}	Cokurtosis of the individual company at time *t*
x_{it}	1×*k* vector whose values are functions of inputs for the company
Y_{it}	Individual return
Adj. R^2	Adjusted coefficient of determination

Greek Letters

β	$k \times 1$ vector of unknown parameters
β_0	Constant term
β_1	Coefficient of market return
β_2	Coefficient of market capitalisation
β_3	Coefficient of book-to-market ratio
β_4	Coefficient of market value
β_5	Coefficient of coskewness
β_6	Coefficient of cokurtosis
β_i	Systematic risk or beta of the company
$\hat{\beta}_i$	Estimated systematic risk of the company
β_p	Systematic risk of the portfolio
$\hat{\beta}_p$	Estimated systematic risk of the portfolio
$\gamma_0, \gamma_1, \gamma_2, \gamma_3$	Parameter estimates
δ_i	Coskewness
$\hat{\delta}_i$	Estimate of the coskewness
κ_i	Cokurtosis
$\hat{\kappa}_i$	Estimate of the cokurtosis
λ	Likelihood ratio test statistic
σ_i^2	Variance for the return of the company
σ_m^2	Variance for the return of the market index
σ_p^2	Variance for the return of the portfolio

PENILAIAN MODEL PENENTUAN HARGA ASET MODAL MOMEN LEBIH TINGGI DAN KECEKAPAN TEKNIKAL PASARAN SAHAM DENGAN PENDEKATAN SEMPADAN STOKASTIK

ABSTRAK

Model Penentuan Harga Aset Modal (Capital Asset Pricing Model, CAPM) merupakan suatu input revolusi dalam teori kewangan. Ia menuntut keseimbangan perkaitan linear di antara pulangan yang dijangka dan risiko daripada sesuatu aset. Kesahihan teori CAPM telah diuji dan diterima. Namun demikian, kesahihannya secara praktikal masih dipersoalkan. Kebanyakan kajian tentang CAPM dan CAPM momen lebih tinggi (higher moment CAPM, H-CAPM) dijalankan di negara Barat. Namun demikian, terdapat hanya beberapa kajian sahaja yang dijalankan tentang pasaran Bursa Saham Dhaka (Dhaka Stock Exchange, DSE) Bangladesh, yang berfokuskan CAPM bukannya H-CAPM. Berdasarkan Standard and Poor's Emerging Stock Markets Fact Book 2000, DSE merupakan pasaran baru di Asia Selatan. Sehingga kini, tiada kajian yang mengukur kecekapan teknikal syarikat-syarikat yang tersenarai di pasaran DSE menggunakan faktor risiko yang diterbitkan daripada H-CAPM. Justeru, kajian ini bermula dengan ujian kesahihan CAPM bagi setiap syarikat serta portfolio mereka di pasaran DSE. Berdasarkan kajian ini, bentuk piawai CAPM atau min-varians CAPM ditolak dalam kedua-dua kes (setiap syarikat dan portfolio mereka) di pasaran DSE. Oleh itu, dalam usaha mencari model alternatif bagi menjelaskan perkaitan risiko pulangan daripada aset yang berisiko, maka min-varians CAPM diperluas dengan mengambil kira kepencongan dan kurtosis momen lebih tinggi. Keputusan menunjukkan bahawa pekali penentuan meningkat selepas momen lebih tinggi diambil kira. Di samping itu, jangkaan kadar pulangan didapati berkaitan dengan kokepencongan dan kokurtosis bersama, tetapi

tidak berkaitan dengan varians sistematik atau beta. Justeru, dapat dirumuskan bahawa H-CAPM adalah lebih utama berbanding min-varians CAPM dalam menjelaskan perkaitan risiko pulangan dalam konteks pasaran DSE. Akhirnya, kokepencongan dan kokurtosis yang diterbitkan daripada H-CAPM digunakan dalam Analisis Sempadan Stokastik (Stochastic Frontier Analysis, SFA) untuk menentukan kecekapan teknikal setiap syarikat serta kumpulan mereka di pasaran DSE. Justeru, dua jenis kecekapan teknikal telah diterbitkan: (1) kecekapan teknikal dengan kokepencongan dan kokurtosis (WSK), dan (2) kecekapan teknikal tanpa kokepencongan dan kokurtosis (WOSK). Seterusnya, kedua-dua jenis kecekapan teknikal ini dibandingkan. Dapatan menunjukkan bahawa analisis pertama menghasilkan kecekapan teknikal yang lebih utama bagi kedua-dua kes: setiap syarikat dan kumpulannya di pasaran DSE. Kajian ini mempunyai nilai tambah dengan menentukan kecekapan teknikal setiap syarikat serta kumpulan mereka menggunakan sumbangan daripada faktor risiko, yang diterbit daripada H-CAPM. Didapati juga bahawa pautan atau kaitan di antara CAPM dan SFA wujud dalam pasaran DSE Bangladesh. Dapatan kajian ini dan perkembangannya mungkin boleh diaplikasikan kepada pasaran saham baru yang lain, dalam konteks yang sama seperti pasaran DSE. Akhir sekali, analisis ini boleh digunakan sebagai suatu rujukan penanda bagi penyelidikan yang bakal dijalankan pada masa depan.

