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The Size and Value Effect to Explain Cross-Section of Expected Stock Returns in Dhaka Stock Exchange

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Abstract

This paper mainly studies the size and value effect to explain cross-section of expected returns in Dhaka Stock Exchange (DSE) in Bangladesh. Using the well-known Fama and French (1993) three-factor methodology in association with descriptive statistics we have evidenced that small size firms along with high book to market (BM) firms tend to produce higher average monthly returns than big firms along with low BM firms do. We also found that the size and value premium as well as market risk premium have very strong power to explain cross-section of expected return in DSE. The validity of three-factor model is also examined in this study and found that the three-factor model is well fitted in DSE with high R square value. One notable observation is that the market risk premium is the only factor which is significant in all portfolios and in all sample data and has dominant power over other factors.

Keywords: cross-section, three-factor, Dhaka stock exchange, portfolio, size and value

1. Introduction

In the 1950s the investors talked about risk, but there was no specific way to quantify risk. Markowitz (1952, 1959) made a great contribution in this regard through developing a basic portfolio theory where he first time quantified risk. He mainly provided a framework for the capital asset pricing model (CAPM). Based on his work, Sharpe (1964) and almost simultaneously Lintner (1965) and later Mossin (1966) developed a model to price capital assets which is known as capital asset pricing model (CAPM). CAPM is a single factor model which expresses a simple linear relationship between the expected return and market risk of a security. It is the market risk as measured by beta coefficient which is the only factor to explain security return. According to CAPM, except betas no other factors should have the power to explain the expected returns of cross-section of stocks. Even though CAPM is treated as modern finance theory and still popularly used in the financial world, many researchers found that CAPM is not capable enough to explain the cross section of expected returns. During the 1980s and 1990s they discovered several anomalies of CAPM and suggested for additional factors which are also responsible for asset pricing. Basu (1977) was the first to test the notion that value-related variables might explain violations of the CAPM (Keim, 2006). He found a significant negative relation between price-earning (P/E) ratio and mean return for U.S. stocks that could not be explained by the CAPM. Later Reinganum (1981) confirmed and extended Basu's findings. Lintzenberger and Ramaswamy (1979) showed that dividend yield has a significant positive relation with return on common stock.

In the early 1980s some researchers observed that smaller firms or small-cap firms were performing better than larger firms or large-cap firms in the market. This is size effect which was first discovered by Banz (1981) and Reinganum (1981). They found that the size of a firm and return on its common stock are negatively related. Dimson and Marsh (1999) reported that a small-cap portfolio outperformed a large-firm portfolio in the United States by 4.10% per year over the period 1955–1983, while the corresponding result for the United Kingdom was 5.90% for the period 1955–1988. Stattman (1980), Rosenberg, Reid and Lanstein (1985), DeBondt and Thaler (1987) have documented a significant positive link between returns and the Book-to-Price ratio. From the above discussion it is obvious that several factors; P/E ratio, size, Book-to-Price ratio and dividend yield; in addition to

market risk of CAPM have power to explain the expected returns. Until 1991, many researchers documented several factors just for explaining CAPM anomalies, but no one gets successful to provide a definite model to incorporate all the explanatory factors together. Finally, Fama and French (1993) became successful to provide a very effective model for asset pricing through adding two more factors, size premium (SMB, small minus big) and value premium (HML, high minus low) to CAPM's single factor, market risk premium. This model is widely called three-factor model. They argue that anomalies of CAPM are successfully captured by their three-factor model. After Fama and French three-factor model, many researchers tried to test the model to know whether the model is valid or not. With some exceptions, many authors; Davis, Fama and French (2000), Connor and Sehgal (2001), Faff (2001), Gaunt (2004), Aleati et al. (2000), Drew and Veeraraghavan (2002) and so on; supported the three-factor model, i.e. the existence of size and value effect in the world capital markets.

