

**TESTING THE THREE FACTOR MODEL OF FAMA AND FRENCH:  
EVIDENCE FROM TURKEY**

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**ABSTRACT**

*The 3 Factor Model, used for explaining the variation in common stock returns has added a fresh insight into asset pricing. The explanatory power of the Model has been tested by employing data of firms from various sectors, countries and regions. The Model has been tested using data of the firms quoted to Istanbul Stock Exchange (ISE), too. But the findings were conflicting. The aim of this study is to investigate whether the 3 Factor Model could capture the variation in common stock returns of firms quoted to ISE or not, by using a data set including firms from the financial sector, for a longer time period. Considering the findings, it would be possible to emphasize that even though the 3 Factor Model could explain most of the variation in common stock returns over the period July of 1993 to June of 2004, there might be still some missing factors in the Model. In other words, the Model could not capture the variation in common stock returns totally.*

**Key Words:** 3 Factor Model, Istanbul Stock Exchange, Common Stock Returns

**ÖZET**

*Hisse senedi getirilerindeki varyasyonu açıklamakta kullanılan 3 Faktör Modeli, varlık fiyatlamaya yeni bir boyut getirmiştir. Modelin getiriler üzerindeki açıklayıcı gücü farklı ülke ve bölgelerdeki çeşitli sektörlerde yer alan firmalara ait veriler kullanılarak test edilmiştir. Model, İMKB’de işlem gören firmalara ait veriler kullanılarak da test edilmiştir fakat elde edilen bulgular çelişki içerisindedir. Bu çalışmanın amacı ise 3 Faktör Modeli’nin, İMKB’de işlem gören hisse senetlerinin getirilerindeki varyasyonu açıklayıp açıklayamadığını, Finansal sektörde yer alan firmaları da örnek gruba dahil ederek, daha uzun bir süre için incelemektir. Bulgulara bakıldığı zaman, her ne kadar 3 Faktör Modeli’nin 1993 yılı Temmuz ayı ile 2004 yılı Haziran ayı arasındaki dönemde İMKB işlem gören firmaların hisse senetlerinin getirilerindeki varyasyonu büyük ölçüde açıklayabildiği söylenebilecek olsa da, Model’de eksik olan bazı faktörlerin var olabileceği de belirtilmelidir.*

**Anahtar Kelimeler:** 3 Faktör Modeli, İMKB, Hisse Senedi Getirileri

### **1. Introduction**

The Capital Asset Pricing Model (CAPM) is the most commonly used model in explaining the variation in common stock returns due to its simplicity. The Model assumes that the variation in common stock returns is captured only by beta, which is used as the measure of systematic risk. The explanatory power of the Model has been tested by many empirical studies. The studies have provided evidence that factors other than beta have explanatory power over the variation in common stock returns. In one study, Fama and French (1992) presented evidence suggesting that common stock returns are a linear function of beta, market value of equity (ME) and book-to-market value of equity ratio (BE/ME). The findings of the pioneering study emphasized that these 3 variables captured the variation in common stock returns, traded at NYSE and AMEX over the 1963-1990 period.

Building upon the findings of the study in 1992, Fama and French (1993), argued that the variation in common stock returns could be explained by three factors; beta, ME and BE/ME. Fama and French constructed a Model, known in the finance literature as the “3 Factor Model”, which is used for explaining the variation in common stock returns by employing these 3 factors as the explanatory variables.

The 3 Factor Model has added a fresh insight into asset pricing. The Model has been studied by many researchers from all around the world. The explanatory power of the Model over the common stock returns has been tested by employing data of firms from various sectors, countries and regions.

The Model has been tested using data of the firms quoted to Istanbul Stock Exchange, too. Aksu and Onder (2003) compared the explanatory power of the 3 Factor Model and the CAPM over the variation in common stock returns of firms quoted to Istanbul Stock Exchange over 1993 to 2001 period. The firms from financial sector were excluded from the database. The results of the study emphasized that the Model could capture the variation in common stock returns. Karan and Gonenc (2003) investigated the explanatory power of the 3 Factor Model over the variation in common stock returns of firms quoted to Istanbul Stock Exchange over 1993 to 1998 period. The findings of the study were conflicting with the findings of Aksu and Onder (2003), emphasizing that the Model could not capture the variation in common stock returns.