EVALUATION OF HIGHER MOMENT CAPITAL ASSET PRICING MODEL AND STOCK MARKET TECHNICAL EFFICIENCY WITH STOCHASTIC FRONTIER APPROACH

ABSTRACT

The Capital Asset Pricing Model (CAPM) is a revolutionary input in financial theories. It postulates an equilibrium linear relationship between expected return and risk of an asset. The theoretical validity of CAPM is well-tested and accepted but the practical validity of CAPM is still in question. Several studies on CAPM and higher moment CAPM (H-CAPM) have been conducted in Western countries. However, only a few studies have been conducted on the Dhaka Stock Exchange (DSE) market of Bangladesh, which is based on CAPM but not H-CAPM. According to Standard and Poor's Emerging Stock Markets Fact Book 2000, the DSE is a frontier emerging market in South Asia. To date, no studies have measured the technical efficiencies of companies listed in the DSE market using risk factors derived from H-CAPM. Therefore, this study began with a validity test of the CAPM for individual companies and their constructed portfolios of the DSE market. Based on the present investigation, the standard form of CAPM or mean-variance CAPM was rejected in both cases (individual companies and portfolios) of the DSE market. That is why, to search for an alternative model to explain the risk-return relationship of risky assets, the mean-variance CAPM was extended by taking higher moments: skewness and kurtosis. The results showed that the coefficient of determination increased after inclusion of the higher moments. And, the expected rate of return was related to the coskewness and cokurtosis, but not to the systematic variance or beta. Therefore, the H-CAPM is superior to the mean-variance CAPM in explaining the risk-return relationship in the context of DSE market. Finally, the coskewness and cokurtosis

which were derived from the H-CAPM were used in the Stochastic Frontier Analysis (SFA) to find the technical efficiencies of the individual companies and their groups of the DSE market. Thus, two types of technical efficiencies were derived: (1) technical efficiency with coskewness and cokurtosis (WSK) and (2) technical efficiency without coskewness and cokurtosis (WOSK). Then, these two types of technical efficiencies were compared in this study. This study observed that the former analysis yielded superior technical efficiency for both cases: individual companies and their groups of the DSE market. This study has added value by finding the technical efficiencies of the individual companies and their groups using the contribution of risk factors, which are derived from the H-CAPM. Also, the link between H-CAPM and SFA is established in the DSE market of Bangladesh. The findings of this study and development may be applied to other emerging stock markets in similar contexts like DSE market. Finally, this present analysis would be used as a benchmarking reference for future research.

CHAPTER 1

INTRODUCTION

1.1 Background of Study

The stock market is an important part of a country's economy. According to Blake (2000), a stock market creates liquidity, improves international trade, accumulates wealth of investors and helps economic agents to make more accurate forecasts of future development of a country. Also, Toporowski (2000) mentioned that stock market supports the country's economic development and progress by encouraging the efficiency and profitability of firms.

Emerging stock markets are generally known as the stock markets of the developing countries whose industrial and financial infrastructures are in a grooming stage (Hamid & Hasan, 2011). According to Mustafa and Nishat (2007), the globalization of financial markets has increased the interest of investors in emerging markets. This thesis focuses on the Dhaka Stock Exchange (DSE) market of Bangladesh. DSE is not only the country's oldest stock exchange, but also one of the frontier emerging stock markets of South Asia (Islam & Khaled, 2005). Moreover, when most of the world stock markets collapsed at the time of global financial crisis in 2008, the stock prices of DSE market showed increasing trend (Mollik & Bepari, 2011). The reasons behind were, DSE was isolated from the global financial markets and Bangladesh Bank (BB) took prompt actions to safeguard the banks and other financial institutions of Bangladesh from this crisis (DSE, 2009). Uddin and Khoda (2009) declared that DSE has significant implications for the performance of the financial sector, and even the economy. Since the development of the capital market is of critical importance for the economic growth of a country, understanding the DSE

market is necessary for a greater understanding about Bangladesh economy. According to Hassan and Chowdhury (2008), a stock market that is well-functioning, can support a developing country like Bangladesh.

In practice, the stock market is an extremely exciting place, which attracts people like entrepreneurs, specialists, administrators, workers, retired persons, vendors as well as housewives. Some of these people have the knowledge of investing while others are ignorant about the stock market. But their sole aims are to maximize the stock returns. Over the years, financial researchers have established a number of capital asset pricing models in the literatures that try to value the asset returns for the investors of stock markets. The examples of such models are as follows: the Capital Asset Pricing Model (CAPM) by Sharpe (1964) and Lintner (1965), Merton's (1973) Intertemporal CAPM (ICAPM), Ross's (1976) Arbitrage Pricing Theory (APT), the Consumption Based CAPM (CCAPM) of Lucas (1978) and Breeden (1979), and so on. Of the various capital asset pricing models, the Sharpe-Lintner CAPM is the most prominent and widely used in both academic and practitioner fields (So, 2006). That is why; sometimes this model is called standard CAPM and it is one of the most important developments in the finance literature (López, Marhuenda, & Nieto, 2009).

CAPM is a model that explains an association between risk and expected return. Under CAPM, stock returns are assumed to be normally distributed. A number of researches (e.g., Bekaert, Erb, Harvey, & Viskanta, 1998; Brown & Matysiak, 2000; Hwang & Satchell, 1999) suggested that the distributions of stock returns are not normal. Bekaert et al. (1998) found that stock returns are not normally distributed in most of the emerging country's stock markets. Brown and Matysiak (2000) mentioned that usually a fat tailed and more peaked distribution (a value for the

kurtosis that exceeds 3) than a normal distribution is found in the stock returns. The study of Hwang and Satchell (1999) gave the importance of higher moments because of getting highly misleading results about the standard CAPM or mean-variance CAPM. Their study claimed that the higher moments should be considered in interpreting a gap between theory and reality in the capital asset pricing literature. This shortcoming can be removed by investigating the validity of two-moment CAPM and higher moment CAPM (H-CAPM) and comparing them.