Very few researchers and academicians have tried to find out the size and value effect in Bangladesh capital market. Chowdhury et al. (2008) found size effect in Dhaka stock exchange (DSE) although their model's fitting was not good enough as the value of R square was poor. Mobarek and Mollah (2005) revealed a significant relation of size and price to book with share return in DSE. Chowdhury and Sharmin (2013) evidenced that size factor have no power to explain cross section of expected return in DSE. It is evidenced that no author attempted to investigate particularly for size and value effect in Bangladesh although Chowdhury et al. (2008) did attempt only for size effect. Indeed, stock market investors or others stakeholders hardly mentioned size and value effect of stock market in Bangladesh. However, recently this size effect makes attention to most of the major daily newspapers and accordingly to the capital market authority in Bangladesh. The daily Financial Express (September 29, 2013) headlines as "Investors' love for low cap issues", the Daily Star (September 25, 2013) as "Low-cap stock prices see abnormal hike" and again the Daily Star (January 05, 2014) as "In 2013, low-cap stocks saw abnormal gains". This recent crowd for size effect has inspired us to conduct this study in DSE. The important side of our study is that we account for pre-boom period, boom period and the post crash period in order to observe whether the results deviate or not under different periods. Another interesting thing is that unlike us, no one used the three-factor model in their research in Bangladesh. Thus, the main objective of this study is to investigate the existence of size and value effect in Dhaka stock exchange over a period of 2004 to 2013. Applying very well-known Fama and French (2003) three-factor methodology, this study evidences that size and value premium along with market risk premium have very strong power to explain cross-section of expected return in Dhaka stock exchange.

The rest of this paper is therefore organized as follows: Part 2 will summarize some important literature relevant to our study. Part 3 will discuss data and Methodology. Part 4 will present the empirical result of this research. Finally part 6 will provide concluding remarks of the research findings of the study.

2. Size and Value Effect on Stock Return: Previous Literature

As we mentioned earlier that size effect was first evidenced by Banz (1981). He examined the empirical relationship between the return and the total market value of NYSE common stocks over the period 1926 to 1980. He divided all the stocks into quintiles based on market capitalization and found that the smallest quintile, on average, outperformed the larger quintiles. The risk-adjusted monthly return for smallest firms is 0.40% more than the remaining firms. He reported that this size effect existed at least for forty years. He also reported that the size effect occurs more when we compare between very small-size and other-size firms while there is little difference in return between medium and large-size firms. Therefore, the size effect is not linear in market value. But he got failed to provide a definite reason why size effect occurs. A very similar study was conducted almost at the same time by Reinganum (1981) who investigated the size effect in a sample of 566 NYSE and Amex stocks and found that the monthly return of smallest 10% of the firms is better than that of the largest 10% by 1.60%. He also reports that if returns are controlled for the firm size effect, earning-price (E/P) ratio effect does not emerge; i.e. the firm size effect largely subsumes the E/P effect.

Using the same data set as used by Reinganum (1981), Brown et al. (1983) re-examined the size effect over a longer period 1967–1979. They found a linear relation between the average daily return on 10 size-based portfolios and the logarithm of the average size (market capitalization), but the size effect is not stable over time.

Stattman (1980) found a positive link between book-to-market equity ratios (BE/ME) and average returns on U.S. common stocks; i.e. firms with high (BE/ME) ratios realized, on average, higher returns that firms with low (BE/ME) ratios. Stattman referred this anomaly as the "value effect". Rosenberg, Reid, and Lanstein (1985) also evaluates the performance of the book to market (B/M) strategy based on the data from approximately1400 stocks in a prospectively defined universe of large companies, called the HICAP universe. They created monthly hedge portfolios that are controlled for a number of factors; size, E/P, share turnover and industry classification.

They also evidenced the same result as got by Stattman (1980).

Chan, Hamao and Lakonishok (1991) found a very strong association between book-to-market ratio (BE/ME) and cross-section of expected return in Japanese stocks during the period 1971 to 1988. In their study, they mainly used four variables: earnings yield, size, book to market ratio, and cash flow yield as the explanatory factors and found that all the variables have explanatory power, but book to market ratio and cash flow yield have the most significant positive impact on expected returns.

Fama and French (1992a) performed a groundbreaking study in asset pricing. They employed several variables; Market β, size, E/P, leverage and book-to-market equity to observe their explanatory power in the cross-section of average stock returns. They found that when each variable is used alone, all the variables have explanatory power, but in combinations, size and book-to-market equity seem to cover the role of leverage and E/P in explaining the average returns while market β have little explanatory power in this regard. Finally he concluded that size and book-to-market equity have very strong power in explaining the cross-section of average returns on NYSE, Amex and NASDAQ stocks over the period 1963 to 1990. Later this study was extended by Fama and French (1993). Fama and French (1993) suggested that there are at least three stock market factors which are responsible to produce common variation in cross-section of average return. This model is widely known as three-factor model which included two more factors- size and book-to-market equity, in addition to CAPM's market factor to explain stock returns. They argue that these three factors; overall market factor, size and book-to-market equity factors seem to do a good job in explaining cross-section of average stock returns. They also argue that anomalies of CAPM are successfully captured by this three-factor model.