The aim of this study is to investigate whether the 3 Factor Model captures the variation in common stock returns of firms quoted to Istanbul Stock Exchange or not, by using a data set including firms from the financial sector. Also, the explanatory power of the Model is investigated for a longer time period, July 1993 to June 2004 period.

### **2. Literature Review**

When constructing the 3 Factor Model, Fama and French (1993) argued that ME factor and BE/ME factor were proxies for risk. This is the risk based view of the Model. This argument is the most widely debated aspect of the Model. Fama and French emphasized that the reason for firms with lower ME (small firms) and firms with higher BE/ME, having higher returns is due to the common risk factors in returns.

On the other hand, there are alternative explanations other than the risk based view. Lakonishok et al. (1994) argue that the abnormal returns that common stocks generate is due to the investors’ misinterpretation based on the past earnings figures.

According to this point of view, investors overreact to firms' performance. Investors perceive firms with higher BE/ME as being weak and perceive firms with lower BE/ME as being strong firms. Dependent on this perception, investors misinterpret the future expected earnings figures of these firms. Investors over-predict the common stock returns of the firms with higher BE/ME and under-predict the common stock returns of the firms with lower BE/ME. These predictions cause the common stocks to be mispriced. When the expectations of the investors are not met, adjustments are observed in common stock prices. As a result, common stocks of the firms with lower BE/ME generate lower returns compared to the common stocks of the firms with higher BE/ME.

In a following study, Fama and French (1995) tested the explanatory power of the 3 Factor Model over the variation in earnings per share. The study provided evidence suggesting that the three factors of the Model captured the variation in earnings per share.

In another study, Fama and French (1996) tested the explanatory power of the 3 Factor Model over the variation in common stock returns by employing portfolios constructed based on earnings/price ratio, cash flow/price ratio and sales growth ratio, separately. The findings of the study provided evidence that the 3 Factor Model captured the variation in common stock returns, even when portfolios constructed dependent on these variables were employed.

Daniel and Titman's (1997) study, where 3 Factor Model's explanatory power over the variation in common stock returns was tested, provided evidence suggesting that the abnormal returns generated by the common stocks of firms with low ME and high BE/ME were not due to the common risk factors in returns. Daniel and Titman used data of firms quoted to NYSE, AMEX and NASDAQ. In contradiction with Fama and French's risk based view, Daniel and Titman argued that it was the characteristics of firms, rather than covariance structure of returns, that explained the variation in common stock returns. The results of the study indicated that there was no return premium associated with the factors in the Model, suggesting that the higher returns associated with those factors could not be viewed as compensation for common risk factors.

Allen and Cleary (1998) tested the explanatory power of 3 Factor Model over the variation in common stock returns, employing data of the firms quoted to the Bursa Malaysia Stock Exchange. The findings of the study emphasized that the Model could capture the variation in common stock returns. Heston et al. (1999) tested whether the 3 Factor Model could capture the variation in common stock returns, by employing data of the firms quoted to twelve European countries. Heston et al. made an adjustment in the Model, replacing BE/ME factor with a one-period lagged market factor. The results of the study suggested that the Model could not capture the variation in common stock returns. Lewellen (1999), using data of firms quoted to NYSE, AMEX and NASDAQ, provided evidence that the 3 Factor Model could capture the variation in common stock returns. Lewellen argued that the reason for the Model's explanatory power was that the changes in common stocks' risks in time were proxies for the three factors.

In response to Daniel and Titman's (1997) study, Fama et al. (2000) tested the explanatory power of the Model by employing portfolios constructed dependent not

only on ME and BE/ME, but also on past factor loadings. The study provided evidence that, in the period studied, in only one sub-period was the characteristics based view dominant to the risk based view, out of all the sub-periods and the whole period.

