

Fama and French Three Factor Model: A Superior Model to Capital Asset Pricing Model (CAPM) in Estimating Excess Return of Securities in Bangladesh

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Abstract: This paper intends to test the superior explanatory power of Fama and French Three Factor model to Capital Asset Pricing Model (CAPM) in Dhaka Stock Exchange and also to observe the impact of market premium, size premium and value premium on excess return. The study covers 20 companies from 5 major sectors namely Food & Allied, Bank, Engineering, Fuel & Power, and Cement for a data period of July, 2013 to July, 2018 by taking DSEX as the representative of market index. For each stock, monthly total return has been calculated for the observed period of five years. In CAPM model, for each of the stocks, the respective excess return series over 60 months has been considered the dependent variable and the market premium series over the 60 months has been considered the independent variable along with the beta coefficient that is also used to deduce whether the prices of stocks are theoretically less or more volatile than what they should be in a normal market. In Fama and French Three Factor Model, for each of the stocks, the respective excess return series over 60 months has been considered the dependent variable and the market premium series, value premium series and size premium series over the 60 months have been considered the independent variables. According to the results of the study, Capital Asset Pricing Model (CAPM) can explain 14.60% of the variation in the stocks' return while Fama and French Three Factor Model can explain 32.60% of the variation in the stocks' return in Dhaka Stock Exchange (DSE).

Keywords: CAPM, Fama and French Three Factor, Dhaka Stock Exchange, DSEX

Introduction

After the famous Portfolio Theory of Markowitz, many researchers have come up with different theories aiming to explain excess portfolio returns. One of the ground breaking models is the Capital Asset Pricing Model (CAPM) which is still used prevalently in order to calculate cost of equity and determine asset pricing. This pivotal theory is based on only one risk factor which is systematic risk. Striking simplicity and the ease of calculation made this theory widely popular among both academicians and practitioners alike. Although CAPM has revolutionized the field of finance, various empirical tests

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have challenged this theory and revealed several drawbacks. On the other hand, Fama and French Three Factor Model was developed as a response to inadequate performance of the CAPM. The authors argue that anomalies related to the CAPM are better captured by their three factor model. Nonetheless, most of the research is conducted on developed markets whereas developing market like Bangladesh remained less explored. Many times it has been found that the developing markets behave quite differently than their developed and efficient counterparts. Capital Asset Pricing Model (CAPM), based on only one risk factor - systematic risk, is still used prevalently in order to calculate cost of equity and to determine asset pricing. But over the time several drawbacks of the model have been revealed. In response, Fama and French Three Factor Model was developed and it is argued that anomalies related to the CAPM are better captured by the three factor model. However, little research has been done in developing market like Bangladesh. This research aims to test both the theories by applying it in the context of publicly listed companies' stock in Bangladesh to evaluate performance of the theories in explaining excess return over risk free return.

Literature Review

Since Efficient Market Hypothesis of Markowitz, investors and academicians have been captivated and involved in the discussion towards optimum portfolio, risk minimization and characteristics of asset return. This led to an era of exhaustive research along the lines of risk and return. Capital Asset Pricing Model by Sharpe (1964) and Lintner (1965) improved this model by introducing risk free asset in this model and combined with the assumption of unlimited buying and selling at a constant rate ' r_f ', CAPM provided a unique point for an efficient portfolio and pave way for the derivation of numerous efficient portfolios as a combination of this single portfolio and Risk Free Asset. Along this line, CAPM states that asset returns are a function of Market Beta (covariance between asset and market portfolio). Though it is mathematically sound and simple in its implication, it didn't fully explain asset return when tested against past returns. To improve predictive power of CAPM different researchers over time have tried to improve on this model by finding other explanations towards this anomaly either by tweaking methodology, adding further assumptions, adding variables or combination of these. All these have led to some remarkable insights into predictive power of Beta and its limitations. Amongst these were different researches over the past which have attempted to show different variables as standing proxies for different risks as rewards for asset returns. Merton (1973) in his paper found that expected returns on risky assets might differ from the risk free rate even when they have no systematic risk. In his study Reinganum (1981) provided an evidence for the size factor in explaining cross-sectional average return of an asset. Banz (1981) also provided evidence that the CAPM is