Daniel and Titman (1997) found that size and book-to-market ratios are both highly correlated with the average returns of common stocks, but they rejected Fama and French (1993) three-factor model by arguing that firm characteristics rather than factor loadings (covariance structure of returns) that explain the cross-sectional variation in stock returns. They further argued that market beta has no explanatory power for stock returns even after controlling for size and book-to-market ratios. In response, Davis, Fama, and French (2000) re-examined Daniel and Titman (1997) study using an extended data set for 68-year period starting from 1929 to 1997 where Daniel and Titman's (1997) used data for 20.5 years (July 1973–December 1993). They evidenced that Daniel and Titman's (1997) characteristics model are valid only to the relatively short data set that they used. They further argued that when they used longer period data (1929–1993), the risk model provides a better story for the relation between book-to-market and average return.

Davis (1994) found very strong relation between book-to-market equity and cross-section of realized stock return. He investigated US stocks for a smaller sample during the period from July 1940 to June 1963 and evidenced that book-to-market equity, earning yield and cash flow yield have significant power to explain the cross-section of realized stock returns, although he excluded small stocks from the sample.

Chui and Wei (1998) examined the relationship between expected stock returns and Fama and French's three factors in five Pacific-Basin emerging markets; Hong Kong, Korea, Malaysia, Taiwan and Thailand; and found that there is a weak relation between beta and average return in all the sample markets even when the beta is used alone to explain average return. They also found that the size effect is significant to explain the cross-sectional variation of expected stock returns in all markets except Taiwan while the book-to-market equity is significant only in Hong Kong, Korea, and Malaysia.

Al-Rjoub and Hassan (2004) conducted a study on a sample of all firms listed in NYSE, AMEX and NASDAQ during the period 1970–2000 and found that small firms outperform large firms, but if transaction costs are accounted, small firms produce no abnormal return.

Recently, Simlai (2009) re-examined the Fama and French three-factor model on a sample of all stocks in NYSE, AMEX and NASDAQ over the longer period 1926–2007 and revealed the same results as did Fama and French (1993, 1996) that size and book-to-market equity have very strong power in explaining stock return. Li, Boo, Ee and Chen (2013) also re-examined the firms' characteristics and stock returns relation in Chinese stock market and found that the value effect have very strong power in explaining stock returns. In addition, they observed a reversed size effect.

Chen, Novy-Marx and Zhang (2010) proposed a new three-factor model where they include three factors; the market factor, a low-minus-high investment factor, and a high-minus-low ROA factor; in their new model. They showed that the model's performance is outstanding in explaining cross-sectional variation of expected stock returns which captures many pattern anomalous to Fama and French (1993) model and performs as well as the Fama and French three-factor model does.

As we early revealed that we hardly found any research which dealt with size and value effect in Bangladesh capital market. Chowdhury et al. (2008) found size effect in Dhaka stock exchange (DSE) although their model's fitting was not good enough. The 1996 market crash in Bangladesh is also accounted in their study and they evidenced that before crash the average return of big firms was almost twice than that of small firms, but after crash large firms produced higher negative return than small firms. Rahman et al. (2006) found that CAPM is a good indicator in asset pricing in Bangladesh based on a sample firms listed in Dhaka stock exchange for the period 1999 to 2003. They also revealed that besides market beta, other variables; firm market capitalization, firm sales and book to market value are also responsible for stocks returns variation. Mobarek and Mollah (2005) investigated on the sample of 123 non-financial companies listed in DSE over the period 1988 to 1997 and found a negative link between stock return and risk which disagrees with the notion of positive risk-return relationship. They also found that size and price to book have significant influence on stock return. Chowdhury and Sharmin (2013) also evidenced negative link between risk and return and added that size factor have no power to explain cross section of expected return in DSE.

3. Data and Methodology

3.1 Data and Sample

Data and sample selection are very tough job in developing stock market like Bangladesh where lot of anomalies and irregularities exist. However, this study considers monthly stock prices of all firms listed in Dhaka stock Exchange (DSE) for the period 2004 to 2013. At present, a total 256 companies of different sectors are listed in DSE till December 2013. We exclude all companies listed after 2003 in order to keep the sample balanced. We also exclude irregular or inactive stocks (in terms of their trading activities). Due to unavailability of data, all life insurance companies are excluded from our sample. Although most of the authors including Fama and French (1996) didn't consider financial sector companies in their study, we do consider because they are very much active in the market and hold nearly 33% of total market capitalization in DSE. Finally, we obtain 142 companies as the sample of this study.