Daniel et al. (2001), investigated whether the explanatory power of the 3 Factor Model could be explained by the risk based view or the characteristics based view, by using data of firms quoted to the Tokyo Stock Exchange over 1975 to 1997 period. For this purpose, following Daniel and Titman (1997), the researchers formed zero cost portfolios that were characteristic-balanced. The risk based view would predict that the portfolios should have a significantly positive return. However, Daniel and Titman's characteristics based view would predict that the portfolios could have a return of zero on average for common stocks. The authors also formed portfolios, which were factor-balanced. According to the risk based view, the portfolios could have a return of zero on average for common stocks. The factor loading, which was taken as the basis for both portfolios' construction, was firms' past BE/ME. The risk based view was rejected when characteristics-balanced portfolios were employed, dependent on the findings of the study.

Connor and Sehgal (2001) tested the explanatory power of the 3 Factor Model over the variation in common stock returns and over the variation in earnings per share growth ratios, using data of firms quoted to the National Stock Exchange of India. The results of the study emphasized that the Model captured the variation in both common stock returns and the variation in earnings per share growth ratios.

Ajili (2002) compared the explanatory power of the 3 Factor Model and Capital Asset Pricing Model over the variation in common stock returns, using data of firms quoted to the French Stock Market. The results of the study emphasized that the 3 Factor Model captured the variation in common stock returns better than the CAPM.

Annert et al. (2002) tested the explanatory power of the 3 Factor Model over the variation in common stock returns, using data of firms quoted to fifteen European countries. Different from similar past studies, value of the net tangible assets figure was employed for ME. The purpose for the extraction of intangible assets was to make a better distinction between firms with higher and lower BE/ME. The findings of the study emphasized a significant premium for ME, but an insignificant premium for BE/ME.

In a following study Ajili (2003) compared the risk based view and the characteristics based view, using data of firms quoted to the French Stock Exchange. The findings of the study supported the risk based view. In a study with a similar purpose, Chou et al. (2004) used data of firms quoted to the Tokyo Stock Exchange. The findings of the study emphasized that an investor, forming a portfolio dependent on characteristics based view, could yield higher returns than an investor forming a portfolio dependent on the risk based view.

Charitou and Constantinidis (2004) compared the explanatory power of CAPM and the 3 Factor Model over the variation in common stock returns quoted to the Tokyo Stock Exchange. The findings of the study emphasized that the latter Model did a better job in capturing the variation in common stock returns. Gaunt (2004), compared the explanatory power of the 3 Factor Model and the CAPM in the case of the Australian Stock Market and found similar findings to Charitou and Constantinidis (2004). In another similar study, Bilinski and Lyssimachou (2004) investigated the

same concept, using the data of firms quoted to Stockholm Stock Exchange. The findings of the study emphasized that the 3 Factor Model could capture the variation in common stock returns.

Qi (2004) compared the explanatory power of both 3 Factor Model and the CAPM over the variation in common stock returns, applying several statistical tests. Qi used data from twelve industries. The results of the study emphasized that, on an aggregate level, the two models behaved similar, and conflicting with the literature, the CAPM outperformed the 3 Factor Model for more sectors, but the difference in some cases was not significant, meaning that the CAPM was slightly better. In another study, Bartholdy and Peare (2005) emphasized that the 3 Factor Model was unable to capture the variation in common stock returns of firms quoted to NYSE over 1970 to 1996 period.

Bundoo (2006) tested the explanatory power of the 3 Factor Model over the variation in common stock returns, for the stock exchange in Mauritius, an emerging stock market in Africa. The findings of the study emphasized that the Model could capture the variation in the case of the stock exchange of Mauritius. In and Kim (2006), tested the explanatory power of the 3 Factor Model over the variation in common stock returns, by applying an approach based on wavelet multi scaling method. The results of the study provided evidence suggesting that all the factors of the Model played an important role in explaining the variation. Bahl (2006) compared the explanatory power of the 3 Factor Model and the CAPM over the variation of common stock returns of the firms listed on the BSE-100 stock market index of India. The findings of the study emphasized that the former model did a better job in capturing the variation in common stock returns than the latter Model. Mohamed (2007) tested the explanatory power of the 3 Factor Model over the variation in common stock returns, using data of firms quoted to Bombay Stock Exchange. The findings of the study emphasized that the 3 Factor Model was more precise than the CAPM in capturing the variation in common stock returns. It was also found that the investors in India paid more premium to the BE/ME of firms, than the ME of firms.