misspecified and there are other factors which explain the cross-sectional average return of an asset. Banz found strong size effect in cross-sectional average returns of US stocks for at least forty years. According to his study the size effect exists but the reason for its existence wasn't found. Gibbons (1982) also found that when market beta are taken alone for explaining cross-sectional average returns on US stocks from 1926-1975, the practical content of the CAPM is rejected for the period with a significance level of less than 1%. Research conducted by Banz (1981), Basu (1988), Rosenberg, Reid and Lanstein (1985) and Lakonishok, Shleifer and Vishny (1994), found that a firm's average stock return is related to other firm specific factors as well. These studies found that a firm's average stock return is related to firm's size (market capitalization), book to market equity (Book value of common equity/Market value), Earning to Price (E/P), cash flow to price (C/P) and past sales growth (FF, 1996). Consistent with this view, Fama and French (1993) document covariation in returns related to BE/ME beyond the covariation explained by the market return, also, Fama and French (1995) show that there is a BE/ME factor in fundamentals (earnings and sales) like the common factor in returns. Fernandez says that the Fama-French factors SMB and HML jointly provide statistically significant explanatory power across almost all the sample return horizons. He argues that SMB and HML proxy for measures of market risk not captured by the CAPM and that the FF factors are more superior in actual use the result which is consistent with the findings of Fernandez (2002). Along the same line, Kothari (1995) found that average returns do reflect compensation for beta risk (if betas are measured at annual interval), however, beta alone does not account for all the cross-sectional variation in expected returns as explained by the CAPM. Fama and French came up with three factor model, in order to improve the explanatory power of CAPM. An empirical study by Fama and French (1992) shows that covariance of portfolio return and market return does not explain the excess portfolio return changes and have little or no power in explaining cross-sectional variations in returns on equity. Fama and French found that that relation between market beta and average return on stocks listed on NYSE disappear during 1963-1990 period. Their tests do not support the prediction of SLB model, that average stock returns are positively related to market beta. Results of the study found that two easily measured variables, size and book to market equity, explain the cross-section of average returns. FF (1992) found strong relation between BE/ME and average stock return on NYSE stocks from 1963-1990. Fama and French Three Factor Model (1993) incorporate market premium, value premium and size premium as predictive variables towards excess return of a portfolio. The model proposes portfolio formation on the basis of market capitalization, book-to-market and earning-to-price since they give better perspective into excess portfolio return ((Fama and French, 1992) (Lakonishok, Shleifer, and Vishny,

1994) (Chan, 1991)). The same has been found by Abbas, Khan, Aziz and Sumrani (2015) in Pakistan market, Sattar (2017) in Bangladesh market (cement industry) and Sayeed, Chowdhury and Khatun (2014) in Bangladesh market.

Research Methodology

This study is strictly quantitative in nature and uses conventional statistical tools such as simple and multiple linear regression analysis. Data have been collected mostly from Dhaka Stock Exchange (DSE). Both single factor (CAPM) and multi factor (Fama-French) models have been applied via regression to find out the effectiveness of the models in comparison to each other. Simple linear regression has been used for CAPM and multiple variable regressions for Fama French model. Adjusted R-Square has been considered as a validity of the regression output. Because, when we have more than one independent variable in our analysis, the computation process inflates the R-squared and the Adjusted R-Square is the R-Square adjusted for this inflation when performing multiple regression. The time frame of the dataset is 5 years which reduces short term anomalies.