Monthly stock price data are collected from DSE. We use 91 days Treasury bill rate (monthly average) as the proxy for risk free rate and collected from Bangladesh Bank. DGEN index is used as the proxy for market portfolio and data are collected from DSE. Our sample consists of 120 months data which starts from January 2004 and continues up to December 2013. Monthly return is calculated using the simple return formula; $R_t = (P_t - P_{t-1})/ P_{t-1} * 100$.

Where, R_t = Return of the stock in Month t, P_t = stock price of the last trading day of Month *t* and P_{t-1} = stock price of the last trading day of the Month just prior to Month t.

3.2 Model

To find size effect and value effect, we have employed Fama and French (1993) three-factor methodology which is widely used in asset pricing. The Fama and French three-factor model is an extension of a single factor model CAPM, where Fama and French (1993) include two more factors; size factor or size premium (SMB, small minus big) and book to market equity factor or value premium (HML, high minus low), in addition to market factor or market premium (R_m-R_f). The market risk premium is the difference between return on market portfolio (DGEN index) and risk free rate, represents excess return that investor could earn if he invests in market portfolio instead of investing in risk free asset. The size premium (SMB) is measured as the difference between the return on a portfolio of small stocks and the return on a portfolio of large stocks while the value premium (HML) is measured as the difference between the return on a portfolio of high-book-to-market stocks and the return on a portfolio of low-book-to-market stocks (HML). Nevertheless, the Fama and French (1993) three-factor model is as follows:

$$R_{i,t} = R_{f,t} + \beta^{m}_{i,t}(R_{m,t} - R_{f,t}) + \beta^{smb}_{i,t}(SMB) + \beta^{hml}_{i,t}(HML) \quad (1)$$

Where, $R_{i,t}$ represents the return of portfolio *i* in period *t*, $R_{f,t}$ represents risk free rate of return, $R_{m,t} - R_{f,t}$ represents market premium, SMB represents size premium and HML is the value premium. The coefficients $\beta^{m}_{i,t}$, $\beta^{smb}_{i,t}$ and $\beta^{hml}_{i,t}$ are the sensitivities of portfolio *i* to the risk factors; market premium, size premium and value premium respectively; at period *t*.

To run regression, we have altered the above three-factor model in to time-series regression model as follows,

$$R_{i,t} - R_{f,t} = \alpha_{i,t} + \beta^{m}_{i,t}(R_{m,t} - R_{f,t}) + \beta^{smb}_{i,t}(SMB) + \beta^{hml}_{i,t}(HML) + \varepsilon_{i,t} \quad (2)$$

Where, $R_{i,t} - R_{f,t}$ is the excess return on portfolio *i*, $\alpha_{i,t}$ is the intercept of regression equation and $\varepsilon_{i,t}$ represents the random error term. It is assumed that if the model holds then regression intercept $\alpha_{i,t}$ should be closer to 0.0.

There are some possible explanations for size effect and value effect in asset pricing as suggested by many researchers. Small size companies are more volatile due to their lower diversified nature of business and even less financial flexibility as compared to relatively bigger firms. In addition, Small firms stocks are less liquid and having less information available resulting greater transaction costs and higher monitoring cost for a portfolio of small stocks compare to that of large stocks. Therefore, investors should require a risk premium while investing in small capitalization firms. On the other hand, high book to market value stocks have more risk compare to low book to market stock as the high book value firms are under-priced by the market probably reasoned by current distress or investors' expectations about the future prospects making such companies vulnerable to business risk as well as financial risk. Therefore, investors should require a risk premium investing on such stocks.

3.3 Formation of Variables

The dependent variable is excess portfolio return ($R_{i,t}$-$R_{f,t}$) where portfolio return is calculated by equally weighting or simple averaging the monthly returns of all stocks included in a portfolio. The three explanatory variables are market premium (R_m-R_f), size premium (SMB) and value premium (HML). The formation of SML and HML are same as used by Fama and French (1993). At the end of December each year t (2004–2013) all the sample stocks are ranked on the basis of their December market capitalization (stock price times number of shares outstanding). Then the stocks are grouped in to two (small or big, S or B) whether their market capitalization (MC) is below or above the median MC for all sample stocks. Now the sample stocks are sorted independently and allocated in to three book to market equity (BM) groups (low, medium or high; L, M or H) on the basis of the break points of bottom 30 percent, middle 40 percent and top 30 percent of the value of BM for all sample stocks. Therefore, six portfolios are formed on the intersection of two MC groups (S and B) and three book to market groups (L, M and H). These six portfolios are S/L, S/M, S/H, B/L, B/M and B/H; where for example, the S/L portfolio includes the stocks in the small size group that also have low book to market ratio, and the B/H portfolio includes large MC stocks that also have high book to market ratio. As we mentioned earlier that these portfolios will be formed at the end of December each year and then the return on these Portfolios will be calculated in each month of the following year (starting from January to the following December).