1.2 Problem Statement

Actually, CAPM is a well-known theory in the western financial world. Various forms of CAPM had been widely investigated for the developed stock markets (e.g., USA, Europe and Australia) and to a smaller volume of the emerging stock markets (Mollah, 2007). Furthermore, Ali, Islam, and Chowdhury (2010) commented that due to the absence of proper validity test of this well-tested pricing model, the practices of CAPM in the emerging stock markets are rare. Since the economy of Bangladesh is still emerging and the capital market is still at a stage of development, the validity tests of asset pricing models are very important (Hassan & Chowdhury, 2008). A sound and well-tested pricing model can contribute more to the emerging markets for their sound operation (Ali et al., 2010). The investors, management, policy makers, investment companies, consultants, regulators of the emerging markets can be guided by a sound pricing model.

In the context of Bangladesh stock market, only a few studies are related to CAPM (e.g., Alam, Alam, & Uddin, 2008; Ali et al., 2010; Mollik & Bepari, 2010) but not to H-CAPM. In addition, the relevant literature survey in Chapter 2 indicates that

there seems to be no literature on the topic of measuring the technical efficiency of the companies listed in the DSE market of Bangladesh. Moreover, as per available literature, no study has been conducted so far to measure technical efficiency of companies by using the risk factors which are derived from H-CAPM. The shortage of research in a less developed market like the Bangladesh stock market has encouraged to conduct this study to contribute to the finance literature.

Hence, this research will not only be limited to the empirical tests of the CAPM and H-CAPM, but it will also make a significant contribution to the scarcity of the research (viz., less study of other asset pricing models, no study of H-CAPM and technical efficiency) into the Bangladesh financial market by developing a relation between H-CAPM and Stochastic Frontier Analysis (SFA). Thus, this thesis will offer a new research avenue in the finance literature. Since DSE is a representative of the emerging stock markets, the findings of this thesis may be applied to the other emerging stock markets.

1.3 Research Aim and Objectives

From a theoretical viewpoint, the main aim of this research is to establish a relation between H-CAPM and SFA for finding the technical efficiencies of the individual companies and their respective groups of the DSE market. To meet this main goal, the following three objectives are considered:

(i) To verify whether the CAPM keeps true in the individual companies and their constructed portfolios of the DSE market in Bangladesh.

(ii) To investigate whether the H-CAPM could present a better explanation than the CAPM for the stock return of the DSE market and whether the coskewness and cokurtosis of H-CAPM has any effect on the asset return of a company.

(iii) To test the technical efficiencies of companies and their respective groups of DSE market by using the SFA approach. Here, the coskewness and cokurtosis of H-CAPM will be used in SFA for finding the technical efficiency.

1.4 Significance of Research

After examining the validity of the CAPM, the outcomes are remarkable for finance directors in Bangladesh who are concentrating to use the CAPM in their decision making.

This study will show that the H-CAPM is better at explaining the stock returns than the CAPM in the DSE market. The findings of this research can help investors to finalize their investment decision and supply the benchmark model to evaluate the stock returns.

This study provides technical efficiencies of the stocks, which will help the financial managers as well as the investors to understand the real activity of the stocks.

1.5 Scope of Study

The scope of the study is limited to the Bangladesh stock market. No attempt is made to do a comparison study with other emerging stock markets (viz., India, Malaysia, Pakistan, Philippines, Singapore, Sri Lanka, Thailand, etc.). The study covers the

period from January 2002 to December 2011. Eighty companies from DSE market are used in this study. The companies cover a wide range of the nonfinancial sectors, which are as follows: Engineering, Food & Allied Products, Fuel & Power, Textiles, Pharmaceuticals & Chemicals, Service & Real Estate, Cement, Tannery Industries, Ceramic Industry and Miscellaneous. The risk-return relationship of DSE market is tested using the framework of asset pricing models: CAPM and H-CAPM. A parametric approach, SFA is used for finding the technical efficiency of the companies of DSE market. Therefore, by getting the technical efficiency results, investors can come to know whether the efficiency scores are stable or not. Some of these results would help to understand better the dynamics of operative performances of the stocks in the DSE market.

1.6 Structure of Thesis

The plan of this section is to give a general sketch of the thesis. This thesis is organized as follows:

Chapter 1 provides a general description of the study. It has the background, problem statement, objectives of the thesis, significance and scope of the study. Apart from this introductory chapter, there are five other chapters in total.

Chapter 2 delivers a brief description of market statistics, history of the market establishment and a literature survey on the DSE market in Bangladesh.

Chapter 3 analyses and estimates the performance of the individual companies and their constructed portfolios in a CAPM framework. This chapter also provides

previous researches that are relevant to the CAPM, describes the methodology, gives the results and draws the conclusion.

The objective of Chapter 4 is to examine the H-CAPM of the DSE market by using the same companies used in Chapter 3.