Research Objectives

The objective of this study is to test the superior explanatory power of Fama and French Three Factor model to Capital Asset Pricing Model (CAPM) in Dhaka Stock Exchange and to observe:

- I. the impact of market premium on excess returns
- II. the impact of size premium (SMB) on excess return
- III. the impact of value premium (HML) on excess return

Market Portfolio Proxy

From 2004-2013 the market index DGEN (Dhaka Stock Exchange General Index) was used as a proxy for market return. However, On January 28, 2013, DSE introduced DSE Broad Index (DSEX) as a market index which was developed by the method of Standard and Poor's. This free floating market index is believed to be a more precise estimate of the market portfolio. Therefore, DSEX is taken as the representative of market index for the period of July, 2013 to July, 2018.

Size and Value Premium for Companies

The four shares of each sector have been ranked according to their market capitalization for size premium and according to their Book value to market value for their value premium. For simplicity the figures and ranking of July 31, 2018 is assumed to be constant throughout the studied period.

Risk Free Rate

Five year T-bond of Bangladesh government issued in July, 2018 with annualized interest rate of 5.74% is considered to be relevant risk free rate (R_f).

Excess Return Calculation

Monthly total returns have been calculated for the observed period of five years. Both the capital gain and adjustment for cash or stock dividends have been considered for the calculation of total return. Total return formula used in this study for stock i is as follows:

$$R_i = \frac{P_t(1+Div_{Stock}) + Div_{Cash} - P_{t-1}}{P_{t-1}} \quad (1)$$

Where,

R_i = Total Return of Stock i

P_t = Stock Price of Current Period

P_{t-1} = Stock Price of Previous Period

Div_{Stock} = Stock Dividend Percentage

Div_{Cash} = Cash Dividend Per Share

Excess return has been calculated by subtracting risk free rate from individual stock's total return. Excess return on security i in CAPM is as follows:

$$R_i - R_f = \beta_i \times (R_m - R_f) \quad (2)$$

Excess return on security i in Fama and French Three Factor Model is as follows:

$$R_i - R_f = \beta_1 \times (R_m - R_f) + \beta_2 \times SMB + \beta_3 \times HML \quad (3)$$

Premium Calculation

Market premium (RMRF): Market premium is the difference between return on market index which is DSEX in this study and risk free rate. Risk free rate is converted to monthly rate and is subtracted from monthly return on DSEX index.

Size Premium (SMB): Stocks have been sorted according to market capitalization in ascending order and top 10% have been considered as big size stocks and bottom 10% as small size stocks. The difference between monthly returns of small size stocks and big size stocks is size premium.

Value Premium (HML): Stocks have been sorted according to the ratio of Net Asset Value Per Share (NAVPS) to Market Price in ascending order and top 10% have been considered as high book to market ratio companies and bottom 10% as low book to

market ratio companies. The difference between monthly returns of high book to market ratio companies and low book to market ratio companies is value premium.

Regression Model & Variables

For testing the explanatory power of CAPM model, simple linear regression has been run. The model applied is as follows:

$$R_t - R_f = \alpha_i + \beta_i \times (R_m - R_f) + \varepsilon_i \quad (4)$$

Here, excess return ($R_t - R_f$) is the dependent variable, market premium ($R_m - R_f$) is independent variable, β_i is the coefficient of market premium or the systematic risk, intercept is α_i and ε_i is residual standard error.

For testing the explanatory power of Fama and French Three Factor Model, multiple linear regression has been run. The model applied is as follows:

$$R_t - R_f = \alpha_i + \beta_1 \times (R_m - R_f) + \beta_2 \times SMB + \beta_3 \times HML + \varepsilon_i \quad (5)$$

Here, excess return ($R_t - R_f$) is the dependent variable, three independent variables are market premium ($R_m - R_f$), size premium (SMB) and value premium (HML), β_1 , β_2 , and β_3 are the coefficients or factor loadings of market premium, size premium and value premium respectively, intercept is α_i and ε_i is residual standard error.

Hypothesis

To conduct the study following hypotheses have been tested,

$$H_1: \alpha_i \neq 0$$

$$H_2: \beta_1 \neq 0$$

$$H_3: \beta_2 \neq 0$$

$$H_4: \beta_3 \neq 0$$

Fama and French Three Factor Model will hold true in the stock market of Bangladesh if intercept α_i is not significant or is statistically zero and the three coefficients β_1 , β_2 , and β_3 are significant or are statistically different from zero. Regression analysis has been done with 95% confidence level meaning alpha (Level of significance) will be 5%.