In this study the explanatory power of the 3 Factor Model over the variation in common stock returns of firms quoted to Istanbul Stock Exchange is investigated, by using a data set including firms from the financial sector. Also, the explanatory power of the Model is investigated for a time period covering July 1993 to June 2004. However, comparing the risk based view and the characteristics based view of the Model is beyond the scope of this article and is left for a further study.

### **3. Data and Methodology**

The sample includes firms, quoted to ISE over July 1993 to June 2004 period. For a firm to be included in the sample in July of year  $k$ ; the monthly returns of the common stock for the 24 months preceding July of year  $k$ ; the number of the common stock and market value of equity for December of year  $k-1$ ; the number of the common stock for December of year  $k$ ; and the monthly returns for the 12 months between July of year  $k$  and June of year  $k+1$  must be available ( $k$ : 1993, 1994....2003, 2004).

In addition to this, firms with missing information, firms that were removed from ISE quotation, firms with fiscal yearends different than December and firms with more than one share class (A,B,C) were excluded from the sample.

Following Fama and French, firms with negative BE/ME for December of  $k-1$ , were excluded from the sample for the period between July of year  $k$  and June of year  $k+1$ . When BE/ME turned positive in the following years, the firms were again included in the sample (Fama and French, 1993).

To ensure that accounting variables were known before the returns they were used to explain, firms with fiscal yearends other than December were excluded from the sample. Firms are required to file their accounting reports to ISE within 3 months of their fiscal yearends. However, Alford, Jones and Zmijewski showed that in USA, almost 19,8 % of the firms do not comply (Alford et al., 1994). To ignore the consequences of such a case and to ensure that accounting variables were known before the returns they were used to explain, the accounting data for all fiscal yearends in calendar year  $k-1$  were matched with the returns for July of year  $k$  to June of year  $k+1$  both for the portfolios and time series regressions, leaving a 6 month gap between fiscal yearend and return tests.

The accounting data of the firms in the sample were gathered from ISE Training and Publications Department. The monthly return and monthly price data of the firms in the sample were gathered from the ISE web page ([www.ise.org](http://www.ise.org)). As the risk free rate; monthly interest rates derived from the annual interest rates of Government Discounted Bond auctions were used ([www.hazine.gov.tr](http://www.hazine.gov.tr)). ISE National-100 indices, a value-weighted indices, was used as the market proxy.

The monthly returns of each portfolio correspond to the value weighted monthly returns of the common stocks and are calculated as:

$$R_{p,t} = \sum_{i=1}^n A_{i,t} * R_{i,t}$$

Where;

$R_{p,t}$ : value weighted monthly return of portfolio  $p$  at month  $t$ .

$R_{i,t}$ : monthly return of the common stock of firm  $i$  at month  $t$ .

$A_{i,t}$ : ratio of the ME of firm  $i$  to the total ME of portfolio  $p$  at month  $t$ .

$n$ : number of common stocks in portfolio  $p$ .

The other variables are as follows; ME for a firm at month  $t$  is the number of the firm's common stock at month  $t$  times the monthly closing price of the firm's common stock traded at ISE. BE/ME for a firm at month  $t$  is the firm's book value of equity divided by the firm's market value of equity. Common stock price at month  $t$  is the closing price of the firm's common stock traded at ISE at month  $t$ . Monthly common stock return for a firm at month  $t$  is the monthly return gained by holding the common stock for month  $t$ .

To investigate the explanatory power of the 3 Factor Model over the variation in common stock returns, the methodology of Fama and French (1993) was followed.

The Model was tested by employing the market, ME and BE/ME factors in the times series regressions as independent variables and the average monthly returns of eight portfolios as dependent variables. Thus, it would be useful to emphasize how the portfolios were constructed, firstly.