Chapter 5 presents and discusses the contribution of coskewness and cokurtosis of H-CAPM to find the technical efficiencies of the individual companies and their respective groups of the DSE market using SFA.

Finally, Chapter 6 concludes the research by briefly reviewing the objectives and the findings of study and provides suggestions for possible future research.

CHAPTER 2

BACKGROUND OF DHAKA STOCK EXCHANGE MARKET

2.1 Introduction

Chapter 2 starts by giving a brief description of some statistics of the DSE market (e.g., position, performance, market capitalisation, movement of indices, fluctuations of return), in an attempt to achieve some initial insights into the nature of the DSE market. Then, market establishment history of DSE is discussed, which is finally followed by some important terminologies and literature survey of the DSE market.

2.2 Some Statistics of DSE Market

In this section, some statistics of the DSE market are discussed.

2.2.1 Position of DSE Market

Bangladesh is a developing country of the third world. Bangladesh economy is going forward to use all its possibilities, leaving behind the problems**.** A developing country like Bangladesh has become a role model of economic resilience. International agencies like the World Bank (WB) has admitted that the Bangladesh economy did not collapse despite economic crisis of the Euro Zone. According to World Economic Outlook (WEO) of International Monetary Fund (IMF), Bangladesh ranked 35th among 150 countries of the world as far as growth forecast is concerned. Bangladesh is one of the countries among the 16, which successfully attains the Millennium Development Goals (MDGs) 2015 of United Nations. Due to this resounding success of Bangladesh, the World Bank believes Bangladesh has all

the qualities to become a Middle Income Country (MIC) by 2021. Bangladesh stock market that is DSE market, is working to expedite such progress of Bangladesh (DSE, 2012).

The position of the DSE market as compared to some other emerging stock markets of Asia is shown in Table 2.1. The total market capitalisation of DSE stands at US$ 29839.30 million in the year 2012. The total turnover of all the listed securities on the DSE market has stood at US$ 19501.65 million in 2012. The market index of DSE stands at 4219.31 on 2012. The size (market capitalisation) and index is relatively low in comparing to other Asian countries' stock markets, but the turnover ratio is reasonably high.

Table 2.1

Comparative Study of Emerging Stock Markets (As on 2012)

Market	Index	Market cap. US$ (in mn)	Turnover US$ (in mn)	% of GDP
Sri Lanka	5643.00	16974.00	1679.10	28.40
Bangladesh	4219.31	29839.30	19501.65	26.27
Pakistan	16943.19	43443.71	11251.77	18.85
India	19426.71	1263335.50	110345.90	64.89
Philippines	5812.73	229316.60	34783.10	95.28
Malaysia	1688.95	466587.60	124332.90	151.89
Singapore	3167.08	765078.00	256055.90	285.54
Thailand	1391.93	389756.30	235168.10	103.39

Note. From the DSE website: http://www.dsebd.org/

2.2.2 DSE Market Performance

The last five year's performances of the DSE market in terms of listed securities, market index and market capitalisation are shown in Table 2.2. As of 2008, in the DSE market, there are 412 listed securities with a market capitalisation of Taka (or Tk. currency of Bangladesh) 1043.80 billion. The number of listed securities shows a

significant increase during the period. The DSE General Index (DGEN) has increased from 2795.34 points in 2008 to 8290.41 points in 2010, and then fallen to 5257.61 points on 2011. Finally, the index ends with 4219.31 points on 2012. Due to the downtrend of the market, market capitalisation of DSE goes down to Tk. 2403.56 billion in 2012 which was Tk. 2616.73 billion in 2011.

Table 2.2

Performance of DSE (2008-2012)

Indicators	2008	2009	2010	2011	2012
Listed securities	412	415	445	501	515
Index (DGEN)	2795.34	4535.53	8290.41	5257.61	4219.31
Market capitalisation (Tk. in billion)	1043.80	1903.23	3508.01	2616.73	2403.56

Note. From the DSE website: http://www.dsebd.org/

2.2.3 Scenario of DSE Market Capitalisation

For the last five years (2008-2012), the picture of the DSE market in terms of market capitalisation by month is shown in Figure 2.1. The market capitalisation of all the listed securities in the DSE market increases over the period of 2008 to 2010 but from the year 2011 the trend starts to decrease. The market capitalisation has risen to a record high to Tk. 3371.00 billion in October 2010. However, the market capitalisation at DSE stands at Tk. 2508.80 billion in 2012 against Tk. 782.60 billion in 2008 and in comparison, the market capitalisation rises by 220.27 percent with the amount of Tk. 1726.20 billion.