For each month SMB is calculated as the difference between the average of the returns on three small-stock portfolios (S/L, S/M and S/H) and the average of the returns on three big-stock portfolios (B/L, B/M and B/H). HML is the difference between the average of the returns on two high-BM portfolios (S/H and B/H) and the average of the returns on two low-BM portfolios (S/L and B/L).

The whole sample period (2004–2013) will be divided into three sub periods; the pre-boom period (2004–2008), boom period (2009–2010) and finally the post crash period (2011–2013). During 2004 to 2013 a mammoth number of both small and big companies were listed with DSE which are not included in the sample of this study. To observe their (companies) effect in the results we incorporate them and form another sample of 208 companies for the period 2010 to 2013.

Thus, the regression model (2) will be used to test the above six portfolios (S/L, S/M, S/H, B/L, B/M and B/H) to unearth the size and value effect. The excess return on each portfolio will be regressed on the three explanatory factors; risk premium, size premium and value premium.

4. Result Analysis

4.1 Descriptive Statistics

Table 1 presents descriptive statistics of monthly returns of six size-BM sorted portfolios, SMB, HML, R_f and R_m series. The table mainly displays the mean, median, maximum, minimum and standard deviation of returns of the portfolios. Panel A of the table 1 shows the return properties for the whole sample periods from January 2004 to December 2013 and it is observed that small size firms have higher returns than big firms and high book to market firms also tend to have higher return than low book to market firms. The standard deviation; a measure of volatility; of small size and high BM firms is also higher than large size and low BM firms respectively. It is also observed that the S/H portfolio; small size firms with high BM ratio; offers the highest average monthly returns (3.78%) while the B/L portfolio; big size firms with low BM ratio; offers the lowest average monthly returns (1.06%). It is appealing that small size portfolios produce higher average monthly returns than the market.

The whole period is divided into three sub-periods: the pre-boom period (2004–2008), boom period (2009–2010) and the post crash period (2011–2013) and the descriptive statistics of these sub-periods are presented in panel B, C and D respectively. During all the sub-periods the small size firms dominate the large firms. With some exceptions, high book to market firms also dominate the low BM firms. The average monthly returns are highest

during the boom period (2009–2010), i.e. 12.45 % which is offered by portfolio S/H. From the above descriptive statistics analysis, it is obvious that small size firms along with high book to market ratio offer higher average monthly return. These results are consistent with Fama and French (1996).

Table 1. Descriptive statistics of monthly returns (%)

Panel A. Entire sample period 2004 to 2013

	S/L	S/M	S/H	B/L	B/M	B/H	SMB	HML	R_f	R_m
Mean	3.126	2.863	3.784	1.058	1.333	2.058	1.775	0.829	0.562	1.666
Median	1.723	1.034	0.633	1.062	1.407	2.358	0.515	0.787	0.622	1.005
Minimum	-36.619	-41.101	-31.790	-39.426	-33.270	-32.111	-15.049	-11.837	0.155	-30.479
Maximum	68.249	62.445	58.868	31.887	29.072	27.656	38.241	20.780	0.945	30.220
Standard Deviation	13.031	12.454	13.788	8.711	8.861	9.387	9.646	4.818	0.202	8.426
Kurtosis	7.585	4.960	2.954	4.236	1.970	1.247	2.892	2.169	-0.283	2.280
Skewness	1.494	0.859	1.225	-0.664	-0.454	-0.325	1.315	0.375	-0.329	-0.146
Count	120	120	120	120	120	120	120	120	120	120