Theoretical Framework

Capital Asset Pricing Model (CAPM):

Capital Asset Pricing Model (CAPM) is the market equilibrium model to estimate the required return of an asset as a linear function of its systematic risk measured by stock's beta. The key insight of the CAPM is that investors assess the risk of an asset in terms of its contribution to systematic risk of their portfolio. It is assumed that all the investors are

rational and all rational investors hold the market portfolio. So when investors consider an asset for investment, they consider only how much additional risk will be added to his existing market portfolio, and investor demands risk premium for that additional risk or systematic risk only. That risk is the variability of return as measured by standard deviation or variance.

According to CAPM, the relation between an asset's risk and return is:

$$R_i = R_f + \beta_i \times (R_m - R_f) \quad (6)$$

Where,

R_i is expected rate of return of asset i

R_f is the risk free rate of return

R_m is the expected market rate of return

β_i is the sensitivity of asset i 's return to market return and computed as $\beta_i = \frac{\sigma_{im}}{\sigma_m}$

The simplest estimate of beta is found by ordinary least square method or linear regression of return on stock as dependent variable and the return of market as the independent variable. The resulting regression line slope or beta estimate is known as unadjusted beta or raw beta. In this study, excess return of securities over risk free rate has been used as dependent variable and market premium or excess return of market index over risk free rate has been used as independent variable.

Fama and French Three Factor Model:

Though CAPM contends that only driver or only factor of equity return is the market factor but after 1980s, substantial empirical evidence showed that market factor alone failed to explain the return. In the US and other equity market, evidence suggests that small cap stocks or value stocks generate higher return over the long run than the CAPM predicts. In 1993 researchers, Fama and French addressed the perceived weakness of the CAPM in a model with Three Factors, which is known as Fama French Model (FFM) or Three Factor Model (TFM).

The three factors of return in the FFM is namely

1. **RMRF** or market factor similar to CAPM, which is measured as return on market value weighted equity index in excess of risk free rate.
2. **SMB** (Small Minus Big) or size factor which is the return to a portfolio of small capitalization stocks less the return to a portfolio of large capitalization stocks.
3. **HML** (High Minus Low) or value factor which is the return to a portfolio of stocks with high ratios of book-to market values less the return to a portfolio of low book-to-market value stocks.

The FFM estimate of required return on equity can be expressed as:

$$R_t = R_f + \beta_1 * RMRF_{marketfactor} + \beta_2 * SMB_{sizefactor} + \beta_3 * HML_{valuefactor} \quad (7)$$

The FFM equation says that required return on equity is not just only function of market factor as in CAPM, two additional factors of return - the size factor and the value factor play role in determining required return on equity. Like market risk factor premium, average historical estimate of size factor premium and value factor premium is positive. This means that investor will require higher required for holding small size company compared to average size company though both small size and average size company have the same market beta. The logic and intuition is that small company is relatively more risky than an average size company and CAPM market beta cannot capture this risk arising from the size factor. Similar to size, required return on high value company (company having high book value to market price ratio) is higher compared to average value company though both high value and average value company have the same market beta. Like CAPM, neutral or average value of beta (β_1) for market factor in the FFM is 1, but neutral value or average value of beta for size and value factor is zero. For a security, the beta value of zero for size and value factor means that the security has no size or value bias. A beta value of positive for size factor means that security is a smaller company relative to an average size company in the market, similarly a negative beta value for size factor means that security has relatively larger in size than an average size company in the market. CAPM determined required return is lower than FFM return because CAPM assumes that investors do not require size factor premium and value factor premium and this factor premium are already in market factor premium or this size factor and value factor premium are due to market inefficiency. But considerable studies and empirical work have shown that small cap company and high value company outperform big cap and low value company over a long period of time horizon both in US and other developed market.