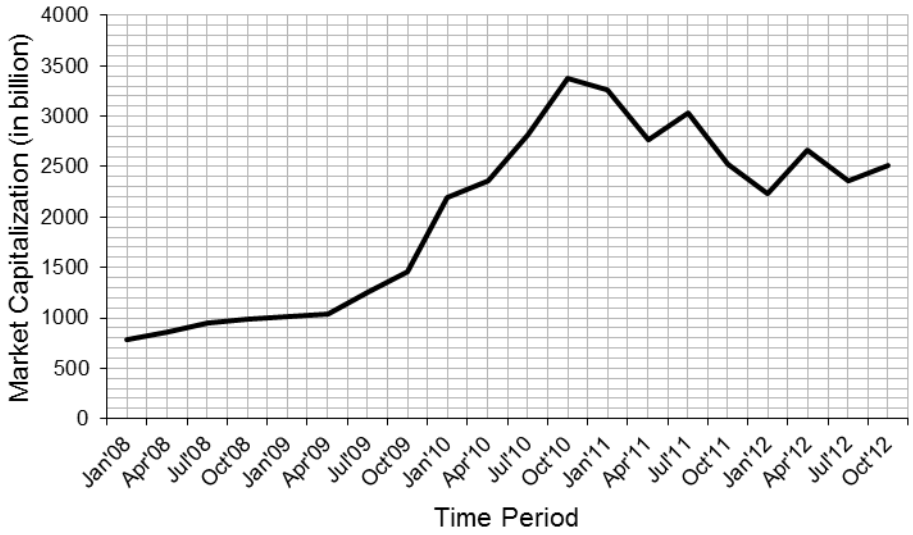

Figure 2.1. Scenario of market capitalisation (2008-2012)

2.2.4 Movement of DSE Indices

The movement of three market indices (by month) of the DSE market for the last five years is shown in the Figure 2.2. The two indices namely, DGEN index and All Share Price Index (DSI) start to increase from April 2009 to October 2010. The other index, DSE20 Index (DSE20) also starts to increase in April 2009 but stop increasing on January 2011. During the period, DGEN index reaches its peak to 7957.12 on October 2010 and bottom to 2554.36 in April 2009. Similarly, DSI index reaches its peak 6612.14 points on October 2010 and its bottom on April 2009 with the points 2119.85. In the year January 2011, DSE20 index reaches its peak to 4701.74 and its bottom to 1976.85 in April 2009. After reaching the peak, all three indices start to decrease slowly until the month of July, 2012 and after that they start to increase again.

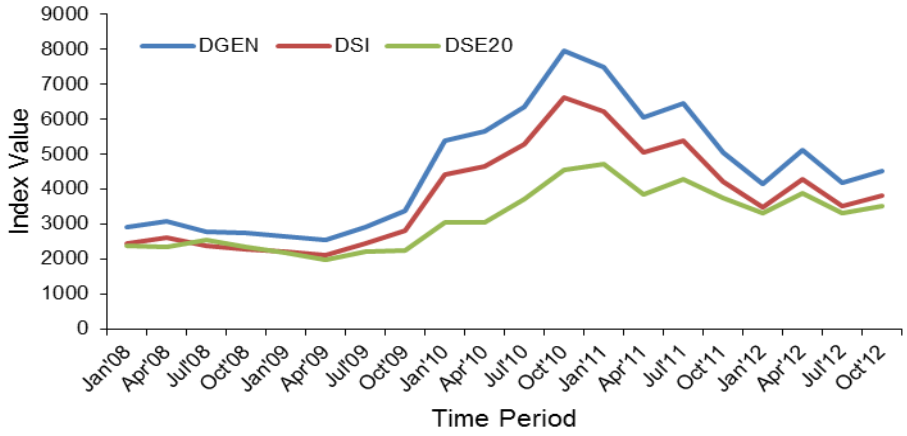

Figure 2.2. Movement of DSE indices (2008-2012)

2.2.5 Fluctuations of DSE Market Return

The fluctuations of monthly market return series of the DSE for the period of 2000-2012 are shown in Figure 2.3. During the period, DSE market has experienced noticeable fluctuations, especially in the year of 2005, 2008 and 2011. The highest return is achieved in November 2009 (Return = 0.2545) and the lowest return is achieved in February 2011 (Return = -0.3616).

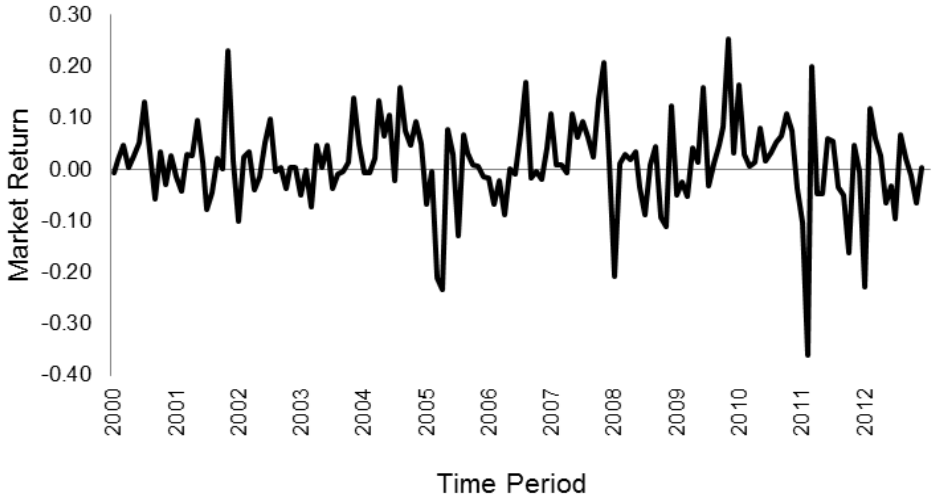

Figure 2.3. Fluctuations of market return series (2000-2012)