Panel B. Pre-boom period 2004 to 2008

	S/L	S/M	S/H	B/L	B/M	B/H	SMB	HML	R_f	R_m
Mean	3.680	2.099	2.523	1.552	2.676	3.061	0.338	0.177	0.568	2.046
Median	1.723	0.799	0.405	0.978	1.917	2.292	0.236	0.444	0.620	1.416
Minimum	-11.786	-16.016	-14.276	-20.195	-21.487	-20.673	-14.529	-10.303	0.409	-19.871
Maximum	60.472	36.737	49.386	15.420	20.093	27.656	38.241	8.926	0.659	17.388
Standard Deviation	9.856	7.897	8.860	7.332	7.867	9.070	7.588	4.112	0.092	7.338
Kurtosis	18.112	5.879	12.382	0.323	0.562	0.753	9.798	0.174	-0.907	0.448
Skewness	3.305	1.640	2.549	-0.231	-0.265	0.192	2.126	-0.068	-0.915	-0.136
Count	60	60	60	60	60	60	60	60	60	60

Panel C. Boom period 2009 to 2010

	S/L	S/M	S/H	B/L	B/M	B/H	SMB	HML	R_f	R_m
Mean	6.722	8.748	12.453	3.195	3.626	5.821	5.094	4.178	0.289	4.924
Median	7.029	10.175	14.961	3.995	2.635	5.084	4.900	2.354	0.203	3.566
Minimum	-12.982	-10.679	-15.994	-7.651	-6.239	-5.616	-15.049	-4.362	0.155	-5.217
Maximum	28.006	32.101	45.354	14.185	15.038	19.562	31.477	20.780	0.661	30.220
Standard Deviation	11.653	12.673	17.584	6.278	6.039	6.203	13.032	5.312	0.169	8.207
Kurtosis	-0.851	-0.983	-1.096	-0.882	-0.708	0.325	-0.822	3.056	0.995	2.802
Skewness	0.087	-0.067	0.096	0.020	0.201	0.303	0.078	1.382	1.542	1.450
Count	24	24	24	24	24	24	24	24	24	24

Panel D. Post crash period 2011 to 2013

	S/L	S/M	S/H	B/L	B/M	B/H	SMB	HML	R_f	R_m
Mean	-0.194	0.212	0.105	-1.189	-2.434	-2.123	1.957	-0.317	0.734	-1.138
Median	-0.689	-1.910	-3.793	0.427	-3.637	-2.432	0.093	0.000	0.718	-0.683
Minimum	-36.619	-41.101	-31.790	-39.426	-33.270	-32.111	-14.345	-11.837	0.426	-30.479
Maximum	68.249	62.445	58.868	31.887	29.072	18.398	36.735	8.618	0.945	22.083
Standard Deviation	17.426	16.875	15.577	11.522	10.834	10.307	9.826	4.701	0.155	9.526
Kurtosis	6.060	4.949	4.922	3.979	2.281	1.007	4.491	0.474	-0.771	2.263
Skewness	1.522	1.066	1.410	-0.501	-0.074	-0.494	1.744	-0.563	-0.291	-0.564

Table 2. Descriptive statistics of monthly returns (%)

Reduced period 2010 to 2013 (including newly listed firms)

	S/L	S/M	S/H	B/L	B/M	B/H	SMB	HML	R_f	R_M
Mean	0.451	1.202	2.534	-0.626	-0.660	-0.441	1.972	1.134	0.608	0.472
Median	1.391	-1.733	-1.659	-0.647	0.557	0.717	0.716	1.105	0.687	0.351
Minimum	-37.371	-42.694	-35.492	-33.916	-33.354	-30.517	-14.177	-8.932	0.195	-30.479
Maximum	56.964	65.304	56.999	26.665	24.353	18.135	38.566	21.194	0.945	22.083
Standard Deviation	14.608	15.485	16.405	9.710	10.434	9.881	9.321	5.525	0.260	9.145
Kurtosis	4.124	6.133	1.865	3.078	1.315	0.711	4.341	3.467	-1.127	2.421
Skewness	0.832	1.037	0.764	-0.535	-0.626	-0.566	1.504	1.152	-0.431	-0.672
Count	48	48	48	48	48	48	48	48	48	48

4.2 Regression Analysis

Table 3 reports the results of the Fama and French three-factor time series regression model (2). It is assumed that if the model holds then regression intercept $\alpha_{i,t}$ should be closer to zero. Panel-A shows the result for entire sample period (2004–2013). It is observed that all intercepts have negative values. The estimated intercepts for portfolios; S/M, S/H, B/L and B/M are very large implying that the model leaves a large negative unexplained return for those portfolios whereas, the intercepts are closer to zero in portfolios S/L and B/H.