In the study of Fama and French (1993), six portfolios were constructed based on ME and BE/ME. Also, two more portfolios were constructed following Connor and Sehgal (2001), and Ajili (2002).

For the construction of portfolios, following Fama and French, the firms included in the sample were, firstly, grouped into two groups based on ME. Firms with a ME value over the median ME value of the sample were put in the B (Big) size portfolio and firms with a ME value under the median ME value of the sample were put in the S (Small) size portfolio. The same firms were, later, ranked based on BE/ME. Firms in the % 30 highest BE/ME interval were put in the H (High) BE/ME portfolio, firms in the % 30 lowest BE/ME interval were put in the L (Low) BE/ME portfolio, and the remaining firms were put in the M (Medium) BE/ME portfolio. The reason for Fama and French to group firms into two groups based on ME and group firms into three groups based on BE/ME was that BE/ME had more explanatory power over the variation in common stock returns compared to ME (Fama and French, 1993).

Six portfolios (LS, LB, MS, MB, HS, HB) were constructed based on the intersection of the two preceding portfolio classifications mentioned, independently.

In addition to these six portfolios, following Ajili (2002), two more portfolios were constructed. These portfolios are; HBE/ME portfolio which corresponds to the average of monthly returns of two portfolios with high BE/ME (HS and HB) and LBE/ME portfolio which corresponds to the average of monthly returns of two portfolios with low BE/ME (LS and LB).

The common stocks taking place in a portfolio were renewed annually at July of each year.

The unconditional version of the 3 Factor Model, tested in the study is expressed as;

$$E(R_i) - R_F = b_i * [E(R_M) - R_F] + s_i * E(SMB) + h_i * E(HML)$$

Where;

$E(R_i)$ : expected return of the common stock of firm i.

$R_F$ : risk free rate.

$E(R_M)$ : Expected return of the market portfolio.

$[E(R_M) - R_F]$ : market factor

$E(SMB)$ : market value factor

$E(HML)$ : book-to-market value of equity factor

$b_i, s_i, h_i$ : factor loadings.

Market factor for any month is the difference between the monthly return of the ISE National-100 indices and the monthly risk free rate. SMB is the difference between the average monthly common stock returns of the three portfolios with small market value (HS, MS and LS) and the average monthly common stock returns of the three portfolios with big market value (HB, MB and LB). In other words;  $SMB = [(HS+MS+LS) - (HB+MB+LB)]/3$ . On the other hand, HML is the difference between the average monthly common stock returns of the two portfolios with higher BE/ME (HS and HB) and the average monthly common stock returns of the portfolio with lower BE/ME (LS and LB). In other words;  $HML = [(HS+HB) - (LS+LB)]/2$ .

According to the risk based view of the 3 Factor Model, Market, SMB and HML factors are constructed in order to proxy for the common risk factors in common stock returns (Fama and French, 1993).

The time series regression run to test the explanatory power of the Model is expressed as;

$$R_i - R_F = a_i + b_i * (R_M - R_F) + s_i * SMB + h_i * HML + e_i$$

The time series regression was run employing the necessary variables over the July 1993 to June 2004 period.

To investigate the explanatory power of the Model over the variation in common stock returns, the average monthly excess returns of the eight portfolios mentioned earlier were employed as the dependent variable in the regression above. The intercept and slope terms gathered as a result of running the regression and the t-statistics and R<sup>2</sup> statistics were investigated to check the explanatory power of the 3 Factor Model.

#### 4. Findings

One of the problems of applying any multiple regression analysis is that there might be multicollinearity between the explanatory variables. The possible occurrence of multicollinearity was checked by considering the correlation matrix for the explanatory variables (Curuk, 2001). The correlation matrix is presented in Table 1.

**Table 1: Correlation Matrix for the Explanatory Variables**

	<b>SMB Factor</b>	<b>HML Factor</b>	<b>Market Factor</b>
<b>SMB Factor</b>	1	-0.2311	-0.1269
<b>HML Factor</b>		1	0.3346
<b>Market Factor</b>			1

The correlation matrix exhibits that there was no such multicollinearity to cause any problem.