2.3 Establishment History of DSE Market

On April 28, 1954 DSE was initially included as "East Pakistan Stock Exchange Association Limited" and then was renamed as "Dhaka Stock Exchange Limited" on May 14, 1964 (Hassan & Chowdhury, 2008). The service of the Exchange continued successively until 1971. On December 16, 1971 the trading was suspended because of the new state policy. The trading was resumed on August 16, 1976 with the adjusted economic policy of the government. Initially, DSE had 9 listed securities with total paid-up capital of Tk. 137.52 million (Uddin & Khoda, 2009). The actual growth of the market has started since 1983 and the market capitalisation was Tk. 812 million at that time (Chaity & Sharmin, 2012). Recently, the number of listed securities was 515 with market capital Tk. 2403.56 billion (DSE website: http://www.dsebd.org/). To control the operation of the DSE market, the regulator body "Securities and Exchange Commission (SEC)" was established on June 8, 1993. After the establishment of the SEC, public interest rose to invest in the capital market because of investment friendly rules and regulations. Moreover, foreign portfolio investment started to stream due to favourable regulatory conditions. Furthermore, to control the unusual price changes, a Circuit Breaker System (CBS) was formed in the DSE market after the year 1996. Under this CBS, share prices on a day is bound by a specified cut off (upward and downward) around the yesterday's closing price (Islam & Khaled, 2005). Next, DSE replaced the traditional trading system by the automated online trading system on August 10, 1998 and the government reformed the regulations of SEC to ensure transparency in the market (Mollah, 2009). DSE upgraded its automated online trading system and infrastructure on August 21, 2005. Finally, to meet the potential growth of the trades and more transparency in the market, DSE launched a web based trading software "Member's

Server Application (MSA Plus)" on June 10, 2012. Through "MSA Plus", investors can get the latest information about their equity or shares and can sell/buy shares from any corner of the world (DSE website: http://www.dsebd.org/).

Now, the market is relatively more translucent due to self-regulation by the DSE and close monitoring by the SEC (Islam & Khaled, 2005). Therefore, DSE is tirelessly trying to make the securities market an efficient reliable organization, which will be capable of meeting the challenges of the economic reality of the country and will make the capital market as the centre for economic development of the nation.

2.4 Market Crash in 1996 and 2010

In 1996, a group of brokers, foreign portfolio managers and sponsors of listed companies manipulated stock prices of the market. Within five months, the DSI index crossed 3600 points (DSI: 3627.02 points on November 16, 1996) from less than 1000 points (DSI: 927.29 on June 16, 1996). The market Price/Earnings (P/E) ratio of all the listed securities reached to the level of 66.5 within that short period. Thereafter, at the end of 1996, the market experienced a first major crash (Rion, 2012). A few national and foreign investors received a huge profit, whereas the general public faced a huge loss (Uddin & Alam, 2007). After the year 1996, very few companies dared to trade in the market as they believed that they would not be able to sell their common shares at fair prices (Musa & Faruqui, 2005).

After the 1996 turmoil, DSE experienced another crash in 2010. The scenario of the stock market crash in 2010 was different from the crash in 1996 (Saha, 2012). On December 2009, the number of Beneficiary Owner's (BO) account holders was 1.25 million in the DSE market, whereas on December 2010 the total number reached to

3.21 million because of investment friendly environment in the DSE market (Centre for Policy Dialogue [CPD], 2011). Most of these new investors did not have enough knowledge about the stock market but invested most or all of their savings in the market. Furthermore, the SEC was not capable to monitor the market conditions properly during that period. Due to the poor monitoring and market surveillance, share prices of small companies increased dramatically (Raisa, 2011). Bhuiyan (2010) stated that the last glorious day of the year 2010 for the investors in the Bangladesh stock market was on December 5, 2010. On that day, DGEN index gained its all-time highest 8918.51 point and broke all old records of DSE (Bhuiyan, 2010). In addition, he mentioned that on December 19, 2010 DSE witnessed its biggest one day fall in the 55 year history with losing 551.76 points.

Recently, the government has taken a number of initiatives to address the turmoil of the DSE market and regain the public confidence. In addition, it is expected that these initiatives will bring back stability in the market (Ministry of Finance [MOF], 2013):

(i) Steps have already been taken to identify the problems of the book building method and to make correction of the system.

(ii) In order to separate the ownership, management and trading of stock exchange, the process of demutualisation in DSE has begun.

(iii) Necessary refinement and correction have been made in the "Merchant Banker and Portfolio Manager Regulation" to ensure further transparency, accountability and expeditious functions of the merchant banks.

2.5 Management Body of DSE

The DSE board comprises of 25 members of whom 12 are elected through direct election from the 230 shareholders of DSE. The remaining 13 board members are:

- One executive director of BB
- One managing director of Investment Corporation of Bangladesh (ICB)
- One member representing investors in listed securities
- One member representing listed issuer companies
- The remaining nine members are selected from the elite and other distinguished persons who are not associated either with the DSE or with any of its members (Bhuiyan, Islam, & Salma, 2007).

2.6 Some Important Terminologies of DSE Market

There are some important terminologies which need to be addressed in understanding the DSE market. Short discussions of these terminologies are given in this section.

2.6.1 Types of DSE Market

In DSE, there are four types of market. They are as follows:

(i) Public Market is the market where securities are traded in a normal volume.

(ii) Spot Market is especially for the spot transactions which should be established within 24 hours. In the Public and Spot market, securities are transacted through automatic matching.

(iii) Block Market is the market where securities are traded in bulk volume (Tk. 0.5 million or above).

(iv) The odd Lot Market is the market where odd lots of all securities are traded in this market. In the block market and odd lot market securities are traded through pick and fill basis. All transactions in these four markets are done by the trading software called “The Electronics Securities Architecture (TESA).”