The market risk premium factor (R_m-R_f) have very strong power to explain the variation of expected returns for all the portfolios since the estimated coefficients of the factor are significant in all portfolios at 1 % level. And the relation is positive which is consistent with Fama and French (1996) results. The coefficients of the size premium factor (SMB) are significantly positive at 1 % level in all portfolios except the portfolio B/H. It is observed that the estimated coefficients are significantly large for small-size firms' portfolios. The coefficients of value premium factor are also significant for portfolios S/L, S/H, B/L and B/H where the relation is positive in portfolios S/M, S/H and B/H and negative in portfolios S/L, B/L and B/M. However, the size premium factor outperforms the value premium factor. The model is well fitted in all portfolios with high R^2 values ranging from 0.75 to 0.92. Hence, there is evidence that the market risk premium has dominant power over other factors in the three-factor model to explain the variation of expected returns. The size factor has also explanatory power in five out of six portfolios whilst the value factor has four out of six portfolios.

In order to test the robustness of the model, the three sub-periods: the pre-boom period (2004–2008), boom period (2009–2010) and the post crash period (2011–2013) are observed and the results are presented in panel B, C and D of table 3. With a very little deviation the results are almost same with entire sample. The little deviation of the results occurs, because the sub-periods data is shaped with short-term period. We have also run the regression analysis on the reduced sample period 2010 to 2013 which incorporated all listed firms that were left out from the entire sample data due to newly listed stocks. The results of this regression are reported in table 4. The market risk premium is significant in all portfolios, the size is significant in three and the value is four out of six portfolios at 1% level. Succinctly, all the three factors; market premium, size premium and value premium have significant power to explain the variation of expected returns of stocks in Dhaka stock exchange where the market risk premium and size premium have positive correlation and the value premium has mixed (in the sense of positive and negative) correlation with the expected returns of the stocks. Here one important observation is that the market risk premium is the only factor which is significant in all portfolios and in all sample data.

Table 3. Regression results of Fama and French three-factor model

Panel A. Entire sample period 2004 to 2013

	α	β^m	β^{smb}	β^{hml}	t(α)	t(β^m)	t(β^{smb})	t(β^{hml})	R^2
S/L	-0.0175	0.9116	1.1346	-0.5293	-0.0416	18.76*	26.48*	-6.244*	0.8880
S/M	-0.5135	0.9605	0.9689	0.0413	-1.0390	16.82*	19.23*	0.4149	0.8308
S/H	-0.2978	0.9027	1.2096	0.4537	0.8156	21.38*	32.49*	6.159*	0.9247
B/L	-0.3307	0.9035	0.1405	-0.5074	-0.8625	20.38*	3.593*	-6.56*	0.7923
B/M	-0.4478	0.9590	0.1072	-0.0366	-1.2030	22.28*	2.825*	-0.4869	0.8111
B/H	-0.0503	0.9123	0.0654	0.5097	-0.1116	17.5*	1.422	5.603*	0.7528

Panel B. Pre-bullish period 2004 to 2008

	α	β^m	β^{smb}	β^{hml}	t(α)	t(β^m)	t(β^{smb})	t(β^{hml})	R^2
S/L	1.2063	1.0373	1.2595	-0.3034	1.959***	11.00*	13.75*	-2.072**	0.7922
S/M	0.0156	0.8220	0.6910	0.3792	0.0218	7.53*	6.518*	2.237	0.5658
S/H	0.1875	0.8808	1.1314	0.4720	0.3793	11.63*	15.38*	4.014*	0.8341
B/L	-0.1678	0.8258	-0.0277	-0.3410	-0.3407	10.95*	-0.378	-2.913*	0.7609
B/M	0.7261	0.9321	0.0091	0.0052	1.3440	11.27*	0.1135	0.04047	0.7498
B/H	0.8510	0.9822	0.1005	0.8836	1.2690	9.561*	1.007	5.539*	0.7094

Panel C. Bullish period 2009 to 2010

	α	β^m	β^{smb}	β^{hml}	t(α)	t(β^m)	t(β^{smb})	t(β^{hml})	R^2
S/L	1.1259	0.4434	1.0159	-0.4602	1.1930	4.422*	14.07*	-2.720**	0.9276
S/M	1.0635	0.5856	0.9555	-0.0445	0.6849	3.548*	8.041*	-0.1598	0.8343
S/H	1.3174	0.6471	1.3202	0.2687	1.0160	4.695*	13.3*	1.155	0.9401
B/L	1.9105	0.5944	0.2163	-0.6848	1.3680	4.003*	2.023***	-2.733**	0.4687
B/M	-0.1227	0.6911	0.1633	-0.1376	-0.1231	6.523*	2.141**	-0.7698	0.7062
B/H	1.7190	0.3907	-0.0880	0.5863	1.5080	3.224*	-1.008	2.867*	0.6286