Findings

To depict the findings of this study, first the simple linear regression model setup for Capital Asset Pricing Model (CAPM) will be presented. The explanatory power, statistical viability and significance of the model will be analyzed. In the similar fashion, multiple regression model setup for Fama and French Three Factor Model will be presented. The explanatory power, statistical viability, and significance of the model will be analyzed. Finally, a comparison will be made between these two models to derive a conclusion regarding the superiority of explanatory power of Fama and French Three Factor Model.

Regression Model Setup for Capital Asset Pricing Model (CAPM)

The model applied is as follows:

$$R_i - R_f = \alpha_i + \beta_i * (R_m - R_f) + \varepsilon_i \quad (8)$$

Here, excess return ($R_i - R_f$) is the dependent variable, market premium ($R_m - R_f$) is independent variable. Excess return has been calculated for each stock each month by subtracting the monthly risk free rate from the total return of the stock for each month. Market premium has been calculated for each month by subtracting the monthly risk free rate from the monthly return given by the DSEX index. β_i is the coefficient of market premium or the systematic risk, intercept is α_i and ε_i is residual standard error.

Running the Regression

For each of the stocks, the respective excess return series over 60 months has been considered the dependent variable (Y Range Input) and the market premium series over the 60 months has been considered the independent variable (X Range Input). Then linear regression has been run for each of the 20 stocks. In the following sections, key findings from regression analysis of Capital Asset Pricing Model (CAPM) will be presented.

Analysis of Key Findings: Capital Asset Pricing Model (CAPM)

According to the Key findings from regression analysis of all the 20 stocks, in Capital Asset Pricing Model (CAPM), the only parameter – variation in the market premium can explain only 14.60% of the variation in the stocks' return on an average. And when weighted to market capitalization it becomes 10.10%. The model produced a weighted average beta coefficient of 0.546 which means if market return moves by 1%, a stock's return will move by 0.55% in the same direction. From the finding the beta coefficient is lower than 1.00, the prices of stocks are theoretically less volatile than what they should be in a normal market. However, a low Adjusted R-Square indicates that this beta coefficient lacks validity. Furthermore, 50% of the stocks produced adjusted R-square of less than 10% hence a low explanatory power is implied. Only 30% of the stocks produced adjusted R-square of greater than 20%. According to the result 95% of the stocks' returns move in the same direction as the market return. Only 30% of the stocks' returns are theoretically more volatile than the market return. To conclude, a low explanatory power makes this model a less reliable one to estimate stock return in Dhaka Stock Exchange (DSE).

Analysis of Findings of Statistical Validity of Capital Asset Pricing Model (CAPM)

To analyze the statistical validity of Capital Asset Pricing Model (CAPM), two key data has been used. Significance F is the probability that the regression model is wrong and needs to be discarded. So, the Significance F or the probability of the model's being wrong is desired to be as small as possible. A cut off significance level has been set at 5% for evaluating the model. So, if the Significance F for any stock is found higher than 5%,

the model will be regarded as a wrong one. Moreover, in the model, excess return has been used as dependent variable and market premium as independent variable; intercept indicates the portion of return that is not captured by the market factor. So, intercept will also be desired to be as low as possible in the model. The result shows that significance F has an average of 11.20%. So, there is 11.20% probability that the model is wrong and unreliable. It crosses the set threshold level. However, there are some outliers, so observing the percentage of the sample that produced higher than 5% significance level is more meaningful. There are 5 stocks whose models seem unreliable. So, 25% unreliability has been found in the model. Because of being a single factor model, Significance F and P-Values are equal. On the other hand, average intercept comes out to be 1.60% which is quite low and doesn't really make the model unreliable because only 1.60% of the return has not been captured by the market factor.