2.6.2 Listed Securities in DSE Market

In December 2012, the total number of listed securities in the DSE market including mutual funds, debentures and bonds (treasury and corporate) are about 515. Among the 515 listed securities, there are Mutual Funds (41), Debentures (8), Treasury Bonds (221) and Corporate Bonds (3). The remaining 242 securities are divided into 18 sectors: Bank, Cement, Ceramics, Engineering, Financial Institutions, Food and Allied, Fuel and Power, Insurance, IT, Jute, Miscellaneous, Paper and Printing, Pharmaceuticals and Chemicals, Services and Real Estate, Tannery Industries, Telecommunication, Textile, and Travel and Leisure.

2.6.3 Categorisation of DSE Shares

To give a clear information to the investors regarding the securities, DSE classified all the listed securities into the five groups, such as A, B, G, N and Z. “Group A” and “Group B” were introduced on July 2, 2000 and “Group Z” came into effect on the market on September 26, 2000. Furthermore, DSE introduced another group “Group G” on August 08, 2002. The newest group, “Group N”, was launched on July 3, 2006. Among the 515 listed securities, there are 474 securities in A category, 18 securities in B category, 0 securities in G category, 6 securities in N category and 17 securities in Z category.

“Group A” companies make the Annual General Meetings (AGM) regularly and declare dividend 10% or more of Earnings Per Share (EPS) in an English calendar year. On the other hand, “Group B” companies make the AGM regularly but offer dividend less than 10% of EPS in a calendar year. The companies which are unsuccessful to hold the AGM or failed to announce any dividend or which are not in action consistently for more than six months or whose accumulated loss after adjustment of revenue reserve is negative, are categorised in “Group Z.” “Group G” companies are those which are “Greenfield (undeveloped)” companies. All recently listed companies except “Greenfield” companies are categorized in “Group N.”

2.6.4 Different Types of DSE Indices

There are three indices in the DSE market. The DSI index comprises all the listed securities of the DSE. The index calculation started on September 16, 1986. After that, the index was recalculated based on the International Finance Corporation (IFC) formula on November 01, 1993.

The DGEN index contains all companies excluding the “Group Z” companies. It is computed on the principle of price movement of individual stocks. It was introduced in the market on November 27, 2001.

DSE20 index consists of frontal 20 shares with a base index of 1000. To formulate this index, the criteria of market capitalisation, free float, dividend and liquidity are taken into account. The journey of DSE20 index was started in the market on January 01, 2001.

Very recently, DSE introduces two new indices on January 28, 2013 based on free float and Standard and Poor's (S & P) methodology. They are known as the DSE Broad Index (DSEX) and DSE30 Index (DS30). DSEX index is the benchmark index of the market and represents 97% of the total market capitalisation. DS30 index constructs with 30 leading companies which can be said as an investable index of the DSE. It reflects 51% of the total market capitalisation (DSE website: http://www.dsebd.org/ and SEC website: http://www.sec.gov.bd/).

2.7 Trading Features of DSE Market

2.7.1 Trading Day and Trading Period

The trading is open on all days except bank holidays (Friday and Saturday) and other government holidays. The trading period is in between 10.30 AM to 2.30 PM on all trading days.

2.7.2 Trading Sessions

There are four sessions of the trading period and they are as follows:

(i) Enquiry: In this session, brokers can log on to the system. No order is submitted and no trade is executed during this session. Only previous orders can be withdrawn in this session.

(ii) Opening: In this session, all buy and all sell orders are compared and the opening prices of the shares are calculated. No trades are executed in this session.

(iii) Continuous Trading**:** During this phase, participants enter orders and immediate execution takes place based on the best price.

(iv) Enquiry: In this session, closing prices are calculated and disseminated to market participant. The market is to be closed in this session.

2.7.3 Types of Transactions

Orders are grouped based on the price, volume and validity. Based on price, there are two types of orders: Limit order and Market order. Limit order must have a price limit which ensures that the order shall be traded at the price equal to or better than the limit price. Market order is the order to be executed at the touchline price (the highest price that a buyer of a particular security is willing to pay and the lowest price at which a seller is willing to sell, at a given time in the trading day). If there is no touchline price then the market order shall be rejected.

Based on volume, there are three types of orders: Partial fill (PF), Partial fill and kill (PFAK) and Full fill or kill (FOK). The PF order signifies that as much as possible, the order quantity shall be executed as soon as the order is submitted to the trading engine. If the order is not fully executed, the remaining order quantity shall be stored and visible to the market. The PFAK order signifies that as much as possible the order quantity shall be executed as soon as the order is submitted and the remaining order quantity shall be returned to the trader who entered the order. A full fill or kill (FOK) order signifies that either all of the order quantity shall be executed as soon as the order is submitted to the trading engine or the entire order shall be rejected and returned to the trader.

Based on validity, there are two types of orders: Good till day (all orders shall be valid till the end of the current trading day) and Good till date (trader can specify the date till which the order should remain active in the market).

2.8 Studies Related to DSE Market

Many researches have been done regarding the emerging stock markets (e.g., for Nigerian stock market, Agwuegbo, Adewole, & Maduegbuna, 2010; for Malaysian stock market, Angabini & Wasiuzzaman, 2011; for Taiwan stock market, Chiang, Lai, & Lee, 2004; for Iranian stock exchange, Oskooe, 2010; for US stock market, Ravichandran & Bose, 2012; for French stock market, Rhaiem, Ammou, & Mabrouk, 2007; for Istanbul stock exchange, Senol & Ozturan, 2008) but, studies related to the Bangladesh stock market are few, which are discussed in this section.