The intercepts, the slopes (t statistics presented in parenthesis) and the R<sup>2</sup> and Adjusted R<sup>2</sup> of time series regressions for each portfolio are presented in Table 2. For each portfolio, the average monthly excess returns were regressed according to the regression below:

$$R_i - R_F = a_i + b_i * (R_M - R_F) + s_i * SMB + h_i * HML + e_i$$

When the average monthly excess return of BH portfolio was employed in the regression as the dependent variable, it was observed that the slope of the market factor and the slope of the HML factor were statistically significant with t-statistics of 22.87 and 12.00, respectively. However, the slope of the SMB factor was not statistically significant with a t-statistics of -1.07. The intercept term was, also, statistically



significant with a t-statistics of 2.42. The  $R^2$  and the Adjusted  $R^2$  statistics were virtually 0.88.

**Table 2: Monthly Excess Return Regression Results of Portfolios (July 1993 to June 2004)**

The table presents the intercept and the slopes (t statistics presented in parenthesis) and the $R^2$ and Adjusted $R^2$ of time series regressions, for each portfolio, whose monthly returns were regressed according to:						
$R_i - R_F = a_i + b_i * (R_M - R_F) + s_i * SMB + h_i * HML + e_i$						
Portfolio	a	b	s	h	$R^2$	Adj. $R^2$
<b>BH</b>	0.0155 (2.42)	0.9136 (22.87)	-0.0762 (-1.07)	0.8790 (12.00)	0.8871	0.8844
<b>BM</b>	0.0122 (1.97)	1.0341 (26.91)	-0.0089 (-0.13)	-0.1032 (-1.46)	0.8655	0.8624
<b>BL</b>	0.0110 (2.09)	1.0382 (31.74)	-0.0957 (-1.64)	-0.4364 (-7.28)	0.8950	0.8925
<b>SH</b>	0.0140 (2.73)	1.0815 (33.92)	1.0160 (17.92)	0.4499 (7.70)	0.9262	0.9245
<b>SM</b>	0.0061 (1.17)	0.9475 (28.94)	0.7675 (13.18)	0.1239 (2.06)	0.8879	0.8852
<b>SL</b>	0.0186 (3.00)	0.9569 (24.83)	1.0355 (15.11)	-0.2345 (-3.32)	0.8517	0.8482
<b>LBE/ME</b>	0.0148 (3.46)	0.9975 (37.44)	0.4699 (9.91)	-0.3355 (-6.87)	0.9179	0.9160
<b>HBE/ME</b>	0.0148 (3.46)	0.9975 (37.44)	0.4699 (9.91)	0.6644 (13.61)	0.9431	0.9418

As the average monthly excess return of BM portfolio was employed in the regression as the dependent variable, the slope of the market factor was statistically significant with a t-statistics of 26.91. However, the slope of the SMB factor and the slope of the HML factor and the intercept term were statistically insignificant with t-statistics of -0.13, -1.46 and 1.97, respectively. The  $R^2$  and the Adjusted  $R^2$  statistics were approximately 0.86.

When the dependent variable in the regression was the average monthly excess return of BL portfolio, it was observed that the slope of the market factor, the slope of the HML factor and the intercept term were statistically insignificant. The t-statistics were 31.74, -7.28 and 2.09, respectively. Only the slope of the SMB factor was statistically insignificant with a t-statistics of -1.64. The  $R^2$  and the Adjusted  $R^2$  statistics were virtually 0.89.

In the cases where the portfolios containing relatively bigger firms were employed in the regressions as the dependent variables, the slopes of the SMB factor were observed to be statistically insignificant. The slopes, also, had negative values for all the three cases. The slopes of the market factor were statistically significant for all the three cases and had the highest t-statistics, compared to the slopes of the other factors. The slopes of the HML factor were statistically significant for two cases and the intercept terms were slightly significant for two cases.

When the average monthly excess return of SH portfolio was employed in the regression as the dependent variable, the slope of the market factor, the slope of the

SMB factor, the slope of the HML factor and the intercept term were all statistically significant with t-statistics of 33.92, 17.92, 7.70 and 2.73, respectively. The  $R^2$  and the Adjusted  $R^2$  statistics were approximately 0.92.