Regression Model Setup for Fama and French Three Factor Model

For Fama and French Three Factor Model, multiple linear regression has been run. The model applied is as follows:

$$R_t - R_f = \alpha_i + \beta_1 * (R_m - R_f) + \beta_2 * SMB + \beta_3 * HML + \epsilon_i \quad (9)$$

Here, excess return ($R_t - R_f$) is the dependent variable, three independent variables are market premium ($R_m - R_f$), size premium (SMB) and value premium (HML), β_1 , β_2 , and β_3 are the coefficients or factor loadings of market premium, size premium and value premium respectively, intercept is α_i and ϵ_i is residual standard error. Excess return has been calculated for each stock each month by subtracting the monthly risk free rate from the total return of the stock for each month. Market premium has been calculated for each month by subtracting the monthly risk free rate from the monthly return given by the DSEX index. For SMB, stocks have been sorted according to market capitalization in ascending order and top 10% have been considered as large cap stocks and bottom 10% as small cap stocks. The difference between monthly returns of small cap stocks and large size cap is size premium. For HML, stocks have been sorted according to the ratio of Net Asset Value Per Share (NAVPS) to Market Price in ascending order and top 10% have been considered as high book to market ratio companies and bottom 10% as low book to market ratio companies. The difference between monthly returns of high book to market ratio companies and low book to market ratio companies is value premium.

Running the Regression

For each of the stocks, the respective excess return series over 60 months has been considered the dependent variable (Y Range Input) and the market premium series, value premium series and size premium series over the 60 months have been considered the independent variables (X Range Input). Then linear regression has been run for each of

the 20 stocks. According to the result, in Fama and French Three Factor Model, the three factors – market, size and value premiums can explain on an average 32.60% of the variation in the stocks' return. And when weighted to market capitalization it becomes 19.70%. Looking further, 85% of the stocks produced adjusted R-square of more than 10% hence a greater explanatory power is implied. Besides, 65% of the stocks produced adjusted R-square of greater than 20%. The model produced an average coefficient of 0.822 for market premium which means if market premium moves by 1%, a stock's return will move by 0.82% in the same direction. Since this coefficient is lower than 1.00, the prices of stocks are theoretically less volatile than what they should be in a normal market. Only 30% of the stocks' returns are theoretically more volatile than the market return. The model also produced an average coefficient of 0.111 for size premium which means if size premium moves by 1%, a stock's return will move by 0.11% in the same direction. Since this coefficient is positive, the market mostly comprises small cap companies and size factor contributes positively to required return. Moreover, 65% of the stocks produced positive coefficient for size premium indicating that small cap companies represent 65% of the market and 35% of the stocks produced negative coefficient for size premium indicating that large cap companies represent 35% of the market. On the other hand, the model produced an average coefficient of -0.010 for value premium which means if value premium moves by 1%, a stock's return will move by 0.01% in the opposite direction. Since this coefficient is negative, the market mostly comprises growth (low value) companies and value factor contributes negatively to required return. Around 70% of the stocks produced negative coefficient for value premium indicating that growth (low value) companies represent 70% of the market and 30% of the stocks produced positive coefficient for value premium indicating that value (high value) companies represent 30% of the market.

Analysis of Findings of Statistical Validity of Fama and French Three Factor Model

Significance F has an average of 2.50%. So, there is only 2.50% probability that the model is wrong and unreliable. It doesn't cross the set threshold level of 5%. Additionally, there are some outliers, so observing the percentage of the sample that produced higher than 5% significance level is more meaningful. There are only 3 stocks whose models seem unreliable. So, only 15% unreliability has been found in the model. Moreover, average intercept comes out to be 1% which is quite low and doesn't really make the model unreliable because only 1% of the return has not been captured by the three factors.

Table 1: Variance Inflation Factor (VIF) and Tolerance Level (1/VIF) for the Independent Variables

Variable	VIF	1/VIF
Market Premium (RM-RF)	1.10	0.91
Size Premium (SMB)	1.10	0.91
Value Premium (HML)	1.00	1.00
Mean VIF	1.07	

Table 1 shows the Variance Inflation Factor (VIF) and Tolerance Level (1/VIF) for the Independent Variables. At 5% significance level, all of the independent variables produced VIFs ranging from 1.00 to 1.10 which are way less than 10 and very close to 1. Accordingly, tolerance values or 1/VIFs ranged from 0.91 to 1.00 which are way above .01 and very close to 1. So, it can be concluded that there is no multicollinearity problem here.