2.8.1 Stock Market Efficiency

Fama (1965) defined stock market efficiency as a market in which stock prices always fully reflect all the available information. There are three forms of stock market efficiency: weak-form, semi-strong form and strong-form (Fama, 1965). He mentioned that the price of a security reflects all available information on past prices in a weak-form efficient market, whereas in a semi-strong form of efficient market, prices reflect all publicly available information. In addition, prices reflect privately available information with the information on past prices and publicly available information in the strong-form of efficient market. In an efficient market, market prices incorporate all information rationally and instantaneously (Uddin & Khoda, 2009) and any abnormal price changes should not be predictable (Islam & Khaled,

2005) in that market. Mobarek and Keasey (2000) commented that the stock markets in developing and less developed countries are not efficient in the semi-strong form or strong-form. They mentioned the reasons are: absence of sufficient data in a convenient form, inadequate regulations and lack of supervision. That is why researchers tested the weak-form efficiency of the DSE market rather than the semi-strong form and strong-form efficiency (Mobarek & Keasey, 2000). This section discusses a review of previous studies that addressed the weak-form efficiency of the DSE market.

Alam, Hasan, and Kadapakkam (1999) studied the market efficiency of five Asian stock markets (viz., Bangladesh, Hong Kong, Malaysia, Sri Lanka and Taiwan) by applying a nonparametric test: variance-ratio (VR) test to monthly stock index returns for the period of 1986 to 1995. In the case of Bangladesh stock market, they found that the monthly stock index return series shows a random walk which implies the existence of weak-form efficiency in the market. On the other hand, using both the nonparametric test (runs test) and parametric test (autocorrelation test) to the daily stock index returns for the period of 1988 to 1997, Mobarek and Keasey (2000) checked the weak-form efficiency of the DSE market. The results of their study provided evidence that the daily stock index return series does not follow the random walk model and suggested that DSE market is not weak-form efficient. Also, some other researchers (e.g., Mobarek, Mollah, & Bhuyan, 2008; Rahman & Hossain, 2006; Uddin & Alam, 2007) indicated the absence of weak-form efficiency in the DSE market. Hussain, Chakraborty, and Kabir (2008) tried to measure the efficiency of the DSE market by using the Moving Average (MA) method. They found that the level of inefficiency in the DSE market is reducing after the market crash in 1996, but not efficient enough at its weak form. So, they proposed certain

recommendations which can increase the efficiency of the market such as: confirming asymmetric information among all the investors, appropriate implication of the rules of the regulatory commission and announcing sophisticated means of investment. Uddin and Khoda (2009) investigated the randomness of the market by applying the unit root test and Augmented Dickey-Fuller (ADF) test to the stock price indices: DSI, DGEN and DSE20. They found that all the three indices do not follow the random walk model. Finally, they concluded that the reasons for the nonrandomness of the market are: poor institutional infrastructure, weak regulatory framework, lack of supervision, poor system of corporate governance, sluggish advancement of the market structure and lack of transparency of market transactions. Recently, Chaity and Sharmin (2012) tested the market efficiency by using the daily data of the indices DSI and DGEN. The results of their study indicated that the return series of both indices are not weak-form efficient, which meant that the investors cannot achieve a true return by possessing a well-diversified portfolio in the DSE market.

Some researchers found mixed results in terms of market efficiency in the DSE market. For example, Islam and Khaled (2005) applied the Box-Pierce test and found the weak-form efficiency in the DSE market after the market crash period in 1996 but not in the pre-crash period. They explained that the reason of finding weak-form efficiency may be due to the steps taken by the SEC after the crash to promote transparency in the stock market. Hassan and Chowdhury (2008) used the serial correlation coefficient test, Dickey-Fuller test, runs test and variance ratio test for testing the efficiency of the DSE market. They concluded that DSE is weak-form efficient in the portfolio context but inefficient in the individual company context. This implied that stock returns are expectable in case of individual companies and

investors can employ trading tactics to make unusual gain. Nisar and Hanif (2012) used runs test for studying the market efficiency of the DSE market and found that the weekly and monthly stock index return series support market efficiency while in the case daily stock index return series, the market is inefficient.

2.8.2 Validity of CAPM

According to the definition of the CAPM (Lintner, 1965; Mossin, 1966; Sharpe, 1964), the validity conditions of the CAPM are: the intercept term should not be significantly different from zero and the coefficient of beta should be positive and significant.

There are few studies about the validity testing of CAPM in the DSE market. For example, Alam et al. (2008) investigated whether or not the CAPM is working in the DSE market. For this purpose, they used the daily data of market index returns and individual company's returns for the period of 1994 to 2005 and found that CAPM is not working in the market. Next, Ali et al., (2010) tested the validity of the CAPM in the market. They concluded the invalidity of CAPM because of the finding of nonlinear relationship between risk and return and not finding beta as a complete measure of risk. Mollik and Bepari (2010) examined the nature of instability of CAPM's beta and found that beta volatility rises with a rise in holding (sample) periods. They mentioned that the evidence of beta instability indicates that investors should also consider the time-varying nature of beta in the case of the developing markets like DSE.