Panel D. Post crash period 2011 to 2013

	α	β^m	β^{smb}	β^{hml}	t(α)	t(β^m)	t(β^{smb})	t(β^{hml})	R^2
S/L	-1.3417	1.0306	1.1157	-0.5053	3.456*	25.49*	25.5*	-5.586*	0.9852
S/M	-0.5167	1.1373	1.0984	0.0779	-1.1150	23.58*	21.05*	0.7221	0.9775
S/H	-0.7094	1.0365	1.1046	0.4403	-1.6730	23.47*	23.11*	4.455*	0.9779
B/L	-0.2620	1.0660	0.0685	-0.6325	-0.5860	22.9*	1.359	-6.074*	0.9549
B/M	-1.4116	1.0784	0.1706	0.2235	-3.216*	23.59*	3.451*	2.186**	0.9510
B/H	-0.8942	1.0600	0.0796	0.4219	-2.407**	27.39*	1.901***	4.873*	0.9611

Note. * significance at 1% level; ** significance at 5% level; *** significance at 10% level & 't' indicates t-statistics.

Table 4. Regression results of Fama and French three-factor model

Reduced period 2010 to 2013 (including newly listed firms)

	α	β^m	β^{smb}	β^{hml}	t(α)	t(β^m)	t(β^{smb})	t(β^{hml})	R^2
S/L	-1.4150	0.9520	0.9636	-0.4514	-2.853*	17.2*	17.83*	-5.151*	0.9531
S/M	-1.0831	1.0809	0.9431	-0.0308	-2.14**	19.14*	17.1*	-0.3444	0.9566
S/H	-0.6830	0.9894	1.0829	0.5366	-1.489	19.33*	21.67*	6.621*	0.9683
B/L	-0.5665	1.0083	0.0384	-0.5347	-1.423	22.7*	0.8844	-7.602*	0.9317
B/M	-1.3161	1.0431	0.0322	0.1119	-2.268**	16.11*	0.5092	1.091	0.8750
B/H	-1.2985	0.9709	-0.0810	0.4773	-2.87*	19.23*	-1.643	5.97*	0.9153

Note. * significance at 1% level; ** significance at 5% level; *** significance at 10% level & 't' indicates t-statistics.

Although our results disagree with the findings of the previous studies in Bangladesh; e.g. Mobarek and Mollah (2005), Chowdhury and Sharmin (2013) who found a negative relation between stock return and risk in DSE, but they all have evidenced the existence of the factors (market, size and value) in the Dhaka stock exchange.

5. Conclusion

The main objective of this study is to investigate the existence of size and value premium effect in Dhaka stock exchange over a period of 2004 to 2013. This study also examines the might of Fama and French three-factor model to explain the variation in stocks return in Dhaka stock exchange. Applying descriptive statistics and very well-known Fama and French (1993) three-factor methodology, this study evidences that small size firms along with high book to market firms tend to have higher returns than big firms along with low book to market firms. The standard deviation of small size and high BM firms is also higher than large size and low BM firms respectively. The estimated coefficients are significantly larger for small-size firms' portfolios than large size portfolios. Thus, the small size and high BM firms have higher volatility in returns than that of the large size and low BM firms. The results of the Fama and French three-factor time series regression evidence that the model is well fitted in all portfolios with high R^2 values. All the three factors; market premium, size premium and value

premium have significant power to explain the variation of expected returns of stocks in Dhaka stock exchange. We also take the three sub-periods: the pre-boom period (2004–2008), boom period (2009–2010) and the post crash period (2011–2013) into account in order to observe whether the returns behavior deviate significantly or not. The findings show that with a very little deviation the results are almost same with entire sample. But, one important observation is that the market risk premium is the only factor which is significant in all portfolios and in all sample data and has dominant power over other factors. Thus, the strength of three-factor model to explain the variation of expected returns of stocks is very impressive in Dhaka stock exchange.

The participants of the stock market, e.g. general investors, institutional investors and fund managers may get benefited using our findings. Usually the investors from developing countries like Bangladesh manage their portfolios and evaluate their assets using single factor model (CAPM). But, now they can do the same thing more accurately through adding two more factors in their analysis. In addition, since the small size and high value firms produce comparatively higher returns, the investors may include such firms more in their portfolios to boost average portfolio returns.

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