Comparison between the Findings of Capital Asset Pricing Model (CAPM) and Fama and French Three Factor Model

To draw the conclusion regarding the superiority of any of the two models to the other, the key findings have to be compared. The comparison has been done in two segments: first one is the comparison of the explanatory power and the second one is the statistical validity of the model.

Explanatory Power Comparison: Adjusted R-Square is the representation of the explanatory power of the model. This key statistic has been presented for each of the 20 stocks for both the model and the improvement of the explanatory power in Fama and French Three Factor Model has been shown in percentage form as follows:

Table 2: Comparison of Explanatory Power between Capital Asset Pricing Model and French Three Factor Model

Stock	Adjusted R-Square		Improvement (%) in FF3F (3/2) – 1.00
	CAPM	FF3F	
	2	3	
Agricultural Marketing Co Ltd.	0.121	0.183	51.72%
British American Tobacco	0.009	0.062	600.99%
Golden Harvest Agro Industries Limited	0.167	0.211	26.35%
Gemini Sea Food Limited	0.003	0.848	29873.36%
Prime Bank Limited	0.058	0.356	515.62%
The City Bank Limited	0.309	0.311	0.73%
Bank Asia Limited	0.048	0.582	1111.74%
Mutual Trust Bank Ltd.	0.087	0.128	47.35%
BSRM Steels Limited	0.430	0.488	13.46%
Navana CNG Limited	0.385	0.386	0.18%
Kay and Que Bangladesh Limited	0.009	0.617	6764.50%
Bangladesh Lamps Limited	0.061	0.070	14.62%
Linde Bangladesh Limited	0.087	0.104	19.15%
Summit Power Limited	0.003	0.023	750.37%
Khulna Power Company Limited	0.214	0.290	35.62%
MJL Bangladesh Limited	0.176	0.265	50.94%
Heidelberg Cement Bangladesh Limited	0.127	0.195	53.41%
Premier Cement Mills Limited	0.093	0.480	416.69%
Confidence Cement Limited	0.323	0.542	67.59%
LafargeHolcim Bangladesh Limited	0.212	0.378	78.54%
Average	0.146	0.326	123.18%

On an average Capital Asset Pricing Model can explain 14.60% of the excess return of the stocks in Dhaka Stock Exchange (DSE) and Fama and French Three Factor Model can explain 32.60% of the excess return of the stocks in the same. So, clearly Fama and French Three Factor Model is superior in estimating excess return of stocks there with 123.18% relatively higher explanatory power to Capital Asset Pricing Model. Furthermore, in 100% of the cases, an improvement in the explanatory power has been observed when Fama and French Three Factor Model is chosen over Capital Asset

Pricing Model for estimating excess return of the stock. So, clearly Fama and French Three Factor Model is superior in estimating excess return of stocks. According to Table 2 highest improvement has been observed for Gemini Sea Food Limited and the lowest has been for The City Bank Limited.

Statistical Validity Comparison: For comparing statistical validity of the model, intercepts and Significance F will be compared. The lower these two emerge, the better the model statistically. These two have been presented for each of the 20 stocks for both the model as follows:

Table 3: Comparison of Statistical Validity between Capital Asset Pricing Model and French Three Factor Model