When the dependent variable in the regression was the average monthly excess return of SM portfolio, it was observed that the slope of the market factor, the slope of the SMB factor and the slope of the HML factor were statistically significant. The t-statistics for the slopes were 28.94, 13.18 and 2.06, respectively. the intercept term was statistically insignificant and the t-statistics was 1.17. The  $R^2$  and the Adjusted  $R^2$  statistics were virtually 0.88.

As the dependent variable employed in the regression was the average monthly excess return of SL portfolio, the slope of the market factor, the slope of the SMB factor, the slope of the HML factor and the intercept term were all statistically significant. The t-statistics were 24.83, 15.11, -3.32 and 3.00, respectively. The  $R^2$  and the Adjusted  $R^2$  statistics were 0.85 and 0.84.

When the portfolios containing relatively smaller firms were employed in the regressions as the dependent variables, the slopes of the market factor had the highest t-statistics, compared to the slopes of the other factors. This time, the slopes of the SMB factor were all statistically significant and were higher than the slopes of the HML factor. Still, the slopes of the HML factor were statistically significant in all the cases. And the intercept terms were again statistically significant for two cases.

In addition to the six portfolios mentioned earlier, following Ajili (2002), the average monthly excess returns of two more portfolios, LBE/ME and HBE/ME, were employed in the regressions as the dependent variables. When the average monthly excess returns of LBE/ME portfolio and HBE/ME portfolio were employed in the regression as the dependent variables, the slopes of the market factor, the slopes of the SMB factor and the intercept terms were all statistically significant. The t-statistics were 37.44, 9.91 and 3.46, respectively, for both cases. The  $R^2$  and the Adjusted  $R^2$  statistics were virtually 0.91 and 0.94, for the LBE/ME case and the HBE/ME case, respectively. The slopes of the HML factor were -6.87 and 13.61 for the LBE/ME case and the HBE/ME case, respectively.

## **5. Conclusions**

To investigate the explanatory power of the Model over the variation in common stock returns, the average monthly excess returns of BH, BM, BL, SH, SM, SL, LBE/ME and HBE/ME portfolios were employed in the time series regression derived from the 3 Factor Model, as the dependent variables.

As a result of the regressions run, it was observed that the t-statistics of the slopes of the market factor were significant and were higher than the t-statistics of the slopes of the other factors for all the cases. Thus, it could be emphasized that the market factor was the most important factor in explaining the variation in common stock returns. The t-statistics of the slopes of the HML factor were significant for all the cases, except one case where the average monthly excess return of the BM portfolio was employed in the regression as the dependent variable. Thus, it could be emphasized that HML factor is the second important factor in explaining the variation in common stock returns. When the t-statistics of the slopes of the SMB factor were considered, it was observed that the slopes were statistically insignificant for the cases

where the portfolios containing relatively bigger firms were employed in the regressions as the dependent variables. However, when the portfolios containing relatively smaller firms and the LBE/ME and HBE/ME portfolios were employed in the regressions as the dependent variables, the t-statistics of the slopes of the SMB factor were significant and had a higher t-statistics than the slopes of the HML factor.

Considering the findings about the t-statistics of the slopes of the market factor, SMB factor and HML factor and also the  $R^2$  and the Adjusted  $R^2$  statistics, as a whole for the eight cases, it could be possible to emphasize that the 3 Factor Model captured the variation in common stock returns of firms quoted to Istanbul Stock Exchange over the period July of 1993 to June of 2004.

However, when the intercept terms are taken into consideration, it was observed that the relevant t-statistics were statistically significant, except for only one case. Similar findings were observed by Ajili (2002). In Fama and French study (1993) and some other studies, the intercept terms were mostly statistically insignificant. When the findings about the intercept terms in our study are taken into account, it would be possible to emphasize that even though the 3 Factor Model could explain most of the variation in common stock returns of firms quoted to Istanbul Stock Exchange over the period July of 1993 to June of 2004, there might be some missing factors in the Model. In other words, the Model could not capture the variation in common stock returns totally.

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