Stock	Intercept		Significance F	
	CAPM	FF3F	CAPM	FF3F
Agricultural Marketing Co Ltd.	0.005	0.001	0.004	0.002
British American Tobacco	0.012	0.016	0.475	0.087
Golden Harvest Agro Industries Limited	0.017	0.007	0.001	0.001
Gemini Sea Food Limited	0.072	0.017	0.687	0.000
Prime Bank Limited	0.003	-0.001	0.036	0.000
The City Bank Limited	0.019	0.016	0.000	0.000
Bank Asia Limited	0.014	0.001	0.051	0.000
Mutual Trust Bank Ltd.	0.034	0.021	0.013	0.010
BSRM Steels Limited	0.000	0.005	0.000	0.000
Navana CNG Limited	0.004	0.001	0.000	0.000
Kay and Que Bangladesh Limited	0.055	0.027	0.220	0.000
Bangladesh Lamps Limited	0.013	0.007	0.032	0.076
Linde Bangladesh Limited	0.012	0.015	0.013	0.028
Summit Power Limited	0.010	0.007	0.695	0.289
Khulna Power Company Limited	0.010	0.012	0.000	0.000
MJL Bangladesh Limited	0.014	0.024	0.001	0.000
Heidelberg Cement Bangladesh Limited	0.005	0.009	0.003	0.002
Premier Cement Mills Limited	-0.008	-0.010	0.010	0.000
Confidence Cement Limited	0.014	-0.002	0.000	0.000
LafargeHolcim Bangladesh Limited	0.012	0.020	0.000	0.000
Average	0.016	0.010	0.112	0.025

According to Table 3 on an average Capital Asset Pricing Model has 1.60% of the excess return that is independent of the explanatory variable and Fama and French Three Factor Model has 1% of the excess return that is independent of the explanatory variables. So, with a lower level of uncaptured excess return, clearly Fama and French Three Factor Model is statistically a superior model to Capital Asset Pricing Model. On an average Capital Asset Pricing Model has 11.20% probability that the model is wrong and unreliable. It crosses the set threshold level of 5% significance by miles. On the other hand, Fama and French Three Factor Model has only 2.50% probability that the model is wrong and unreliable. It doesn't cross the set threshold level of 5% significance. So, with a lower level of significance or lower level of probability of the model's being wrong and unreliable, clearly Fama and French Three Factor Model is statistically a superior model to Capital Asset Pricing Model. Moreover, there are some outliers, so observing the percentage of the sample that produced higher than 5% significance level is more meaningful. In Capital Asset Pricing Model, there are 5 stocks whose models seem unreliable. So, 25% unreliability has been found in the model. On the other hand, in Fama and French Three Factor Model, there are only 3 stocks whose models seem unreliable. So, only 15% unreliability has been found in the model. So, with a lower level of unreliability, clearly Fama and French Three Factor Model is statistically a superior model to Capital Asset Pricing Model.

Summary and Conclusion

The objective of this study is to find out whether Fama and French Three Factor Model is a superior model to Capital Asset Pricing Model when it comes to estimating excess return of securities in Dhaka Stock Exchange (DSE). Additionally, observing the effects of market, size and value premiums on excess return is also an objective of this study. To unmask these facts, two regression models have been used. Adjusted R-Square has been considered as the explanatory power of the regression output and hence the model. The time frame of the dataset is 5 years. 20 stocks from 5 different sectors have been considered for the study. The 5-year data series of excess return of each stock has been regressed against the market premium (RM-RF) for the Capital Asset Pricing Model and against market premium (RM-RF), size premium (SMB) and value premium (HML) for Fama and French Three Factor Model. In 100% of the cases, an improvement in the explanatory power has been observed when Fama and French Three Factor Model is chosen over Capital Asset Pricing Model for estimating excess return of the stock. Both models show that the prices of stocks are theoretically less volatile than what they should be in a normal market. The market mostly comprises small cap companies and size factor contributes positively to required return. It has been found that small cap companies represent 65% of the market and large cap companies represent 35% of the market. The market mostly comprises growth (low value) companies and value factor contributes negatively to required return. It has been found that growth (low value) companies

represent 70% of the market and value (high value) companies represent 30% of the market. So, all the three factors have impact on excess return although stocks tend to be most sensitive to the market factor. But size factor and value factor also exert impact on excess return and are statistically significant. Fama and French Three Factor Model is also statistically a superior model with only 2.50% probability of being wrong compared to 11.20% probability for Capital Asset Pricing Model (CAPM). To conclude, Fama and French Three Factor Model does a good job in explaining excess return of stocks and in this regard outweighs Capital Asset Pricing Model (CAPM).

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